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ART MANAGEMENT DURING THE COVID-19 PANDEMIC: VISUAL ARTS CREATOR PERSPECTIVE*

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Abstract. Forced virtualisation and digitisation – such as the COVID-19 pandemic – significantly affect the quality of the creative process within the aesthetic situation, depending on the form of participation in visual arts. The visual arts creator, managing the creative process within the aesthetic situation, must take into account the new optics concerning the components of the aesthetic situation because otherwise, his work will be incomprehensible or unattainable for the recipients – not due to the low quality of the artwork, but because the artwork in new virtualised circumstances may change its features. The features of the aesthetic situation vary depending on the optics of the visual arts creator and the visual arts recipient. This paper focuses on the creator's perspective. Management in the field of visual arts may have three dimensions: self-management, managing the aesthetic situation and managing a cultural institution. Each of these dimensions is characterised by different issues; however, they also have common denominators in the need to consider the metaphysical nature of the essence of the aesthetic situation. This work aims to analyse changes in the artistically creative process understood as the management of the aesthetic situation depending on the form in which participation in visual arts takes place: traditionally, i.e. in-person or virtually using digital methods. Literature analysis and empirical qualitative research in the form of interviews with visual arts creators did allow to answer the following research questions: 1) How do forced virtualisation and digitisation affect the quality of the creative process in an aesthetic situation regarding visual arts? 2) Which qualitative parameters of the aesthetic situation are losing and which are gaining quality in connection with the virtualisation of the creative process in an aesthetic situation regarding visual arts? The presented results of empirical research show which of the components of the aesthetic situation are subject to modifications due to the form of participation in visual arts.

Keywords: art management, art of management; organisation's aesthetics; humanistic management; creativity; creativeness; artistry

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1. Introduction and literature background

One of the more universal and, at the same time, more widely unknown holistic theories in the field of aesthetics is the theory of the aesthetic situation (Gołaszewska, 1984b; Ingarden, 1981); this theory is successfully used in the field of management (Szostak, 2021, 2022; Szostak & Sułkowski, 2020). Its universality lies in the simplicity and inclusiveness of all phenomena occurring in the art creator and recipient areas. The components of the aesthetic situation are the creator, the work of art, the recipient (also a critic as a specific type of recipient), the world of universal values and the natural world. In addition to being aware of the components of this theory, one should be aware of the mutual relations between them: a work of art is a crucial component of the aesthetic situation; however, it needs a creator who will include universal values in the artwork in the form of items of the natural world, as well as a recipient who will read universal values in the elements of the natural world through the process of receiving the work. The features of the aesthetic situation vary depending on the optics of the visual arts creator and the visual arts recipient. Therefore, this paper focuses mainly on the creator's perspective, considering the recipient of the visual arts perspective.

The mutual perception of the visual artist as a disordered personality functioning in a messy space is not confirmed in the identity of the artists (Szostak, 2022; Szostak & Sułkowski, 2021c). Moreover, it concerns only the shallow and easily-visible layer of reality without touching the essence of the organisational side of the creative process. The creative process is also commonly perceived as a phenomenon on the edge of madness and chance; however, analysing theories concerning aesthetic and managerial optics allows looking at the creative process as a phenomenon perfectly suited for investigation based on management theory.

Visual arts management may be considered on three levels: 1) self-management of the visual arts creator (Jones, 2009; Kostera, 2014; Marra, 2019; Sims, 2003; Szostak & Sułkowski, 2021b); 2) management of the aesthetic situation by the visual arts creator (Böhme, 2021; Szostak, 2021; Szostak & Sułkowski, 2020); 3) visual arts institution management by a visual arts creator (Morozova et al., 2016; Rius-Ulldemolins & Klein, 2021). Each of these levels is characterised by different complications; however, they also have common denominators based on considering the metaphysical nature of the essence of the aesthetic situation (Szostak, 2021). The last level is mainly described in the literature focusing on how to run an art gallery, a theatre, or organise an art event. Therefore, this article focuses on the first and second levels mentioned above.

Naturally, a large part of the processes developing in the 21st century is virtualised; part of reality adapts faster to the digital world, another part slower (Karki & Porras, 2021; Kröner et al., 2021). Visual arts is also an area that cannot resist the process of virtualisation, although each of the forms of the visual arts (painting, sculpting, graphics) has a different propensity for digitisation due to its characteristics (Mao & Jiang, 2021; Schwartz, 2020; Wagner, 2020). Since the turn of 2019/2020, the COVID-19 pandemic has been an essential catalyst for visualisation and digitisation in virtually all areas of human activity. It was the dominant external factor, from which there was no turning back, and its strength and a long period of influence were able to break even the most hardened traditionalists accustomed to traditional forms of participation in arts (Szostak & Sułkowski, 2021c, 2021a). In this case, too, visual arts had to surrender, and perhaps for the first time in the history of humankind, most visual artists and audiences were forced to participate in their art discipline in a virtualised way – in whole or to a large extent. Just as each visual arts form reacts differently to virtualisation, the creators and recipients of individual visual arts forms also react inversely to this process. The reasons for this different reaction are many factors: 1) the characteristics of the creative process among visual arts forms; 2) characteristics of the perception process among visual arts forms; 3) the personal preferences of a visual arts creator; 4) personal preferences of the recipient; 5) having an appropriate infrastructure to participate in visual arts in virtual forms.

This paper aims to analyse changes in the creative process among the aesthetic situation depending on the form in which the aesthetic situation regarding visual arts takes place: 1) traditional in-person or 2) virtual with digital

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techniques. In order to structure the considerations, the subsequent research questions were formulated: 1) How do forced virtualisation and digitisation affect the quality of the creative process in an aesthetic situation regarding visual arts? 2) Which qualitative parameters of the aesthetic situation are losing and which are gaining quality in connection with the virtualisation of the creative process in an aesthetic situation regarding visual arts?

The research methods used in this work are critical review and qualitative analysis of the literature and qualitative research in the form of interviews with visual arts creators. The methodological strategy is based on an interdisciplinary and multi-paradigm approach, taking into account the achievements in the field of aesthetics and management. The critical review of the literature concerned two areas of aesthetics and management. As a supplement to the cognitive gaps in key-importance themes, the literature in philosophy, psychology, sociology and pedagogy was also analysed to a limited extent. The primary languages of the analysed publications were English and Polish; critical German publications were also analysed. Qualitative analysis of the literature was based primarily on monographs with an established position in the field of aesthetics (Dahlhaus, 2007; Gołaszewska, 1967, 1984a, 1984b, 1986, 2001, 2005; Ingarden, 1981; Levinson, 2003; Ossowski, 1949; Wilkoszewska, 2007), management (Drucker, 2006b, 2006a, 2009; Griffin, 2005; Kotler & Keller, 2016; Koźmiński, 2005; Koźmiński & Piotrowski, 1999; Mintzberg, 2012; Porter, 1980) and aesthetics of management (Biehl-Missal, 2011; Guillet de Monthoux, 2004; Kostera, 2014, 2019; Kostera & Woźniak, 2022; Linstead & Höpfl, 2000; Minahan, 2020; Strati, 1999), as well as on the analysis of the results of research published in the form of scientific articles, which were made possible by scientific research EBSCO, Google Scholar, JSTOR, Mendeley, Scopus and Web of Science databases.

Considerations regarding managerial issues in the artist's activity can be placed on self-organisation and self-management, where self-awareness and the ability to reflect are essential. This self-management, which from the title of M. Kostera's monograph may be called "occupy management", is a response, on the one hand, to the erosion of the role of the nation-state, and on the other hand, to the growing power of corporations that take over an increasing range of everyday spheres. Among all these, there is a modern man who is better and better equipped with the knowledge and skills to organise his own life without institutional support (Kostera, 2014). Nevertheless, on the other hand, we also see that the existing guarantees of the good of humanity – in the form of technological progress, democracy and science – are no longer valid. In each area mentioned above, we notice negative sides, e.g., heartlessness, populism or using progress results for selfish purposes. Referring to selected classic management functions, M. Kostera recognises the principal axes of self-management (Kostera, 2019): 1) as the keys to planning (3I: imagination, inspiration, intuition); 2) as the keys to organising (3S: structure, space, synchronicity); 3) as keys to motivate (3L: leadership, learning, love); 4) as keys to control (3E: ethos, ethics, ecology).

The optimal explanation of the visual artist's organisational optics will be analysing the aesthetic situation with its components and their relations (Gołaszewska, 1984b; Szostak, 2020; Szostak & Sułkowski, 2020). According to the theory of the aesthetic situation, the artist's organisational activities take place on three levels: 1) the world of values (artistry), 2) works of art (creativity), 3) the natural world (virtuosity) (Szostak, 2022). Managing by a visual artist at the level of the world of values (managing artistry) can be compared to strategic management. It is responsible for defining the organisation's vision, mission and strategic goal(s). Decisions at this level determine the further direction of the processes. Artists tend to be focused on specific values exploring them over long periods of creativity, or they change the subject of their creative interests depending on various internal and external factors. The chosen strategies for achieving the goals may be permanent or changeable – adapted to the circumstances. Managing at the level of a work of art, i.e. managing creativity, can be compared to tactical management. The defined goals and strategies are translated into directional decisions regarding the creative process, ending with the creation of the work, taking into account the process of receiving the work by the recipient. It should be remembered that the artist's intention is not to create the work itself but to use the created work to influence the recipient in a planned manner through the values to which the work relates. This fact is not without significance for the process of reception of the work, which depends on many factors discussed earlier. Natural-world management, i.e. virtuosity management, is an analogy for managing operational activities. Decisions regarding the

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choice of the content and form of the work, the use of a specific material (sculptural, colours, structures, musical scales, gestures, language) and its processing techniques. The vast majority of the literature about every field of art and most of the didactic process concern this management level. It is understandable because this level is the most tangible, visible and modelable, and the effects of this modelling are measurable.

In this context, the creator plays the role of a manager of the aesthetic situation because of the content of the message (the choice of values and their location in the elements of the natural world) and its form (applied schemes, styles or formal solutions) will depend on him. For this purpose, the creator has three streams of influence at his disposal: virtuosity, artistry and creativity. A conscious creator manages these streams in a controlled manner – both at the stage of building his competencies in this area and, above all, at the stage of using them in the creative process. Not every work requires highly virtuosic solutions: the creators often refer to brutalist solutions (e.g. rough sculptural material) to draw the recipient's attention to specific issues in this way. Not every work requires many sophisticated references to the world of values – often, the simplicity of the message is sometimes more powerful. In the same way, creativity does not have to be characteristic of every work – not always an innovative form will be more understandable than traditional solutions.

The visual arts creator, as the manager of the aesthetic situation – through designing the work – also determines the process of its reception. Nevertheless, of course, in each form of visual arts, the creator has a different influence on the reception process. After completing the work, the creator within the visual arts separates himself from it and cannot influence the reception process: the recipient can shape the circumstances of contemplation (time, length of exposure, contexts) at his own discretion. Based on that, the visual arts creator does not fully influence the reception process because the reception process depends on many factors independent of the creator, including, first of all, the level of the recipient's activity.

In addition to the analysis of the results of secondary research published in the literature on the subject, primary qualitative research was carried out from the perspective of the visual arts creator (as understood by the manager of the aesthetic situation) in terms of the aesthetic situation taking place in a traditional and virtual form. The research was carried out in structured face-to-face interviews with the creators of the visual arts. What constitutes the essence of art, i.e. the creator's contact with the work and the work with the recipient, was taken by the deadly SARS-CoV-2 virus into the brackets of threats to health and life (Demiańczuk, 2022). This ubiquitous and irreversible change served as the primary context for showing the specificity and mechanisms of managing an aesthetic situation from the creator's perspective.

2. Materials and methods

To explain the changes in the nature of the creative process depending on the form of presentation of the work (traditional/in-person or digital/virtual) from the visual arts creator's perspective, the method of exploratory research was used in the study. The qualitative research was conducted in the form of structured in-depth formal interviews with key informants engaged in visual arts actively. The choice of such a methodology seems to be the most appropriate for the pilot nature of the study. Furthermore, the research sample selection was justified by the availability of people engaged in creative activity in visual arts from different countries and cultures and their openness to participation in such research. The study examined representatives of all visual arts forms: painting, drawing, photography, sculpture, ceramics, architecture, comics, design, and fashion.

Twelve visual artists were asked to participate in the study. Respondents came from the following countries:, Poland, Turkey, Ukraine, and Vietnam. The interviews were conducted in a personal or virtual form over five months, from April to August 2022. Most of the research sample came from Poland (75.0%), one person from Turkey, Ukraine and Vietnam (8,3% each). Most of the respondents were men (75.0%). Due to the pilot nature of this study, no efforts were made to achieve a balance in terms of gender, age, or the length of the artistic experi-

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ence of the participants. Therefore, the influence of these elements on the research results was fully realised, but the results were analysed to obtain at least a general picture of the examined problems. Content analysis was performed using NVivo software.

Interviews with Polish respondents were conducted in Polish, and interviews with non-Polish respondents were conducted in English, recording their responses. Then they were written to standardise the analysis and inference process, and the answers obtained from the English-language interviews were translated into Polish. Description of the research sample – in terms of: 1) gender, 2) year of birth, 3) year of commencement of artistic activity (number of years of artistic activity), 4) determining whether the artistic activity is performed as primary, additional or one of many forms of professional activity, 5) artistic education, 6) non-artistic education and 7) declared nationality – is presented in Table 1**Error! Reference source not found.**.

Table 1. Research sample description

Code	***Sex***	***Birth year***	***Years of art experience***	***Artistic activity as primary, additional or one of many forms of professional activities***	***Artistic education***	***Beyond-artistic education***	***Nationality***
VIA01	M	1983	25	primary	Doctor of Visual Arts, painting, MA in Art History	lack	Poland
VIA02	K	1964	30	one of many	Doctor of Visual Arts, painting	MA in Polish Language Studies	Poland
VIA03	M	1983	25	primary	Doctor of Visual Arts, painting	MSc	Poland
VIA04	K	1999	3	primary	MA in Visual Arts, painting	lack	Vietnam
VIA05	M	2000	10	additional	lack	Bachelor in Management (in progress)	Turkey
VIA06	M	1990	18	additional	lack	MSc	Poland
VIA07	K	1976	26	one of many	Doctor of Visual Arts	MSc	Poland
VIA08	M	1985	22	one of many	Doctor of Visual Arts	postgraduate studies in Blockchain	Poland
VIA09	M	1995	2	additional	lack	MSc in Cybersecurity	Ukraine
VIA10	M	1985	18	one of many	Doctor of Visual Arts	lack	Poland
VIA11	M	1984	14	additional	Doctor of Visual Arts	lack	Poland
VIA12	M	1995	6	additional	lack	MA in Physical Education	Poland

Source: own elaboration

Inference regarding the results of the secondary and primary research was mainly based on the synthesis of the results and was carried out with awareness, rigour, systematics, pluralism and methodological triangulation. The methods used in the qualitative research were reproducible according to the canon and can be repeated to verify or expand the conclusions.

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3. Results and discussion

The analysis of the impact of the limitations resulting from the COVID-19 pandemic on the creative process from the perspective of the visual arts creator is as follows[†] (questions from part A). The following aspects had a negative impact rather: no public live performances of one's work (question 9, rating: -0.25); limitation of in-person contact with own team/group members (12, -0.42); limiting in-person contact with other creators of visual arts (13, -0.42); limiting in-person contacts with creators of other art disciplines (14, -0.33); limitation of in-person contact with people in general (15, -0.42). The pandemic limitations slightly impacted visual arts creators' moods (20, -0.08) and mental states (21, -0.08). Note that "restrictions have been replaced by very intense, even excessive, online contact" [VIA02], which may indicate that in traditional circumstances, the creator had more opportunities to regulate contact's qualities; when switching to virtual mode, the freedom of communication was so facilitated that their excessive number simply interfered with the implementation of basic classes. The visual arts creators found the following positive effects of limitations: transferring their artistic activities to virtual reality (10, 0.33); the possibility for recipients to participate in visual arts following their personal preferences in the form of shaping the time and duration of participation or regulating the parameters of the artwork (11, 0.25); more time to relax (16, 0.75), development of the artistic knowledge (17, 0.83), development of the artistic skills (18, 1.00), as well as the level of their creativity (19, 0.92). As for the issues related to goals and their implementation, the assessment is moderately positive: the impact of pandemic restrictions on setting one's own life goals (22, 0.33) and their implementation (23, 0.25), own artistic goals (24, 0.42) and their implementation (25, 0.25). Understanding human nature as manifested by acting under constrained conditions has also been assessed moderately positively under pandemic constraints (26, 0.50). In summary, the creative process determined by the limitations resulting from the COVID-19 pandemic was assessed by the creators of visual arts on the border of neutrality and moderate positivity (0.21); details are presented in Figure 1.

Assessment by visual artists of the impact of restrictions caused by the COVID-19 pandemic on visual arts in general (i.e., with creators, audiences, institutions, and sponsors) is on the verge of moderately negative and neutral (responses to questions from part B, general rate: -0.18). The limitations had a moderately negative impact on the following issues: limiting the in-person contact with members of one's creative group (30, -0.50), limiting the in-person contact with other creators of visual arts (31, -0.50) and creators of other art disciplines (32, -0.33). On the other hand, the lack of public performances of own work in-person (27, -0.08) and the possibility of the audience participating in visual arts following their personal preferences as to the time of participation, duration of participation or regulation of the parameters of the work were considered neutral (29, 0.00). Only the transfer of artistic creativity to virtual reality was rated moderately positively (28, 0.33). The results are presented in Figure 2.

Changes in the creative attitude of visual artists following the transition from traditional to digital methods of artistic activities (questions from part C) were assessed negatively. Overall, it can be said that with the transition from traditional to digital methods of artistic activities, the creators of visual arts lose only 5% of their creative potential. After the transition from traditional to digital methods of artistic activity, all the analysed parameters of the creative attitude lose their quality, and the loss varies between individual parameters. By ranking the aspects from the most losing quality, we get the following list: contact with the audience (46, -15%), inspiration to create (44, -7%), external motivation to start creative activity (38, -5%), external motivation to continuation and termination of creative activity (40, -5%), opportunities to delve into topics bothering society (48, -5%), creativity (42, -4%), internal motivation to start creative activity (34, -2%) . Only the intrinsic motivation to continue and

[†] Five-point Likert scale: -2 = very negative influence, -1 = rather a negative influence, 0 = neutral influence, +1 = rather a positive influence, +2 = very positive influence.

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end creative activity does not change with the transition from traditional to digital methods of artistic activities in the field of visual arts. The results are presented in Figure 3.

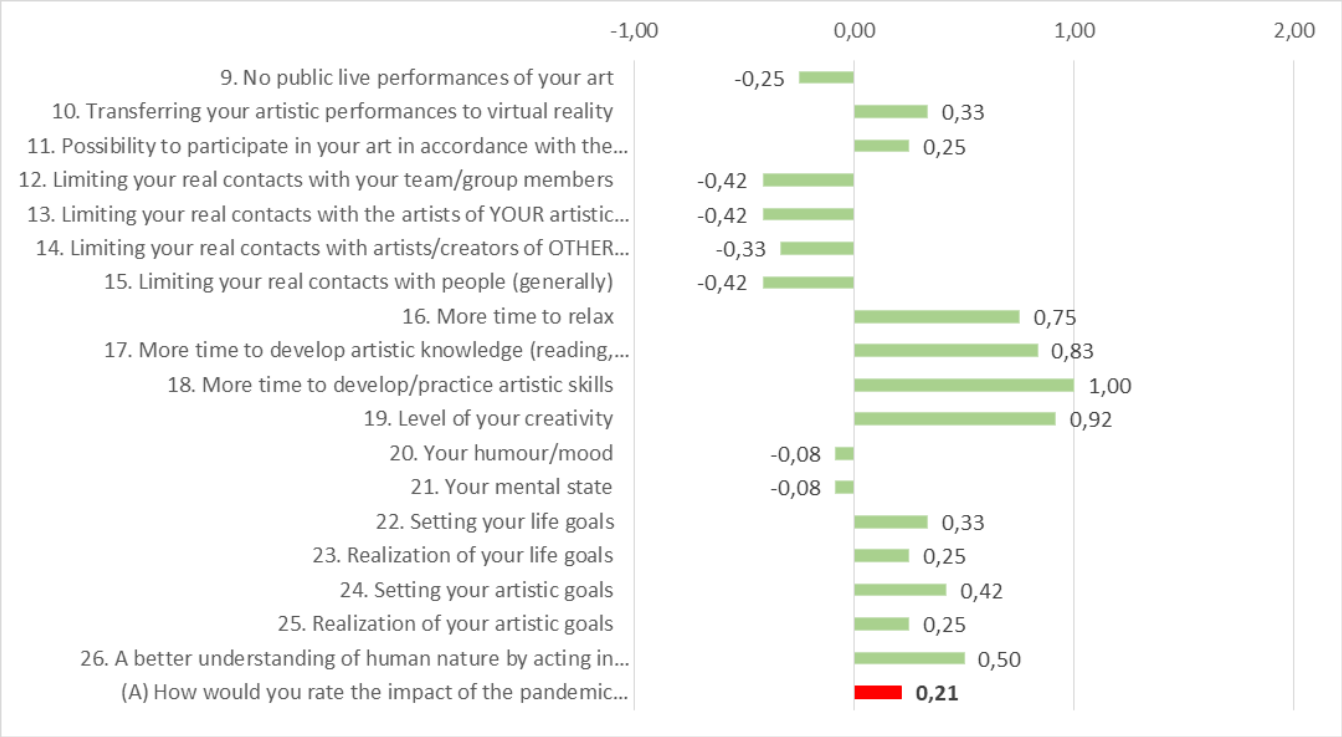


Figure 1. Assessment of the COVID-19 pandemic impact on visual artists

Source: own elaboration

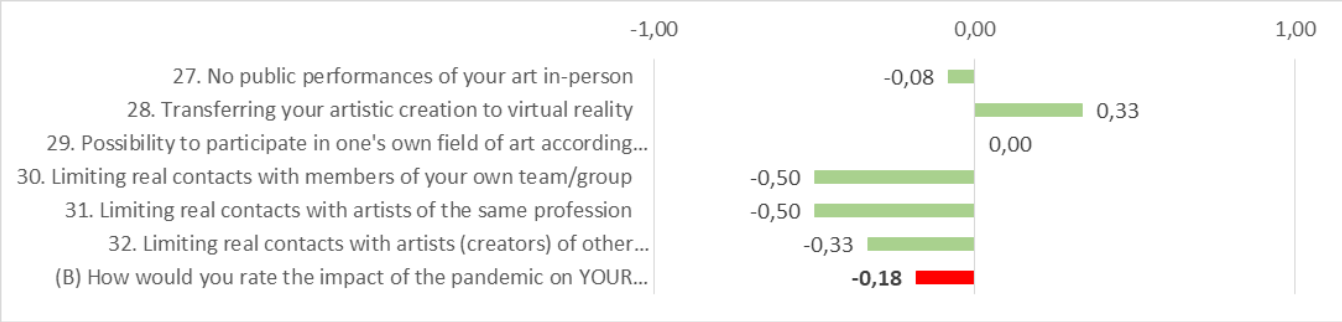


Figure 2. The impact of restrictions caused by the COVID-19 pandemic on the discipline of visual arts in the opinion of creators

Source: own elaboration

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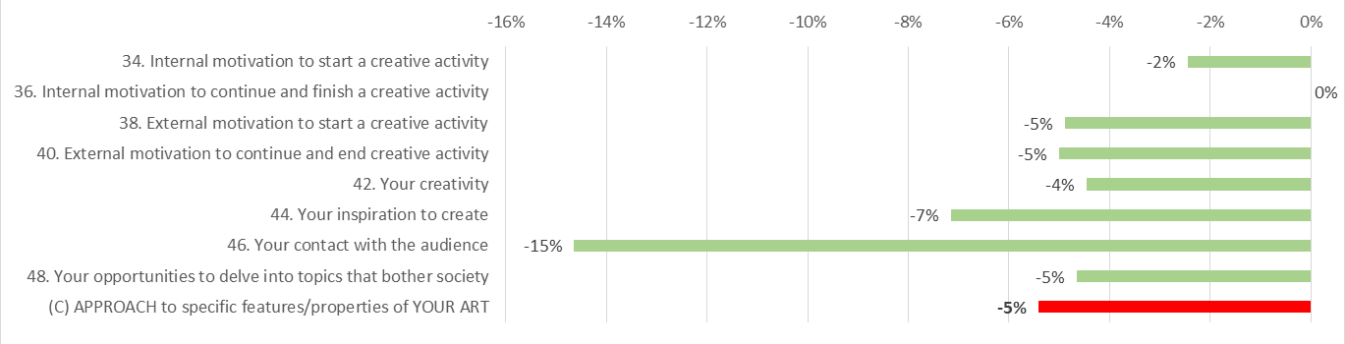


Figure 3. Changes in the creative attitude of visual artists following the transition from traditional to digital methods of artistic activities

Source: own elaboration

The creators of visual arts referred to their predictions of the situation in the field of visual arts after lifting the restrictions of the COVID-19 pandemic (questions from part D). They concluded with moderate certainty that public events in in-person would be simultaneously broadcast virtually (50, 0.50), literary arts will fall into two subcategories: those specialising in traditional live activities and those operating virtually (51, 0.33), and that sooner or later everything will return to the pre-pandemic state (49, 0.25). A graphic presentation of the results is shown in Figure 4.

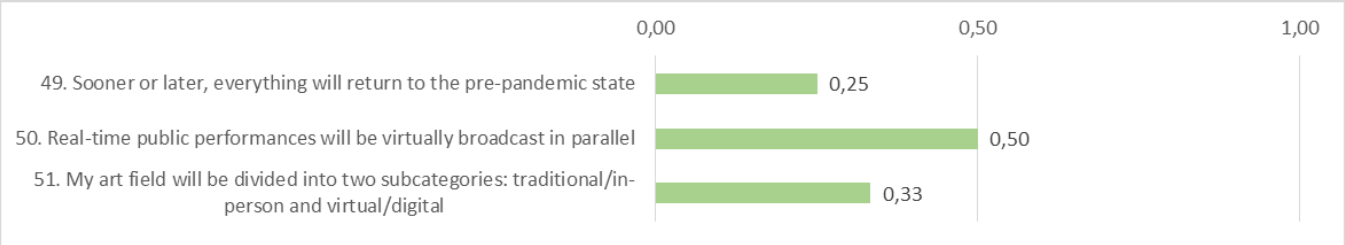


Figure 4. The future of visual arts concerning in-person and digital methods of artistic activities as assessed by artists

Source: own elaboration

The assessment of the reception process in visual arts in the context of traditional and virtual forms of participation in the eyes of the creators of the visual art (questions from part E) looks negative concerning digital and virtual forms and, thus, definitely unambiguously positive concerning traditional live forms. The strength of differences in all aspects was assessed as moderate to the disadvantage of virtual forms, i.e. in terms of: customer satisfaction (53, -0.75), customer satisfaction (54, -0.67), customer involvement (55, -0.67)), the possibility of experiencing the state of catharsis by recipients (56, -1.08), contact of recipients with the work itself (57, -0.75), contact of recipients with the creator/performer of art (58, -1.00). Only the possibility of attracting more recipients was assessed moderately in favour of virtual forms (52, 0.25). A valuable commentary on this group of questions will be the following statement: "Although direct contact is the most important thing for a creator, the visual arts recipients have a good opinion of virtual forms of presentation that allow for a wider reach. According to the creator, the work itself is lost in this perception, but I do not know if it disturbs the recipient" [VIA02]. The synthetic results of this group of questions are presented in Figure 5.

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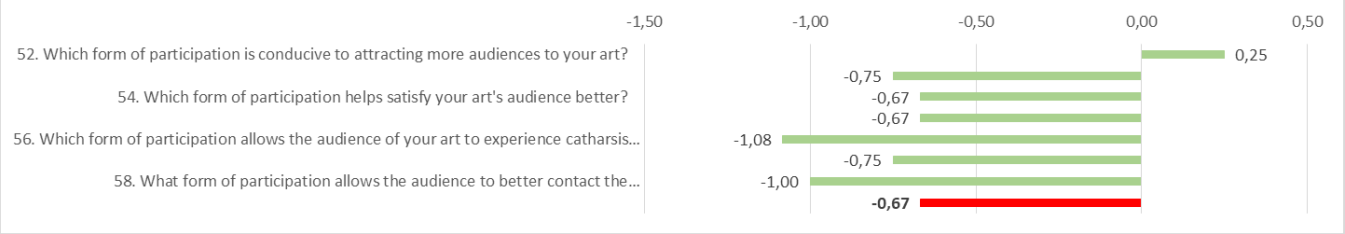


Figure 5. The process of reception in visual arts in the context of traditional and virtual forms of participation in the assessment of artists

Source: own elaboration

Two (17%) of the creators of visual arts stated that they did not see any differences in their creative process from the traditional and virtual forms of the aesthetic situation [VIA02, VIA08] (question 59): "Creating a painting requires solitude – there is no difference between later virtual or in-person presentation" [VIA02]. However, the vast majority of respondents (83%) emphasised the differences between both forms concerning:

- a contact with the artwork, experiencing the creative process: "A work that will be presented virtually requires a different rent conceptualisation than that presented in-person. I try to add extra possibilities to work being presented virtually that cannot be used in a traditional presentation" [VIA07];
- experiencing aesthetic experiences, creative fulfilment: virtual forms are treated as "a compromise, a transitional state, [method of obtaining] financial support and scholarships" [VIA01];
- contact with creative matter [VIA03];
- contact of the recipient with the work: "The mood and contact of the recipient with the work in-person are most important" [VIA11];
- the possibilities of conveying emotions: "More emotions can be conveyed in-person" [VIA12];
- treating activities in traditional forms as fundamental, which is reinforced by virtual activities, e.g. as a form of promotion [VIA10];
- virtual activity is more convenient [VIA05].

Three (25%) visual artists see no differences in their creative process, knowing that the work will (or is) presented traditionally or virtually [VIA01, VIA07, VIA08] (question 60). Most visual arts creators, however, notice differences in their creative process: "I shape the visual message a bit differently – but it is not fully conscious – I know that stronger and simpler messages work better on the Internet, so I choose intuitive ones for presentation there" [VIA02]. "If I have to do a job on the Internet, I must have a separate idea for it" [VIA11]. Certain doubts are also raised by the fact that there is no influence on the fate of one's work presented virtually: "Live transmissions are worse compared to traditional activities – they are unpredictable compared to in-person performances, and yet they are archived, for example, on YouTube forever; no one seems to be removing YouTube live streaming services" [VIA10]. All visual artists unanimously confirmed that the COVID-19 pandemic had intensified their art discipline's digitisation and virtualisation process, but the beginning of that process started earlier (question 61).

Conclusions

The cited research results show how, in practice, the visual arts creator manages the creative process within an aesthetic situation. He has to consider many factors that together shape the quality of the aesthetic situation. As apparently ephemeral and seemingly impossible to grasp by scientific models, the creative process can be – with the help of an appropriate conceptual apparatus taken from aesthetics – broken down into many analytical components, the single definition of which is not so difficult. Of course, it is essential how the parameters of the aesthetic situation's quality are determined to be able to conclude based on the obtained results. The methodology presented and used in the above study can be successfully replicated in further research on the analysed problem.

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The context of the limitations resulting from the COVID-19 pandemic, which firmly determined the aesthetic situation, served only as a pretext for the dynamisation of phenomena in the studied area. Even without factors as vital as the pandemic, the visual arts creator in the creative process must consider the same parameters that synthetically allow him to manage an aesthetic situation from his perspective in a conscious manner. The management factor is essential in fruitful artistic activity due to the achievements in organisational methods that can be successfully used to manage the natural world and the aesthetic situation. By applying management models, of course, along with the necessary adjustments to the metaphysical world, we can expect an improvement in the effectiveness of the creative process through its deeper understanding and analytical approach.

The omnipresent changes also affect the visual arts world, the essence of which seems to be unchanged. Forced virtualisation and digitisation – such as the recent COVID-19 pandemic – significantly affect the quality of the creative process within the aesthetic situation, depending on the form of participation in visual arts. Managing the creative process within the aesthetic situation, the visual arts creator must consider the factors mentioned above because otherwise, his creativity will be incomprehensible. The presented research results show the components of the aesthetic situation being subject to modifications due to the form of participation in art. Therefore, visual arts creators – consciously managing the creative process within the aesthetic situation – should appropriately modify the scale of virtuosity, artistry and creativity so that their message is consistent with their assumption, taking into account the form of participation in art.

Forced virtualisation and digitisation significantly affect the quality of the reception process because each visual arts form, using a different scope of senses, reacts differently to digitisation and virtualisation. Therefore, knowledge about this phenomenon should accompany the creators of visual arts. As a conscious manager of the aesthetic situation, the visual arts creator will be able to manage the parameters of virtuosity, artistry and creativity more effectively as part of own work, depending on the manner of participation (in-person or virtually).

The following groups should be interested in the research results: 1) visual arts creators to develop or structure their perception of the creative process; 2) visual arts managers to develop or structure their perception of the complex nature of the creative process; 3) visual arts institutions' managers to develop or structure their perception of the complex nature of the creative process of visual artists involved in the institutions they manage. The limitations of the research may be the following: 1) the relatively small size of the research sample and randomness of research participants do not allow for profound generalisation of results; 2) the research took place in the middle of the COVID-19 pandemic when the conclusions could be affected by day-to-day struggling. Among perspectives of the research can be mentioned: 1) large-scale research could be undertaken based on the methodology prepared for this study; 2) more focused research could be undertaken based on the methodology prepared for this study (visual arts creators from different countries, regions, cultures, divided by age, gender or the length of experience).

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ANALYSIS OF FINANCIAL LITERACY AMONG HIGH SCHOOL STUDENTS, GRADUATES, AND YOUNG PROFESSIONALS IN GERMANY

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Abstract. This research paper aims to examine various factors influencing the financial literacy of high school students, graduates, and young professionals. Although the academic literature has dealt extensively with the factors influencing financial literacy, no current study focuses on Germany and explicitly on the group of young people with an upper educational level. The empirical research undertaken primarily examines the influence of different manifestations of academic status, income, gender, and origin on the degree of financial literacy. In this context, financial literacy is approximated using the scientifically established set of questions, the so-called "Big Three" questions. A total of over 500 participants were surveyed. To evaluate the results, a simple linear regression model is formulated for each hypothesis and then tested for significance using the T-test. Subsequently, a multivariate regression model based on the significant influencing factors is specified and tested again. Thereby, the examined factor of gender is highly significant. Immigration background also influences financial literacy. Findings related to education, background, and income were often inconclusive or weak. No influence of the place of residence, the parent´s educational level, or a practice-related education on financial literacy could be found.

Keywords: financial education: financial literacy; gender gap; high school students; graduates; young professionals

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JEL Classifications: A23, C12, G53

1. Introduction

The topic area of financial literacy has come under political discussion in recent years. This is due both to the consequences of the economic and financial crisis of 2008 and to the fact that many countries are restricting their social systems and increasingly transferring responsibility to citizens. As a result, more and more people are having to manage their financial situation. However, according to the current state of research, the level of financial literacy in the population is to be classified as "too low" (Bachmann et al., 2021). Recent and past studies show that there are major fundamental deficits in knowledge about financial literacy (OECD, 2020).

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Germany compared to other countries, performed relatively well but there is a wide range within the different socio-demographic groups (Bucher-Koenen & Lusardi, 2011; Schmidt & Tzamourani, 2017; Stolper & Walter, 2017).

2. Theoretical Background

Financial literacy is a subfield of economic literacy and, in this context, the part of economic literacy that deals with the mechanisms of the economy. In particular, individuals with a high level of education have often attended (e.g., as part of their studies) specific courses dealing with financial products or the functioning of the market economy (Reifner, 2003). In this context, it should be emphasized that even frequently cited technical papers, such as those by Lusardi and Mitchell (2007) have not prefaced a definition of financial literacy. Kaminski and Eggert (2008) derive several practice areas from their definition of financial literacy that aims to provide people with the financial skills they should have to enable them to engage in appropriate financial decision-making behaviors. The central fields of action in financial literacy are financial resources, life risks, asset accumulation, and loans. In the scope of dealing with financial risks, individuals must consider their current financial situation as well as their income and expenditure accordingly. Furthermore, the question should be asked as to what costs and time are involved in financial transactions and what means of payment should be used (Kaminski & Eggert, 2008).

Huston (2010) analyzed around 70 studies in the field of financial literacy. In more than two-thirds of these studies, the definition was completely missing, and in the remaining studies, the definitional approaches vary so much that no unified definition can be determined. Numerous approaches to defining financial literacy exist in the literature. A study by Kaiser and Lutter (2015) shows that in empirical research, the number of citations in the field of financial education is subject to a steady increase, but still, the concept behind it is insufficiently explained.

Based on the OECD/INFE definition of financial literacy, which focuses specifically on financial decision-making, and the clarification provided by the corresponding OCED and INFE questionnaire, this definition of financial literacy is directed at adults who have the total legal capacity and have thus reached the age of 18 years (Seeber & Retzmann, 2017). Like most academic studies in Germany, this study follows the OECD/INFE definition of financial literacy, according to which financial literacy can be derived from existing financial knowledge and the corresponding behavior in financial decisions (Seeber & Retzmann, 2017).

Questions on financial knowledge primarily focus on interest rate effects and inflation, whereas those on financial behavior focus on managing personal budgets, investment decisions, and borrowing (OECD, 2018). To determine financial literacy, the OECD and INFE also ask questions in the latest 2020 study that relate to both financial behavior and financial knowledge (OECD, 2020).

The most common definition of financial literacy in the current literature, which is also used by the G20 countries, comes from the Organisation for Economic Co-operation and Development (OECD) and the OECD-founded International Network for Financial Education (INFE; Bucher-Koenen & Knebel, 2021). The OECD and INFE define financial education as follow: “A combination of awareness, knowledge, skills, attitude, and behavior necessary to make sound financial decisions and ultimately achieve individual financial wellbeing”.

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Definition of the Target Group: High School Students, Graduates, and Young Professionals

This research paper examines in particular the financial literacy of high school students, graduates, and young professionals. However, it is often unclear in which situations a young professional is considered. Therefore, a clear conceptual delineation of the target groups is needed:

(1) High School Students;
(2) Graduates;
(3) Young Professionals.

(1) A high school student is a person who has achieved or is short to attain a degree entitling him or her to study in Germany. The general higher education entrance qualification, the subject-related higher education entrance qualification, or the advanced technical college entrance qualification may have been obtained. The general higher education entrance qualification is awarded after completing the upper secondary school at a Gymnasium, a vocational Gymnasium, or a comprehensive school and represents an unrestricted entitlement to study. On the other hand, the subject-related university entrance qualification restricts access to higher education to specific courses of study. The "Fachhochschulreife" is obtained after successful completion of a school-based and a vocational part at a higher school (e.g., "Berufskolleg", "Fachoberschule", "Berufsoberschule").

(2) A Person who has completed a course of study or training, especially a person who has been awarded an undergraduate or first academic degree. The degree usually leads to a bachelor's degree, a diploma, a master's degree, a doctorate, or a passed state examination. In this research work, only students who have not yet reached the age of 30 are considered.

(3) There is no generally accepted definition of a young professional in the literature (Luippold, 2021). Young professionals are usually people who have not yet reached the age of 30 but have already completed their first degree (at least a bachelor's degree) (Luippold, 2021). In most cases, they have also gained their first professional experience.

Key Factors influencing Financial Literacy and Behaviour

According to scientific studies, the quality of financial decision-making correlates significantly with the financial literacy of individuals (Grohmann & Menkhoff, 2015). This fact is theoretical since higher financial education in the form of more extensive financial knowledge generally leads to better financial behavior as well as a higher quality of financial decisions. The factors influencing the level of financial literacy are mainly as follows:

(1) Level of education: The level of education is an essential factor influencing financial literacy, but this correlation varies across countries due to different education systems. Evidence shows that a high level of education (for example, among individuals with a university degree) often leads to higher financial literacy than individuals with a very low level of education (Stolper & Walter, 2017; Bottazzi & Lusardi, 2021).

(2) Gender: despite a more modern division of roles due to societal changes implying that greater diversity leads to more economic responsibility for women, women are significantly less financially literate than men (Jappelli & Padula, 2013; Siegfried & Wuttke, 2021; Bottazzi & Lusardi, 2021; Kubak et al., 2021).

(3) Income: Income is a significant determinant of the degree of financial literacy. Higher-income flows increase both the willingness to invest and the willingness to save (for retirement), which is very limited or hardly possible with a low income (Brugiavini, 2002; Hou & Schuler, 2022).

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(4) Place of residence: In terms of the level of financial literacy, it is assumed that people who grew up as children and adolescents in small towns have fewer opportunities to acquire financial literacy. This assumption is based on the fact that the availability of financial education is higher in larger cities (Klapper & Panos, 2011; Bottazzi & Lusardi, 2021).

(5) Practice-based training: Practice-based training (even before a degree program) provides additional knowledge that can be supportive in making financial decisions (Riebe, 2018).

(6) Parents' level of education: Children and young people from so-called "working-class families" often have more difficult access to financial education compared with those academics. The reason for this is that parents with a degree can introduce their children to economic contexts at an early age (Lusardi et al., 2010; Kubak et al., 2021).

(7) Origin: National background is seen as a key influencing factor in financial literacy, so an immigrant background is seen as hampering the attainment of high financial literacy (Bucher-Koenen & Lusardi, 2011; Siegfried & Wuttke, 2021).

Financial Literacy among High School Students, Graduates, and Young Professionals

In an empirical study by FOM University of Applied Sciences, subjective self-assessment and objective financial knowledge were surveyed. More than half of the young professionals surveyed (62%) rated their financial knowledge as high. In addition, 82% have objectively measured "good" financial knowledge, which represents a positive correlation. The study also shows that educated young professionals are capital market-savvy and diversified in investment opportunities in the capital market. In this regard, 57% of respondents beat inflation with their investment, although only under 40% trust an external advisor with their investment strategy (Reiter et al., 2016).

The study "Economic Education in Germany Index (OeBix)" of the Flossbach von Storch Foundation, conducted by the Institute for Economic Education (IÖB) at the University of Oldenburg, describes the current state of knowledge regarding financial and economic education at schools in Germany (Loerwald et al., 2021). These research results are the first to provide a data basis for Germany that substantiates the need to strengthen financial and economic education based on figure 1 and figure 2. The survey was conducted among high school students as well as other students. As a result, eleven out of 16 German states did not even meet 50% of the requirements necessary for the school subject "Economics" (Loerwald et al., 2021). These results are confirmed by a study conducted by Bernstein and Rawe (2021) in which students were asked about their financial literacy self-assessment. In school grades, they rated their financial knowledge at 3.3, a downward trend from 3.1 in the previous three years. Nevertheless, interest in financial education is exceptionally high. For example, 9 out of 10 young people said they would like a subject that taught them about money as well as finance (Bernstein & Rawe, 2021). Furthermore, according to a representative Forsa survey (2021), 59% of schoolchildren between the ages of 14 and 21 believe there is no equality of opportunity in Germany regarding their financial and cultural background (Forsa, 2021).

The target group of students from all disciplines should be considered more closely, as they should have a comprehensive general education based on their previous education and the expansion of their knowledge (through the studies they have embarked on). Also, the scientific literature assumes that a high level of general education correlates positively with financial literacy. However, it should be noted that factors such as cultural or family influences as well as differences in the education system also play a role (OECD, 2020).

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Measuring Financial Literacy

The questions on financial literacy often include the so-called "Big Three" question catalog (Lusardi & Mitchell, 2011a). The latter tests financial knowledge on the topics of interest rates, inflation, and diversification. The "Big Three" questions form the basis of much of the research regarding financial literacy, as they have been asked in the same form for more than a decade and thus allow a high degree of comparability. To ensure comparability with other studies, this research is limited to measuring financial literacy using the "Big Three" questions, which is in line with the accepted approach of Lusardi and Mitchell (2011b). Measuring the financial literacy of individuals is often challenging because financial literacy encompasses not only financial knowledge but also financial behavior (Schmidt & Tzamourani, 2017). The OECD/INFE has developed a standardized methodology for measuring financial literacy, which is now used by many countries around the world to test financial literacy. The financial behavior questions include, for example, whether an individual pays his or her bills on time (OECD, 2018). This methodology uses a standardized questionnaire that includes questions on both financial behavior and financial knowledge (OECD, 2020). The answers to the "Big Three" questions are combined to form a score within the scientific research. Correct answers are assigned a value of 1. Incorrect answers and questions in which "I don't know" was stated or no information was given are assigned a value of 0. The score is the sum of the values of the "Big Three" questions. Therefore, the score can assume a maximum value of 3 (all three questions answered correctly) - and a minimum value of 0. To test a hypothesis that assumes that a specific factor (e.g., education level of individuals) influences the degree of financial literacy, a question to determine the influencing factor must be formulated and included in the questionnaire. Subsequently, the expression of the influencing factor measured by the question (e.g., educational level is bachelor's degree) can be compared with the respective score value for measuring financial literacy and, in this form, it can be checked whether the individual factor influences financial literacy. In this context, regression analyses, as well as hypothesis tests, are often used in addition to descriptive statistics. The empirical part of this research uses descriptive statistics and regression analyses with hypothesis tests to describe the data set collected to test the hypotheses formulated.

This research paper and the empirical study conducted are intended to provide insights into the financial literacy of high school students, graduates, and young professionals, a group that has been insufficiently researched in Germany. This is particularly important given the relevance of financial literacy for the prosperity of a society. The coming generations of high school students, graduates, and young professionals contribute significantly to the future wealth generation and wealth preservation in Germany.

3. Research objective and methodology

Hypotheses
Analogous to the current state of research regarding the individual hypotheses on the factors influencing financial literacy, this paper examined factors influencing financial literacy. To test the influence of these factors on financial literacy, the following hypotheses were tested:

Education level
Hypothesis 1 (H1): Individuals with a higher level of education have higher financial literacy than individuals with a lower level of education. This hypothesis assumes that as the level of education, measured by technical education, increases, so does the degree of financial literacy (Stolper & Walter, 2017; Bottazzi & Lusardi, 2021).

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Gender

Hypothesis 2 (H2): Women have lower financial literacy than men. This hypothesis is based on the assumption that women have lower financial literacy than men (Jappelli & Padula, 2013; Siegfried & Wuttke, 2021; Bottazzi & Lusardi, 2021; Kubak et al., 2021).

Income

Hypothesis 3 (H3): High income leads to high financial literacy. This hypothesis assumes that high income promotes higher financial literacy. This hypothesis assumes that there is no reciprocal relationship, i.e., income influences the level of financial literacy, but not vice versa (Brugiavini, 2002; Hou & Schuler, 2022).

Residence

Hypothesis 4 (H4): Individuals living in urban areas will have higher financial literacy than individuals living in smaller towns. This hypothesis assumes that the degree of financial literacy depends on the size of the place of residence (Klapper & Panos, 2011; Bottazzi & Lusardi, 2021).

Practical training

Hypothesis 5 (H5): Pre-college work-based education leads to higher financial literacy. This hypothesis states that practice-based undergraduate education will increase the level of financial literacy (Riebe, 2018).

The educational level of parents

Hypothesis 6 (H6): Individuals with at least one academic as a parent will have higher financial literacy than those who do not come from an academic household. This hypothesis refers to the fact that the educational level of the parents influences the later level of financial literacy of the children (Lusardi et al., 2010; Kubak et al., 2021).

Origin

Hypothesis 7 (H7): Individuals with an immigrant background have lower financial literacy. This hypothesis tests whether the origin in sense of a migration background of the parents has a negative influence on the child's education (Bucher-Koenen & Lusardi, 2011; Siegfried & Wuttke, 2021).

Data collection

For data collection, a questionnaire with 27 questions was created. For this study, only a section of the questionnaire was relevant to test the relevant hypotheses. This section of the questionnaire includes the "Big-Three" questions, a question to elicit age, a control question to check for consistency of the questionnaire, and one question for each hypothesis H1 to H7 to be tested. The question on age was relevant because, following the definition of high school students, graduates, and young professionals were only included in this research up to the age of 30. The control question referred to whether a respondent is currently studying, has already completed their studies, or has not studied. If the respondent indicated a master's degree as the highest level of education, the control question could not be answered with "I have not studied". This question checked the plausibility of the respective data set and excluded questionnaires that were not carefully completed by the respondent. The questionnaire was published via the online portal "empirio - surveys for students" and was available from August 1 to December 31, 2021. A total of 728 respondents participated in the study and completed the questionnaire.

Data cleansing

The collected data was cleaned according to the requirements of this research. First, a total of 205 records were removed because respondents indicated an age of over 30 and this study targeted high school and college students, and young professionals who are under 30. Furthermore, questionnaires were excluded in which the essential questions about age, education level, gender, and place of residence, as well as the control question, were not answered. Two data sets in which "diverse" was specified as the gender were also excluded from the

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data due to the low number and the associated low statistical relevance. In another six data sets, the control question was not answered consistently regarding the educational qualification indicated. In total, 502 questionnaires were included in the study after the selection of the data sets, with 446 data sets referring only to high school students, graduates, and young professionals. The following table 1 shows a summary of the adjusted data:

Table 1. Data cleansing

	Quantity
Records	**728**
Age "over 30 years" or "not specified"	205
Gender "diverse" or "not specified"	5
Educational level "not specified"	5
Place of residence "not specified"	1
A control question not answered consistently or "not specified".	10
Relevant data sets for this study	**502**
of which high school students, graduates, and young professionals	
thereof education (without a high school diploma)	29
thereof secondary school diploma	20
of which skin school diploma	7

Source: Own survey

To improve the evaluation and comparability of the data with other studies, additional categories were formed for the questions on educational level, income, and place of residence, and the data collected were classified accordingly. These categories are shown in the following table 2:

Table 2. Categorization of educational level, income, and place of residence

	Categories
Education level	very low, low, medium, high
Income	not specified, very low, low, medium, high
Residence	small place, city, big city

Source: Own survey

In the final step, the score for the "Big Three" questions was determined for each data set, analogous to the described methodology. The results of the evaluation of the score for the consolidated consideration of the "big three" questions can be taken from table 3 below.

Descriptive statistics

The descriptive analysis of the data first looked at the response behavior of the respondents concerning the "Big Three" questions. Subsequently, key aspects of the data collected from the target group of high school students, graduates, and young professionals were examined. The results from the evaluation of the "Big-Three" questions are summarized in the following table 3:

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Table 3. Evaluation of the "Big Three" questions according to response behavior

	Relevant respondents (n_1 = 502)		High school students, students, and young professionals (n_2 = 446)	
	Quantity	%	Quantity	%
A. Question about the interest				
higher than 102 Euro	**401**	**79,9 %**	**365**	**81,8 %**
exactly 102 euro	29	5,8 %	22	4,9 %
lower than 102 euro	39	7,8 %	32	7,2 %
I do not know	27	5,4 %	23	5,2 %
not specified	6	1,2 %	4	0,9 %
B. Question on inflation				
More	10	2,0 %	8	1,8 %
just as much	17	3,4 %	15	3,4 %
Less	**413**	**82,3 %**	**370**	**83,0 %**
I do not know	55	11,0 %	48	10,8 %
not specified	7	1,4 %	5	1,1 %
C. Diversification question				
I agree	50	10,0 %	44	9,9 %
I do not agree	**326**	**64,9 %**	**294**	**65,9 %**
I do not know	109	21,7 %	92	20,6 %
not specified	17	3,4 %	16	3,6 %
D. Overall view				
three questions correct (score 3)	**260**	**51,8 %**	**237**	**53,1 %**
two questions correct (score 2)	148	29,5 %	133	29,8 %
one question correct (score 1)	64	12,7 %	52	11,7 %
no question correct (score 0)	30	6,0 %	24	5,4%
Mean (M) Score	2,27		2,31	
Standard deviation (SD) Score	0,90		0,88	

Source: Own survey

In table 3 the results of the answers to the "Big Three" questions from all respondents relevant to this study (n_1 = 502) are compared with those from the target group of high school students, graduates, and young professionals (n_2 = 446). Looking at the answers, it can be seen that when considering all respondents relevant to this study, 80% answered the question on interest rates correctly, and 82% answered the question on inflation correctly. On the other hand, only the question of diversification could be answered by only 65% of the respondents. For this question, moreover, the proportion of respondents who indicated "I don't know" as an answer was exceptionally

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high at 22%, compared with the other two questions. This result is comparable with other studies from Germany, where a lower proportion of respondents answered the question on diversification correctly.

It should be emphasized that the question on inflation was answered much better, with 82% correct answers, both in comparison with other studies for Germany and in an international comparison. One reason for this could be that inflation in Germany rose significantly again in 2021 for the first time in 20 years, and this mainly affects young people under 30, as they are exposed to a corresponding increase in consumer prices. On the one hand, some of these people still have to finance their education; on the other hand, they are often only at the beginning of their careers and first must build up appropriate capital for old age. Therefore, both aspects pose challenges for young individuals due to increased consumer prices.

Overall, the respondents in this study rank first in an international comparison. Of the respondents relevant to this study, 52% are considered "financially savvy". Only a study by Brown and Graf (2013) for Switzerland was able to achieve a comparable result in an international context. Only 6% of the relevant respondents were unable to answer any question.

A comparison of all relevant respondents with the target group of high school students, graduates, and young professionals shows that the overall results differ slightly. The target group of high school students, graduates, and young professionals is between 1% and 2% higher for each correctly answered question and also for the overall consideration of "financial sophistication" than when considering the total of relevant respondents in this study (n_1 = 502), which additionally includes respondents with a secondary school leaving certificate, intermediate school leaving certificate and vocational training. In addition, the average score, which is the sum of the correctly answered "Big Three" questions, is higher for the target group of high school students, graduates, and young professionals (M = 2.31; SD = 0.88) than when considering all respondents (M = 2.27; SD = 0.90). When analysing the target group of high school students, graduates, and young professionals (n_2 = 446) in terms of educational level, measured by the highest level of education, it becomes clear that more than half of the respondents (57%) have completed high school.

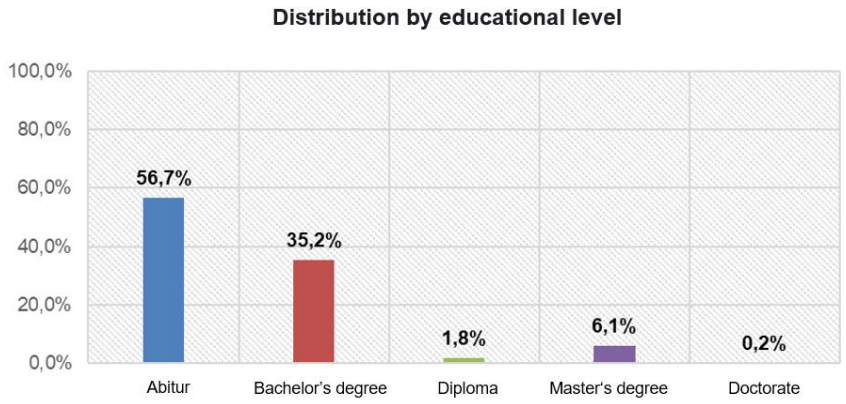


Figure 1. Distribution by educational level
Source: Own survey

More than a third of respondents (35%) already have a bachelor's degree. On the other hand, only 2% have a diploma and 0.2% have a doctorate. In addition, 6% of respondents have completed a master's degree. Accordingly, the most significant proportion of respondents in the target group of high school students, graduates, and young professionals has an intermediate level of education (Abitur) as defined in this research. Furthermore,

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when looking at the target group of high school students, graduates, and young professionals, it is also evident that 59% of the respondents are female, and 41% are male.

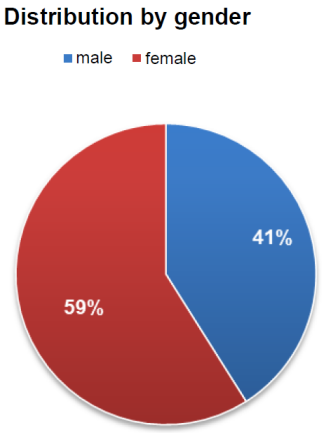


Figure 2. Distribution by gender
Source: Own survey

Furthermore, the analysis shows that 273 of the 446 female and male respondents (61%) in the target group of high school students, graduates, and young professionals are between 18 and 25 years old, as figure 3 clarifies.

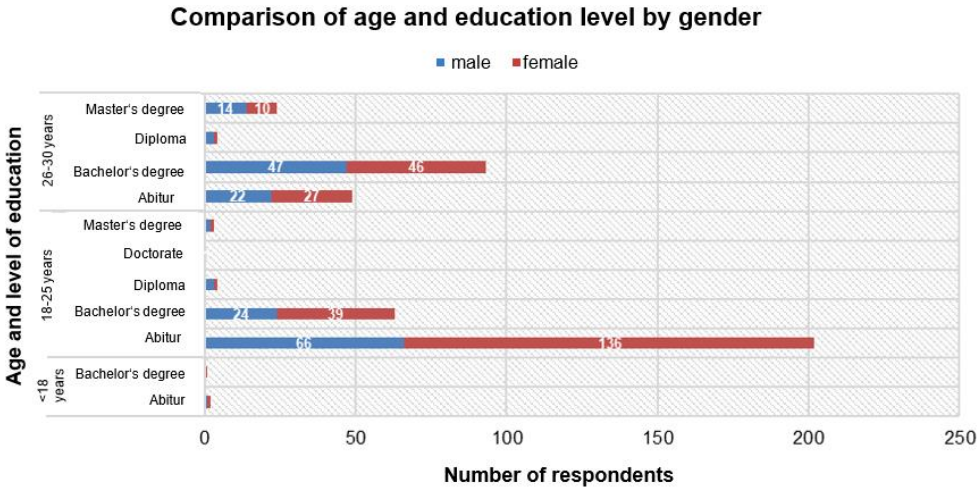


Figure 3. Comparison of age and education level by gender
Source: Own survey

When comparing the women and men surveyed, it becomes clear that men in this study have a higher level of education in the form of educational attainment. Of the 263 women surveyed, 164 (62%) have only a high school diploma as their highest educational qualification. Among the men surveyed, on the other hand, only 89 out of 183, and therefore less than half, have a high school diploma as their highest educational qualification. The analysis of income figure 4 illustrates that 81% of women have a very low or low income, whereas this is the case

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for only 63% of men. In particular, a very low income (net monthly income of fewer than 1,000 euros) affects 59% of the women surveyed and only 39% of the men surveyed. Based on this finding, it is evident that women in this study have lower incomes than men.

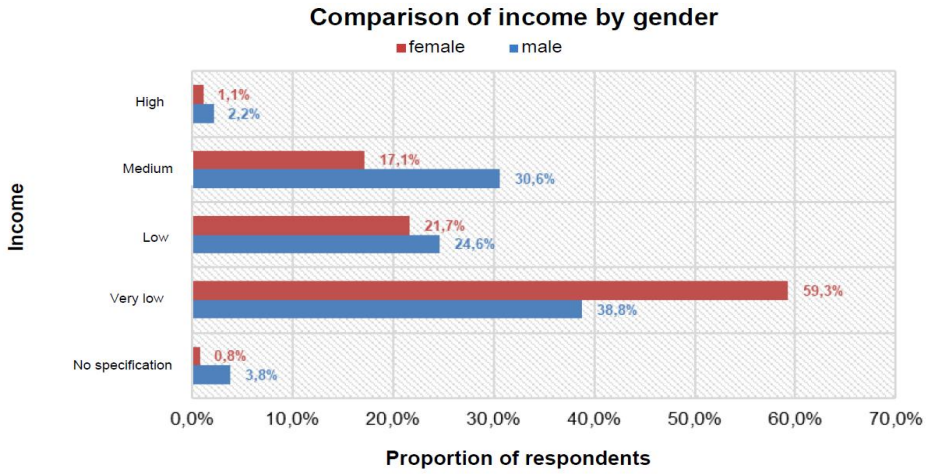


Figure 4. Comparison of income by gender
Source: Own survey

Further descriptive analysis of the target group of high school students, graduates, and young professionals shows that the proportion of female respondents who live in a city is lower (40%) than the corresponding proportion of male respondents (48%). In addition, the proportion of female respondents with a practical education is higher (65%) than the proportion of male respondents, 57%. There are only marginal differences between the female and male respondents in terms of their parents' educational level and origin.

4. Results and analysis

As part of this research, a simple linear regression model was first defined and tested for each thesis. The result from H1 was not included in the overall model, regardless of significance, as it relates to all relevant data sets and is intended to show that the target group of high school students, graduates, and young professionals, which are part of this research, have a higher financial education than respondents with a lower secondary school leaving certificate, intermediate secondary school leaving certificate or respondents with only an education.

Education level
The results regarding the hypothesis that a higher level of education in the form of better educational attainment leads to a higher level of financial literacy can be seen in the following table 4:

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Table 4. Results H1 - Education level

	Estimate	Standard Error	T-Statistics	$\mathbb{P}(>\|\|t\|\|)$
Constant = Education level: high	2,3161	0,0645	35,928	<2e-16 ***
Educational level: medium	-0,0157	0,0856	-0,183	0,8548
Education level: low	-0,2548	0,1433	-1,779	0,0759
Educational level: very low	-0,8875	0,3446	-2,576	0,0103 *

n_1 = 502; df = 498 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

Respondents with a high level of education act as the comparison group in this analysis and have a score of 2.32 on average. This is not significantly different from the score of respondents with an intermediate level of education. Respondents with lower levels of education have a different score at a 10% significance level than respondents with high levels of education. In this analysis, the result is on average 0.25 points worse. On average, respondents with a very low level of education answered almost one additional question inadequately compared to respondents with a high level of education. The result is significant at the 5% level.

Gender

The results regarding the hypothesis that gender influences the level of financial literacy can be seen in table 5:

Table 5. Results H2 - Gender

	Estimate	Standard error	T-Statistics	$\mathbb{P}(>\|\|t\|\|)\mathbb{P}(>t)$
Constant = Gender: male	2,5671	0,0629	40,813	<2e-16 ***
Gender: female	-0,4428	0,0820	-5,404	1,07e-07 ***

n_2 = 446; df = 444 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

The comparison group of men surveyed has an average score of 2.57. On average, women have a score of 0.44, worse than men. The result is significant at a level of 0.1% and confirms existing research findings from past studies. In addition, it demonstrates that women in the target group of high school students, graduates, and young professionals have lower financial literacy than men.

Income

The results regarding the hypothesis that higher income leads to higher levels of financial literacy can be seen in the following table 6:

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Table 6. Results H3 – Income

	Estimate	Standard error	T-Statistics	ℙ(>||t||)ℙ(>t)
Constant = income: very low	2,2291	0,0580	38,409	<2e-16 ***
Income: low	0,1729	0,1042	1,659	0,0979.
Income: medium	0,1472	0,1046	1,407	0,1601
Income: high	0,6281	0,3355	1,872	0,0619.
Income: not specified	-0,2291	0,2972	-0,771	0,4412

n_2 = 446; df = 441 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

Only limited evidence supports the hypothesis that high-income respondents have better financial literacy than low-income respondents. For example, the results of middle-income respondents are not significantly different from those of very low-income respondents. In contrast, low-income respondents outperform very low-income respondents at the 10% significance level. High-income respondents are distinguishable from very low-income respondents at the 10% significance level.

The results are ambiguous. There is no strong indication that incomes differ from the comparison group at a high significance level. Moreover, the finding that low-income respondents perform better than middle-income respondents is inconsistent with H3.

Residence

The results regarding the hypothesis that respondents who live in a city have a higher level of financial literacy can be seen in the following table 7:

Table 7. Results H4 - Place of residence

	Estimate	Standard error	T-Statistics	ℙ(>||t||)ℙ(>t)
Constant = residence: small place	2,2756	0,0780	29,191	<2e-16 ***
Residence: City	0,0028	0,1003	0,028	0,978
Residence: Big city	0,1084	0,1107	0,979	0,328

n_2 = 446; df = 443 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

There is no indication that place of residence influences financial literacy. Against financial literacy background, it can be interpreted that state education is equally good in rural regions and large cities. Freely accessible continuing education opportunities, such as online courses, could also mitigate this.

Practical training

The results regarding the hypothesis that pre-college work-based education leads to higher levels of financial literacy can be seen in the following table 8:

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Table 8. Results H5 - Practical training

	Estimate	Standard error	T-Statistics	ℙ(>||t||)ℙ(>t)
Constant = practice-related training: yes	2,2333	0,0715	31,230	<2e-16 ***
Practical training: no	0,1326	0,0888	1,493	0,136
Practical training: not relevant	-0,1833	0,2085	-0,879	0,380

n_2 = 446; df = 443 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

There is no evidence to support the hypothesis that practical training before university influences the degree of financial literacy. The comparison group is respondents with a practice-based education. They have an average score of 2.23. This is not significantly different from the score of respondents without practice-based education. During their studies, many students complete mandatory internships, which compensate for the upstream practice-based training.

The educational level of parents

The results regarding the hypothesis that the educational level of parents, if at least one parent is an academic, has a positive influence on the level of financial literacy can be seen in the following table 9:

Table 9. Results H6 - Educational level of parents

	Estimate	Standard Error	T-Statistics	ℙ(>||t||)ℙ(>t)
Constant = Academic: yes	2,3065	0,0645	35,758	<2e-16 ***
Academics: no	0,0024	0,0845	0,029	0,977
Academics: not specified	-0,3065	0,8821	-0,347	0,728

n_2 = 446; df = 443 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

In this evaluation, there is no indication that the educational level of the parents influences the level of financial literacy of the respondents. This is because the research refers to the target group of high school students, graduates, and young professionals, and consequently, the respondents have at least a high school diploma. Above this level of education, the influence of the parent's level of education on the degree of financial literacy is not present, and therefore no evidence for H6 is found.

Origin

The results regarding the hypothesis that an immigrant background, and thus origin, harm the level of financial literacy can be seen in the following table 10:

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Table 10. Results H7 - Origin

	Estimate	Standard error	T-Statistics	$\mathbb{P}(>\|t\|)\mathbb{P}(>t)$
Constant = Migration background: no	2,3471	0,0459	51,186	<2e-16 ***
Migration background: yes	-0,1826	0,1085	-1,683	0,0931.
Migration background: not specified	-0,8471	0,4392	-1,929	0,0544.

n_2 = 446; df = 443 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

In this evaluation, the comparison group includes respondents who do not have a migration background. They have an average score of 2.35. Both respondents with an immigrant background and respondents who did not specify have a different score than the comparison group at a significance level of 10%. On average, the score is 0.19 lower for respondents with an immigrant background. For respondents who did not give any information, the score is even 0.85 lower. This shows that respondents with a migration background have a lower level of financial literacy.

Consolidated view

To mitigate the "omitted variable bias" described above, the significant influencing factors were considered in a consolidated manner in an OLS estimation. The following result was obtained from the compact consideration of the influencing factors of gender, income, and origin utilizing an OLS estimation:

Table 11. Survey results - Summary view

	Estimate	Standard error	T-Statistics	$\mathbb{P}(>\|t\|)\mathbb{P}(>t)$
Constant[2]	2,6214	0,0887	29,554	<2e-16 ***
Gender: female	-0,3242	0,0845	-3,839	0,000142 ***
Income: high	0,2011	0,3193	0,630	0,529210
Income: medium	0,0104	0,0995	0,105	0,916664
Income: low	0,0386	0,0976	0,395	0,692920
Income: not specified	-0,1953	0,2803	-0,697	0,486282
Migration: yes	-0,1516	0,1006	-1,506	0,132689
Migration: not specified	-0,5831	0,4136	-1,410	0,159347

n_2 = 446; df = 435 Level of significance: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Source: Own survey

In this OLS estimate, the comparison group consists of male respondents with a very low income and no migration background. In addition, this OLS estimate showed that only the influencing factor "gender" is significant. On average, women have a score of 0.32 lower than the comparison group. In summary, this research study found that only the influencing factor "gender" (H2) affects the level of financial literacy in the target group of high school students, graduates, and young professionals. For the other hypotheses, the regression analysis shows no clear indication in the consolidated view.

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Summary

Apart from the significant findings about gender and origin (the level of financial literacy was significantly lower among individuals with an immigrant background), it was confirmed above all by the statistical review that measuring financial literacy using the established "Big Three" questions is not sufficient for individuals with a high level of education. Future questionnaires must include a higher level of difficulty and more questions regarding compound interest and inflation (Hou & Schuler, 2022). The significant gender gap could be better researched in upcoming surveys by including questions on the social and cultural environments in which girls and boys live (Bottazzi & Lusardi, 2021).

5. Discussion

The results presented are based on the data set regarding the "Big Three" questions and are subject to their limitations. From the experience of scientific research, the answers of the respective study participants depended strongly on the formulation of the question (Alessie et al., 2011). In addition, participants had no incentives to answer the questions correctly or to ask third parties for assistance (Hastings et al., 2013). From a methodological point of view, it is desirable to have an instrument of measurement that consists of several questions and at the same time has different levels of difficulty. This finding results from the fact that neither the "Big-Three" questions nor the extended version of the "Big-Five" questions, due to their small number of questions and only rough categorization, are only suitable in a limited way to query and test a deep understanding of financial literacy (Nicolini & Haupt, 2019). A broad-based household panel study in Germany identified the inadequacy of the current measurement of financial literacy. In addition, this study recommended an extension of the financial literacy questionnaire (Hou & Schuler, 2022)

In the present work, the fact that the "Big Three" questions appear insufficient to differentiate between a medium and a high level of education came into play in particular. This circumstance resulted in low variation in most hypotheses. Consequently, significantly more complex questions show a more considerable variation and are better suited as explanatory variables. Building on this, other approaches have become established in the literature. For example, Knoll and Houts (2012) developed a psychometrically sound questionnaire to measure financial literacy. This consists of 20 questions, which include the "Big Three" questions. The questionnaire is characterized by high comparability as well as validity (Knoll & Houts, 2012).

The survey results show that this questionnaire indicates whether an individual is making provisions for old age, for example. At the same time, the "Big-Three" questions represent a significant measure of financial literacy, which was confirmed by a high correlation with the results Knoll and Houts (2012) affirmed. Due to the described limitation of available instruments, the literature often uses sociodemographic factors such as wealth, income, educational status, intelligence, gender, age, or occupation as proxies for the degree of financial literacy (Christelis et al., 2010; Bannier & Neubert, 2016; Bianchi, 2018). Especially the influence of rationality on the level of financial literacy should also be included in the measurement process of financial literacy (Kubak et al., 2021).

Given the significant gender gap in financial literacy, whose causes can also be traced back to the parental background, the role of mothers in particular, which is important for girls' financial literacy, should be investigated more comprehensively in the future. In addition, the social and cultural environment in common in girls' and boys' lives, which plays a crucial role in explaining gender differences, should also be considered to explain this gender gap (Bottazzi & Lusardi, 2021). In recent research, studies conducted among high school and college students revealed that there is a relationship between financial literacy and the number of family members. For example, students from families with more members demonstrated better financial literacy than students from families with fewer members (Kubak et al., 2021). Siegfried & Wuttke (2021) reveal in their study

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that gender and educational background significantly influence financial literacy and thus financial learning opportunities as well as the ability to deal with gratification deferral.

Research on the interaction effects of financial literacy and risk aversion, in particular, must be given greater priority in future research. They are crucial for potential start-up behavior (Riepe et al., 2022).

6. Conclusions

The research paper examined various factors influencing the financial literacy of high school students, graduates, and young professionals. In addition, the influence of different characteristics of educational level, income, gender, and origin was examined. To this end, seven hypotheses were formulated. In the work context, financial literacy was approximated using a questionnaire known in the literature, the so-called "Big Three" questions. For this purpose, over 500 individuals were surveyed.

Although the literature has dealt extensively with the determinants of financial literacy, no recent study focuses on the German market and is limited to individuals with higher levels of education. The latter is significant because the characteristics of low educational levels are already well researched.

A simple linear regression model was formulated for each hypothesis to evaluate the results and then tested for significance using the T-test. Subsequently, a multivariate regression model based on the significant influencing factors was specified and tested again. The gender factor is highly significant. Immigration background also influences financial literacy. The results concerning education, origin, and income were sometimes ambivalent or weak. No indication was found for an influence of the place of residence, the parent's educational level, or a practice-related education. In the multivariate model, the results concerning gender were still significant. The results suggest that the complexity of the "Big Three" questions is insufficient to differentiate well between elevated levels of education (Hou & Schuler, 2022).

This paper provides a good overview of the status of financial literacy of high school students, graduates, and young professionals within Germany. As expected, the importance will increase in the coming years when demographic changes require the modernization of the pension system. In this respect, there are many possibilities for granular studies, e.g., psychometric questionnaires.

Future research should therefore include other components in the financial literacy survey such as an additional question on compound interest (Hou & Schuler, 2022) or socio-demographic characteristics or the history of origin and family composition (Bottazzi & Lusardi, 2021). This would also provide a more in-depth analysis of the gender gap. Also concerning the start-up culture, which is significantly related to risk aversion and risk understanding, questions regarding these aspects should be included in future panels (Riepe et al., 2022).

The findings of this research paper underpin the urgency of strengthening the financial literacy of women to establish equitable prosperity and income conditions within a diverse society. It also reinforces the call for greater financial literacy support for immigrants to ensure their integration into the German affluent society.

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A SYSTEMATIC LITERATURE REVIEW ON E-HEALTH IMPLEMENTATION AND POLICIES*

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Abstract. Despite the existing attention to e-Health implementation, there are several gaps and bottlenecks related to its implementation and policies. Starting from previous research, this paper presents a systematic literature review that we conducted to determine the current state of the art in e-Health implementation and policies, with particular attention to the European area. After the research and filtering of the papers, 49 papers were selected to be carefully examined and compared according to a set of criteria including objective, targeted and implementation compliance. Based on the obtained results, we identified several gaps and suggested recommendations to fill them. Based on the results, the topic has yet to be discussed and deepened, bringing to synthesis the different experiences gained in the field by both operators and researchers.

Keywords: SRL; e-Health; digital platforms; implementation; policies

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JEL Classifications: I18, P46, O33, O32, M12, C54, C30

1. Introduction

Implementation of electronic health (e-Health) at a national level creates a fundamental innovation in health care. Alongside technical challenges, E-Health implementations outside numerous technological, social and organizational issues are often ignored. Accepting those e-Health achievement necessities to involve all stakeholders, achieve organizational changes and lighten resistance, e-Health implementation ambitions at observing social and organizational factors influencing large-scale health systems and at recognizing best practices. The e-Health implementation would fundamental welfares such as an important cost saving - due to information that identical exams would be eluded - an upgrading of the strength of care assistance by the opportunity of sharing user health history records between providers and health institutions (Weng et al., 2017;

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Saidi et al., 2020; Hwang et al., 2019). Within this research stream (Squitieri, et al, 2017; Zhao, et al, 2019; Bloom, et al, 2019; Lehoux, et al. 2019; Benjamin, et al. 2019) there is a strong relationship between e-Health implementation and policies. Starting from these strong relationships the aim of the paper is to share a systematic literature review on the implementation of e-Health and its policies.

2. Literature Review

The nature of the European e-Health, applied at the National level showed dated and unsolved bottlenecks within a large number of European States. The implementation provides both, opportunities and challenges for the redesigning of economic and service structures (Benjamin, et al. 2019). It is strategic to implement e-Health because it could allow maintaining and adding to the creation of information systems, both, patients and medical, in a specific way, but also as organizational value (Squitieri, et al, 2017; Zhao, et al, 2019; Bloom, et al, 2019). Furthermore, to create value means implementing e-Health, working in alignment, coordination, and co-creation. Value in e-Health means changing the information system at all levels of organizational structure (Kelly, et al. 2019; Casado-Vara et al, 2019). Past studies (Hwang et al 2008; van Gemert-Pijnen, et al. 2011) has exposed that the innovative vision, as it is increasingly along the adoption and the application process, results in an ultimate implementation that is frequently far from the initial vision. The implementation is comparable to the introduction of the main management innovation. The key phases of the projected growth would be the macro and micro-actions. These two levels must be in continuous interaction to realize the implementation (Baltussen et al 2019; Wong et al., 2019). A recent study argues that these implementation processes are functional for generating positive value in health (Fenwick et al., 2020; Rothery, et al 2020; Iqbal, et al. 2019; Porter et al, 2019; Urena, et al. 2019; Finkelstein, et al. 2019). According to the literature (Chohan, 2019), e-Health can improve collective and individual service delivery (Romzek, et al., 2014; Bryson, et al., 2014; Mintromet al, 2017; Cluley et al 2020).

Furthermore, success and sustainability are strongly related also to deep cultural change within the health departments which, as underlined in literature (Martins, et al., 2019; Ferlie et al., 2019; Cronemberger et al, 2019), is one of the main obstacles is the health professionals' resistance. There are interesting contributions that consider e-Health implementation as enabling factor to create an information system in health (Martins, et al., 2019; Ferlie, et al.,2019; Cronemberger et al, 2019; Palanisamy et al 2019). Given today's changes in the health market, due to the pandemic Covid 19 (Capone et al, 2021), that involves the world, most health departments' is implementing e-Health, which ensures a continuous improvement of health services and their adaptation to change. Nevertheless, avoiding these errors, in starting stage, is strategic, in fact: e-Health serves as a basis for knowledge sharing, quality of service (Yang, 2016), regulatory compliance, and stakeholder collaboration (Lepore et al., 2018, Tuikka, et al., 2016; Bonomi, 2016). Furthermore, in the average and a long time, the difficulties in correcting errors increase exponentially over the life cycle (Krebs, et al, 2015; Cooper, et al., 2019; Porter 2010; Campanella et al. 2016; Adler-et al., 2015; Desautels, et al., 2016; Tavares, et al 2016;). The inappropriate use of digital tools, both, by customers and health personnel is a typical mistake to be avoided, discussed and explored in the literature (Nguyen, et al., 2014; Strong, et al., 2014;). To overcome this shortcoming and expand the use of E-Health, the Governments, have introduced an extensive investment to overcome these bottlenecks supporting new educational behavior, for both, the customers and healthcare (Aldosari, 2017; Fukami, et al, 2019; Joukes, et al., 2019). These support actions are also concentrated within the department or where e-Health is used, to improve its organizational dimension: flexibility, complexity, and variability (Martel, et al., 2018; Saleem, et al 2018; Bonomi, et al., 2015). In this paper, we rely on guidelines depicted in (Keele, 2007) to conduct a systematic literature review (SLR) that aims to determine the current state of the art in E-Health and identify the gaps that should be filled in this research area. An SLR is distinguished from other types of literature review primarily by a comprehensive literature search and specification of research questions that should be addressed (Keele, 2007). To the best of our knowledge, (Ross, et al 2016) is the existing literature review that focuses on the implementation of E-Health. The authors from 2009 to 2014, have classified 37 papers related to the topic. Our

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SLR complements that of (Ross, et al, 2016) in terms of both literature and criteria. Indeed, after the search and filtering of papers, 49 have been chosen. To compare published research (Ross, et al 2016) we have established a set of criteria, such as the objective, target domain, representation format, conformance, implementation, and evaluation. Our study also aims to see how the characteristics of E-Health have evolved over the past few years by comparing our results with those of Ross et al 2016. The paper, using the SLR tool, concerning the implementation of e-Health, aims to better understand the phenomenon and inform operators in the sector what can be the possible reflections and actions to be evaluated to implement e-Health. The remainder of this paper is organized as follows: after the introduction, and conceptual background section 2 highlights the main literature contributes linked to the topic and aim of the paper, section 3 methodology, highlight the SRL criteria, section 4 display results, and finally in section 5 there are conclusive.

3. Methodology

A Systematic Literature Review (SLR) is a specific type of literature reviews that is characterized by (Keele, 2007):

- A specification of research questions that should be addressed;
- A comprehensive and unbiased search for the relevant literature;
- An explicit definition of inclusion and exclusion criteria;

One of the main reasons for undertaking an SLR is to summarize and evaluate existing work in a given research area, identify their gaps, and suggest work to address them. Based on the guidelines depicted in (Keele, 2007), we conducted our SLR in several stages:

- Formulating the research questions
- Extracting and filtering papers
- Defining evaluation and comparison criteria
- Presenting and discussing the obtained results

The remainder of this section describes the details of each stage.

3.1 *Formulating the research questions*

The specification of research questions (RQs) is the most important part of any SLR as they guide authors throughout the review process (Keele, 2007). The RQs that should be addressed in our SLR are formulated as follows:

RQ1: What are the areas and goals targeted by E Health implementations these last years?
RQ2: What are the formats used for the representation of E-Health implementations?
RQ3: Do the proposed implementations comply with the implementation mechanism specified by the WHO?
RQ4: How is E-Health implementation demonstrated and evaluated.

3.2 *Extracting and filtering papers*

To retrieve papers proposing E-Health implementation, we constructed our search string firstly by combining the main terms E-Health and Implementation. To make the search as comprehensive as possible and not forget any main terms, we replaced the term E-Health with Application and the term

Implementation was replaced by several derived words (e.g., Implementing) or belonging to the same semantic field (e.g., Delivery solution, Standard, Customers, System). The final search string is structured as follows: Search string = (“E-Health” OR “Implementation” AND “Applic*” OR “Delsol*” OR “Standa*” OR “Custom*” OR “System”).

We resorted to several databases and search engines like Web of Science, Scopus, Science Direct, Google Scholar, and IEEE Xplore Digital Library. Besides, each found article was used for a backward search through its related work section. Our SLR targets all E-Health implementation published over the time of 2016 to 2021 in

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journals, conference/workshop proceedings, and book chapters. For this, we filtered the obtained papers according to the following exclusion criteria:

- Papers published before November 6 2016 whether or not they are treated in Ross et al 2016;
- Papers that are not published in journals, conference/workshop proceedings, and book chapters such as master and doctoral theses;
- Papers that do not propose a new e-Health implementation;
- Papers are written in a language other than English;
- Papers that describe the same E-Health implementation in the same way.

Filtering has greatly reduced the number of papers. In fact, after the paper collection, we obtained a total of 93 papers. Next, we discarded papers that were published before November 6, 2016, duplicate/similar papers and those in which we did not find an E-Health implementation. However, we have kept the papers that propose an E-Health implementation whether it is a primary or secondary contribution. Accordingly, a set of 49 papers was retained for an in-depth examination in our SLR. Figure 1 displays the main steps of the paper extraction and filtering process.

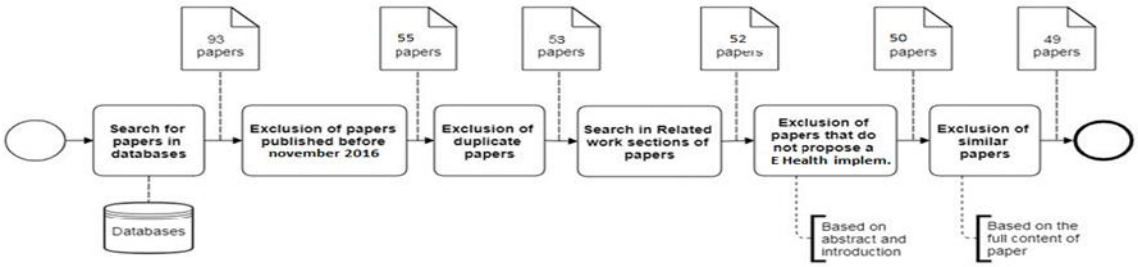


Figure 1. Process of paper extraction and filtering

Source: our elaboration

3.3 *Defining evaluation and comparison criteria*

To evaluate and compare the E-Health implementation, we have defined the following criteria:

- Publication type: indicates if the extension has been published in a journal, a conference/workshop proceeding, or a book chapter.
- Aim: indicates the reason for which the implementation was proposed or the problem that it solves.
- Category: we have defined two categories to classify the E-Health Implementation according to their purpose. The first category is intended to represent or handle the processes of a particular domain of healthcare: e.g., cardiology, orthopedics, and vascular diseases. The second category aims to improve healthcare performance: e.g., cost, security, compliance, and quality. The extensions of the second category are independent of a specific domain but, they can be used in any domain.
- E-Health implementation related to software: specifies the version of the software.
- Implementation name: indicates whether a name has been assigned to the proposed solution.
- Main domain: Designates the main domain targeted by an implementation knowing that some extensions deal with multiple domains (e.g., quality in healthcare processes) but only the main domain is considered.
- Demonstration: indicates whether an implementation has been demonstrated through an operational example before to be inserted within e.g., the department, or the hospital.

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- Implementation Modality: mentions whether technologies have been implemented either by integrating them into an existing tool or by developing a new tool.
- Evaluation: specifies for each tool (existing and modify or new) whether it has been evaluated and which method is used for the evaluation.

Conformity: determines whether an E-health implementation complies with the ISO both standards and recommendations also, in terms of whether it is reused, customized, or extended

4. Results

In table 1, we define for each e-Health implementation the publication type ('J' for the journal, 'C' for conference or workshop and 'Ch' for chapter), the main purpose of the implementation as well as the category ('Imp' 'for improvement and 'SD' for specific- domain).

Table 1. *Comparison of e-Health implementation according to their publication type, aim, and category*

e-Health Implementation	Publication Type	Aim	Category
An et al., 2021	J	The Authors, identify, main e health inter-organizational research opportunities modeled through an evaluation approach	Imp
Ahmed et al., 2019	J	The Authors, identify, main e health inter-organizational research opportunities modeled through an evaluation approach	Imp
Aldosari 2017	J	The Author, identify, the main opportunities for the application of automation in health care contexts	SD
Alonso et al., 2021	J	The Author, identify, the main opportunities for the application of automation in health care contexts	SD
Bakker et al., 2016	J	The Authors, identify, the main phases of implementation of the technologies in e health contexts	SD
Bartholomew Eldridge et al., 2016	Ch	The Authors develop a planning health promotion program with information technologies	Imp
Benjamin et al., 2019	J	The Authors study the information and communication technologies applied in health care contexts	SD
Biancone et al., 2021	J	The Authors study the information and communication technologies applied in health care contexts	SD
Bitar et al., 2021	J	The Authors, identify, the main phases of implementation of the technologies in e health contexts	SD
Bokolo 2021	J	The Authors study the information and communication technologies applied in health care contexts	SD
Bloom et al.,2019	C	The Author study applied information and communication technologies and economic dynamics in health contexts	SD
Casado Vara et al., 2019	J	The Authors develop information technologies applications applied to the healthcare environment	SD
Chang et al., 2021		Authors highlight difficulties in implementing e-health	Imp
Chatterjee et al., 2019	C	Authors highlight difficulties in implementing e-health	Imp
Chohan 2019	Ch	The Author highlights the difficulties in implementing e-health in relation to value creation	Imp
Cooper et al., 2019	J	The Authors highlight the economic dynamics of the implementation of e health	Imp
Covvey et al., 2017	C	The Authors highlight the evolution of skills and related gaps in the implementation of e health	Imp
Desautels et al., 2016	J	The Authors highlight the evolution of skills and related gaps in the implementation of e health in healthcare contexts	SD
Enam et al., 2018	J	The Author highlights the interventions necessary in the implementation of e health in health care contexts	SD
Ferlie et al., 2019	C	The Authors highlight the interventions necessary in the implementation of e health for the creation of value	Imp
Ferwerda et al., 2016	J	The Authors measured the benefits of therapy using information technology	Imp

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Finkelstein et al., 2019	J	The Authors measure the benefits of health care programs and related technologies	Imp
Fukami et al., 2019	J	The Authors measure the benefits of information technology in healthcare contexts	SD
Granja et al., 2018	J	The Authors identify factors determining the success and failure of e Health interventions	Imp
Gemert-Pijnen 2017	J	The Author identifies key components determining the success and failure of e Health interventions	Imp
Greenhalgh et al., 2017	J	The Authors identify key components beyond adoption of e Health	Imp
Hekler et al., 2016	J	The Authors identify models and theories related to e Health implementation	Imp
Iqbal et al., 2019	J	The Authors identify key factors design and implementation of e Health	Imp
Jacobs et al., 2016	J	The Authors study e Health implementation to improve health literacy	Imp
Joukes et al., 2019	J	The Authors study e Health implementation to improve health professionalities	Imp
Kaur et al., 2021	J	The Authors study e Health implementation to improve health professionalities	Imp
Kelly et al., 2019	C	The Authors study e Health evaluation	Imp
Lehoux et al., 2019	J	The Authors study the relationship between innovation and e-Health evaluation	Imp
Lepore et al., 2018	J	The Authors study cultural orientations and information systems success in public and private hospitals:	SD
Li et al., 2021	J	The Authors study the development of e Health applications	Imp
Maramba et al., 2019	J	The Authors study the development of e Health applications	Imp
Martel et al., 2018	J	The Authors study software applications related to e Health	Imp
Michie et al., 2017	J	The Authors identify the interventions to promote e Health	Imp
Moller et al., 2017	J	The Authors study the impact of e Health in health care contexts	SD
Morrissey et al., 2016	J	The Authors study behavior change in e Health implementation	Imp
Ossebaard et al 2016	J	The Authors study e Health and quality in health care	SD
Palanisamy et al., 2019	J	The Authors study innovation technologies and health care context	SD
Patrick et al., 2016	J	The Authors study technologic change and implications for e health	Imp
Perrin et al., 2019	J	The Authors identify key factors from e Health implementation	Imp
Pieterse et al., 2018	Ch	The Authors study the complexity of e Health Implementation	Imp
Saleem et al., 2018	C	The Authors study the complexity of e Health Implementation in health care context	SD
Schreiweis et al., 2019	J	The Authors study barriers and facilitators to the implementation of e Health services	SD
Schueller et al., 2017	J	The Authors study behavioral intervention technologies	Imp
Sieverink et al., 2017	J	The Authors study e Health implementation identifying key factors to improve outcome and resources	SD
Squitieri et al., 2017	J	The Authors study e Health implementation identifying key factors to improve services and resources	SD
van der Kleij et al., 2019	J	The Authors study e Health in health care contexts	SD
van der Vaart et al., 2017	J	The Authors measure e health implementation in health care contexts	SD
Walsh et al., 2016	J	The Authors measure e health implementation related to projects	Imp
Warth et al., 2019	J	The Authors measure e health implementation related to service outcomes	Imp
Vis et al., 2020	J	The Authors measure e health implementation related to service outcomes	Imp
WHO 2017	Ch	The Organization highlight the global diffusion of e Health	Imp
Wu et al., 2021	J	The Authors identify e Health assessment factors	Imp
Yang et al., 2021	J	The Authors identify e Health assessment factors	Imp
Yusif et al., 2017	J	The Authors identify e Health assessment factors	Imp
Zhao et al., 2019	J	The Authors study innovation technologies and its application oin health care contexts	SD

Source: own making

It is possible to note, from table 1, that the majority of publications type are in Journals. We can explain this by the fact that e-Health implementation is consistent enough in terms of operative and theory contribution to be submitted to journals. In line with this, the distribution by category is balanced between improvement and specific

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domain. In table 2, e-Health implementation is compared according to their name, main domain, demonstration, implementation, and evaluation.

Table 2. Comparison of e-Health implementation to their Authors, e Health name, domain, demonstration, implementation, and evaluation

Authors	eH Name	Domain	Demonstration	Implementation	Evaluation
Ahmed et al., 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Aldosari 2017	Yes	EMR/EHR	Yes	Hospital	Comparison with other approaches
Bakker et al., 2016	Yes	App	Yes	Hospital	Comparison with other approaches
Bartholomew Eldridge et al., 2016	NA	NA	NA	Theory and Model	Comparison with other approaches
Benjamin et al., 2019	Yes	Yes	Yes	Hospital	Comparison with other approaches
Bloom et al.,2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Casado Vara et al., 2019	Yes	Blockchain	Yes	Hospital	Comparison with other approaches
Chatterjee et al., 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Chohan 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Cooper et al., 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Covvey et al., 2017	NA	NA	NA	Theory and Model	NA
Desautels et al., 2016	YES	EHR	Yes	Hospital	Comparison with other approaches
Enam et al., 2018	NA	NA	NA	Theory and Model	NA
Ferlie et al., 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Ferwerda et al., 2016	Yes	T	Yes	Hospital	Comparison with other approaches
Finkelstein et al., 2019	NA	NA	NA	Theory and Model	NA
Fukami et al., 2019	Yes	EHR	Yes	Hospital	Comparison with other approaches
Granja et al., 2018	NA	NA	NA	Theory and Model	Comparison with other approaches
Gemert-Pijnen 2017	Yes	ST	Yes	Hospital	Comparison with other approaches
Greenhalgh et al., 2017	NA	NA	NA	Theory and Model	Comparison with other approaches
Hekler et al., 2016	NA	NA	NA	Theory and Model	Comparison with other approaches
Iqbal et al., 2019	Yes	SW	Yes	Hospital	NA
Jacobs et al., 2016	NA	NA	NA	Theory and Model	Comparison with other approaches
Joukes et al., 2019	Yes	EHR	Yes	Hospital	Comparison with other approaches
Kelly et al., 2019	Yes	CLEF	Yes	Hospital	Comparison with other approaches
Lehoux et al., 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Lepore et al., 2018	NA	NA	NA	Theory and Model	Comparison with other approaches

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Maramba et al., 2019	Yes	SW	Yes	Hospital	NA
Martel et al., 2018	Yes	SW	Yes	Hospital	Comparison with other approaches
Michie et al., 2017	NA	NA	NA	Theory and Model	Comparison with other approaches
Moller et al., 2017	NA	NA	NA	Theory and Model	Comparison with other approaches
Morrissey et al., 2016	NA	App	Yes	Hospital	Comparison with other approaches
Ossebaard et al 2016	NA	NA	NA	Theory and Model	Comparison with other approaches
Palanisamy et al., 2019	Yes	Big Data	Yes	Hospital	Comparison with other approaches
Patrick et al., 2016	NA	NA	NA	Theory and Model	NA
Perrin et al., 2019	NA	RAFT	Yes	Hospital	Comparison with other approaches
Pieterse et al., 2018	NA	NA	NA	Theory and Model	Comparison with other approaches
Saleem et al., 2018	Yes	EHR	Yes	Hospital	Comparison with other approaches
Schreiweis et al., 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
Schueller et al., 2017	NA	NA	NA	Theory and Model	Comparison with other approaches
Sieverink et al., 2017	Yes	Big Data	Yes	Hospital	Comparison with other approaches
Squitieri et al., 2017	NA	NA	NA	Theory and Model	Comparison with other approaches
van der Kleij et al., 2019	Yes	EHR	Yes	Hospital	NA
van der Vaart et al., 2017	NA	EHR	Yes	Hospital	Comparison with other approaches
Walsh et al., 2016	NA	App	Yes	Hospital	Comparison with other approaches
Warth et al., 2019	NA	NA	NA	Theory and Model	Comparison with other approaches
WHO 2017	NA	NA	NA	Theory and Model	Comparison with other approaches
Yusif et al., 2017	Yes	NA	Yes	Hospital	Comparison with other approaches
Zhao et al., 2019	Yes	MHM	Yes	Hospital	Comparison with other approaches

Source: own making

In table 2, a few documents indicate the name of e-health implemented, in terms of brand and tools. This is possible, considering the indirect advertising that can result. Furthermore, more than 50% of papers, have indicated domain. The domain is related to specific applications, e.g., EHR, but also the development of big data and communication. The papers that have indicated the domain also contain the demonstration, more than 50%. The implementation is related to the hospital, while in a few papers there is not an evaluation approach. In addition, also in terms of theory and model, interesting information emerging related to both key factors, and bottlenecks. The Demonstration, implementation and evaluation, within hospitals are, also strictly linked to, our previous study. These reasons highlight that all variables have been considered in functional properties in our previous study. In table 3, we compare the E-Health implementation taking into account the conformity criterion: ISO standard, recommendations, reused, customized or extended.

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Table 3. Comparison of e-Health implementation to their conformity: ISO standard, recommendations, reused, customized, extended

Authors	Conformity	ISO	Reccomendations	Reused	Customized	Extended
Ahmed et al., 2019	NA	NA				
Aldosari 2017	Yes	Yes	X		X	X
Bakker et al., 2016	Yes	Yes	X	X	X	X
Bartholomew Eldridge et al., 2016	NA	NA				
Benjamin et al., 2019	Yes	Yes	X		X	
Bloom et al.,2019	NA	NA				
Casado Vara et al., 2019	Yes	NA			X	X
Chatterjee et al., 2019	NA	NA				
Chohan 2019	NA	NA				
Cooper et al., 2019	NA	NA				
Covvey et al., 2017	NA	NA				
Desautels et al., 2016	Yes	Yes	X	X	X	X
Enam et al., 2018	NA	NA				
Ferlie et al., 2019	NA	NA				
Ferwerda et al., 2016	Yes	Yes	X		X	X
Finkelstein et al., 2019	NA	NA				
Fukami et al., 2019	Yes	YES	X		X	X
Granja et al., 2018	NA	NA				
Gemert-Pijnen 2017	Yes	YES	X	X	X	X
Greenhalgh et al., 2017	NA	NA				
Hekler et al., 2016	NA	NA				
Iqbal et al., 2019	Yes	Yes	X	X	X	X
Jacobs et al., 2016	NA	NA				
Joukes et al., 2019	Yes	Yes	X		X	X
Kelly et al., 2019	Yes	Yes	X		X	X
Lehoux et al., 2019	NA	NA				
Lepore et al., 2018	NA	NA				
Maramba et al., 2019	Yes	Yes	X		X	X
Martel et al., 2018	Yes	Yes	X	X	X	X
Michie et al., 2017	NA	NA				
Moller et al., 2017	NA	NA				
Morrissey et al., 2016	NA	Yes	X		X	X
Ossebaard et al 2016	NA	NA				
Palanisamy et al., 2019	Yes	Yes	X	X	X	X
Patrick et al., 2016	NA	NA				
Perrin et al., 2019	NA	Yes	X		X	X
Pieterse et al., 2018	NA	NA				
Saleem et al., 2018	Yes	Yes	X		X	X
Schreiweis et al., 2019	NA	NA				
Schueller et al., 2017	NA	NA				
Sieverink et al., 2017	Yes	Yes	X	X	X	X
Squitieri et al., 2017	NA	NA				
van der Kleij et al., 2019	Yes	Yes	X	X	X	X
van der Vaart et al., 2017	NA	Yes	X		X	X
Walsh et al., 2016	NA	Yes	X		X	X
Warth et al., 2019	NA	NA				
WHO 2017	NA	NA				
Yusif et al., 2017	Yes	NA	X		X	X
Zhao et al., 2019	Yes	Yes	X	X	X	X

Source: own making

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In Table 3, most authors represent their E-Health implementation in the form of both, theory and model. However, 23/40, papers, make a comparison of E-Health implementation to their conformity and related it with ISO standards, recommendations, reused, customized, and extend. This comparison is little used despite its specific and standard recommendation. In Tables 2 and 3, big data are widely used. Furthermore, these two implementations, take into account, on the one hand, the relationship with the external environment by defining everything that can occur during the implementation and execution, and, on the other, the impact on the process flow in terms of information about what activities require to be performed and what they generate. In Table 3, recommendations and customization are present in all 23 documents. We believe that this result is logical, as this category includes the main elements to define the behavior of the electronic health implementation process. Furthermore, in Table 3, recommendation and customization are present, in each paper, together. As a result, recommendation and customization are strongly related to the implementation of e-Health. The statistics reveal that: less than half of the papers comply with e-Health implementation which hampers the comparability. This reflection emerges from the statistics of Table 3, in which the phase of recommendations is always linked to personalization, therefore, if on the one hand, ISO standards are followed, on the other hand, they are customized to the specific needs of those who adopt those technologies. The latter result, to be understood in depth, needs to study and research the different cases of implementation, for example in hospitals. The not simple understanding of this implementation highlights literature more inclined toward theoretical study and models. All implementations use the recommended tools, although, case studies in different contexts are little explored and as a result, absentee comparisons. Therefore, we can expect publications that study the differences between specific cases. The objective of our literature review is to complement that of (Ross et al., 2016) in terms of both literature and criteria. In particular: a) the publications related to the implementation of e-Health have increased slightly. This finding is in line with the study by Ross et al., (2016). Although, these results are useful, is possible argue that:

- the influence of the recent and still ongoing pandemic, Covid 19, which requires social distancing of distance care, has brought attention also not only to medical research to the topic of e-Health;
- this shows that the topic of research has gained maturity and implementations are more consistent, at the current stage with the new dynamics of treatment, the pandemic phase, and we believe that it will increase further in the coming years;
- the topic examined in Ross et al., (2016) is slight, more oriented towards theoretical and model implementations, in our study, which follows the Author's study, the focus on implementation sees growth for studies that verify compliance, standards, recommendations and customized solutions.

Our SRL shows greater attention to the customization of the solutions within the implementation carried out.

5. Discussion

In this paper, SLR was conducted to determine the current state of the art in e-Health implementation and identify our research gaps. The extraction and filtering of papers resulted in a set of 49 e-Health implementations. The e-Health implementation is evaluated and compared according to a set of criteria (Marino et al, 2022, 2021, 2021a, 2021b). The SLR can contribute to helping both, research and operative researchers choose the e-Health implementation. After this SRL, is possible to deduce the following points:

- The targeted areas and objectives are not very diversified;
- Despite a slight improvement in recent years, less than half of the extensions conform to the theory and model approaches;
- The specific domain of e-Health implementation is yet little developed;
- e-Health implementations are rarely evaluated in terms of comparison of case studies, despite the existence of several theoretical studies.

Based on these points, we suggest the following path that may bridge the identified gaps and advance the field of E-Health implementation:

- Authors should develop e-Health implementation to provide considerations to enable a better understanding of the phenomenon;
- In addition, a clear methodology should be provided throughout the development of comparison between case studies with attention to the target domain related to implementation;
- It is desirable to define global standards and not only standards valid in each Country;

Finally, the studies should make more effort in the operational implementation of e-Health, by integrating it into a theory and model to prove its feasibility. Based on these indications, the topic has yet to be discussed and deepened, bringing to synthesis the different experiences gained in the field by both operators and researchers.

Conclusions

This last step is devoted to the presentation, interpretation, and analysis of the results obtained after a deeper examination of each paper. For this, we begin by classifying, comparing, and assessing all e-Health implementations in tables according to the criteria defined in the previous stage. Finally, we interpret the obtained results and provide explanations. What emerges from our research is the presence of several gaps and bottlenecks associated to e-Health implementation and policies. Accepting those e-Health achievement necessities to involve all stakeholders, achieve organizational changes and lighten resistance, e-Health implementation ambitions at observing social and organizational factors influencing large-scale health systems and at recognizing best practices. A multi-level transition process that sees a non-unanimous action within the individual systems of government and that represents a further future analysis of what are the current and future paths on which to evolve this digital transition.

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DEVELOPMENT PECULIARITIES OF AGRARIAN ENTREPRENEURSHIP IN UKRAINE

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Abstract. The article reveals the concept of entrepreneurship as an independent activity carried out by economic entities with the aim of obtaining profit and achieving social results. Successful development of entrepreneurial activity depends on its effectiveness and efficiency. The essence and meaning of the concepts of *development*, *effectiveness* and *efficiency* are characterized. The main indicators of the activity of large, medium and small agricultural, forestry and fishery enterprises are analyzed: the dynamics of the number of operating enterprises by their size, the dynamics of employment, of the amount of wages, of economic, investment and financial activities of enterprises. During the period under study, there is an increase in the number of large and small agricultural, forestry and fishery enterprises, whereas the number of medium-sized enterprises decreases. All enterprises, in terms of size, are profitable. However, the level of profitability of all enterprises is decreasing. The indices of development, effectiveness and efficiency of large, medium and small agricultural, forestry and fishery enterprises are calculated in accordance with the selected indicators. The findings show that enterprises, regardless of their size, should pay considerable attention to increasing the level of profitability of sales and equity capital. An integral assessment of large, medium and small agricultural, forestry and fishery enterprises is carried out in terms of their competitiveness and prospects for future development. The article suggests that all enterprises in terms of size have significant internal potential for development. Yet, according to the indicator of the integrated index of efficiency, medium and small enterprises are inferior to large enterprises. The study offers proposals for increasing the effectiveness and efficiency of all enterprises by size.

Keywords: entrepreneurship; development; efficiency; effectiveness; entrepreneurial activities; large; medium; small enterprises; companies; agriculture; forestry; fishery; performace

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JEL Classifications: M1, M2, O1, Q1

1. Introduction

One of the key preconditions for increasing the level of competitiveness of the country's economy, forming and realizing its export potential, reducing the unemployment rate, improving the quality of life of the population, and financially enriching the country's economy is development of entrepreneurship. Under the conditions of the successful operation of enterprises and their stable development, Ukraine may increase the volume of exports, as well as the value of the national monetary unit. In addition, the efficient operation of enterprises is a source of

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economic growth, which provides employment in the country and directly affects the improvement of the quality of life of the population.

However, under conditions of an unstable market environment, which is characterized by uncertainty and constant changes, the activities of entrepreneurs and their behavior are formed mostly under the influence of a significant number of various factors. Today, it is the ability of entrepreneurs to assess the impact of external and internal environmental factors, the ability to quickly and efficiently respond to changes, that are the determining conditions for their development, effectiveness and efficiency. The special role of entrepreneurship is determined by the need for constant monitoring of patterns and trends of market development, which is an indicator for adequate changes and successful development.

Moreover, the modern business conditions in Ukraine are complex, changeable and contradictory in both political and economic aspects, which hinders the development of entrepreneurship. It is the strengthening of competition on domestic and foreign markets, the emergence of new forms of competition, the differentiation of consumer demand that require the search for new directions of development, increasing the effectiveness and efficiency of entrepreneurship in Ukraine.

2. Literature review

In modern market conditions, entrepreneurial activity operates under conditions of fierce competition. So far, there has been a deterioration of the competitive position of many Ukrainian enterprises, deepening of existing and emergence of new crisis situations, complication of living conditions and reduction of financial results. In addition to that, the external factors of the dynamic environment exert a significant influence on the activities of enterprises, in particular, negative ones.

Extant definitions of entrepreneurship variously relate to opportunity pursuit, business creation, uncertainty, profit-seeking and more, reflecting the myriad perspectives that exist within the entrepreneurship field and beyond (Bennett 2006). This definitional diversity has been well documented to date (Audretsch et al., 2015; Alegre et al., 2017; Bacq & Janssen, 2011; Dato-on & Kalakay, 2016; Moroz & Hindle, 2011), including the impact this diversity has on what is included and excluded within the entrepreneurship domain (Howorth et al., 2005). Whilst some scholars have lamented the attention that the definition of entrepreneurship has received in the literature (e.g. Low, 2001), others have motivated a continued discourse as a means of advancing the field (Shane, 2012; Welter et al., 2017).

Entrepreneurship as a driving force of the national economy is studied by many scientists at differentlevels (micro-, meso- and macro-) and using different methods (empiricaldescription, development of strategic directions, factor analysis, study of determinants of entrepreneurial activity between different temporal and spatialobjects of research, etc.) (Camacho Ballesta et al., 2020; Kucher et al., 2021; Ivanovic-Dukic et al., 2022; Prince et al., 2021; Gavrila Gavrila & De Lucas Ancillo, 2022; Kyfyak et al., 2021).

The concept of entrepreneurship stands for "the act of being an entrepreneur", and has been derived from the French word “entreprendre” meaning “pursuing the opportunities; undertaking-embarking; meeting the needs and demands via initiating an innovation and work (Özer & Topaloğlu, 2007). Also, the consept of entrepreneurship derived from the German word “unternehmen” stands for the act “üstlenmek” in Turkish (Güney, 2008).

The notion of entrepreneur has been derived from the “intare” root in Latin, “enter (introduction) and pre (first)” word roots in English and meaning “entrepreneur”, i.e. the one first initiates and starts. This term was first used by the economist Richard Cantillon who lived in France at the beginning of the 18th century and it was defined as “the person who buys and manufactures the production inputs and services today in order to sell at a cost not yet

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determined" (Iraz, 2005).

As of the French economist J. B. Say (1971), entrepreneurship has been accepted as the fourth production factor and therefore entrepreneurship has been included in such classical production factors as labor, capital and nature. However, the subject has become more important with the notion of "dynamic entrepreneur" suggested by J.Von Schumpeter (Müftüoğlu & Durukan, 2004). Kirzner defined entrepreneurship according to its opportunist characteristics. Accordingly, Kirzner defined entrepreneurship as "the entrepreneur who takes the profit opportunity and highlighted the importance of competition" (Abiyev & Özgür, 2013)

The notion of entrepreneurship gaining importance in the rapidly globalizing world is a multi-dimensional phenomenon that can be defined as "the process of gathering the unique combination of sources with the purpose of watching and opportunity" (Dogan, 2015).

Shane and Venkataraman's (2000) highly influential definition of entrepreneurship as "the identification, evaluation, and exploitation of opportunities" (Shane, 2012) marks the crux point at which the definitional debate shifted from "what exactly is entrepreneurship?" to "what exactly is an entrepreneurial opportunity?" (McMullen, Plummer & Acs, 2007).

Economic Code of Ukraine (Article 42) defines the term *entrepreneurship* as an independent, proactive, systematic, at one's own risk economic activity carried out by business entities (entrepreneurs) with the aim of achieving economic and social results and obtaining profit (Economic Code of Ukraine, 2003).

Today, individuals having the spirit of entrepreneurship in the society must realize themselves in order for a region or country to develop in economic and social terms. An increase in entrepreneurship implies an increase in competition, employment, innovation, quality and efficiency and acceleration of economic development (Özkul & Dulupçu, 2007).

In the course of the research, it is determined that efficiency of enterprises is characterized by the level of their development. Many scientists considered development as an economic category. In general, the concept of development can be defined as a change in a process or phenomenon from simpler to more complex (Dunda, 2016).

Kolesnikov (2013) understands the concept of development as the changes occurring at the enterprise, that is, a certain sequence of transitions of the socio-economic system of the enterprise from the beginning of its creation to its liquidation.

According to Kyfyak (2011) development is a dynamic system of interacting subsystems, prerequisites, factors and principles that form a vector of quantitative and qualitative changes in the functioning of the enterprise aimed at achieving priorities. Pohorielov (2012) interprets this concept as a continuous process that takes place according to an artificially established or natural program, as a change in the state of the enterprise, each of which is qualitatively different from the previous one, due to which the enterprise, like a more complex system, may have emerged, disclosed and potentially implemented new opportunities, new properties, qualities and characteristics that contribute to the ability of the enterprise to perform new functions, to solve fundamentally different tasks, which strengthens its positioning in the external environment and increases the ability to counteract negative influences.

Rayevnyeva and Chankina (2013) define development as a unique process of transformation of an open system in space and time, which is characterized by a permanent change in the global goals of its existence through the formation of a new dissipative structure and its transfer into a new attractor (one of the alternative trajectories of

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enterprise development) of functioning. Chorna and Koval (2018) explain development as a process of cumulative changes in the socio-economic system of the enterprise, aimed at its transition to a new qualitative and quantitative state over time under the influence of internal and external environmental factors. It is important that it can be both positive and negative in its direction.

According to Koniaha and Dunda (2018), the development of an enterprise is a set of directed, intensive and qualitative changes of an economic nature that occur at the enterprise as a result of contradictions in the internal environment and the influence of external environmental factors.

In the process of development, the main component of the successful activity of any enterprise is its efficiency. The first studies of the problem of efficiency can be attributed to the time of the founders of the classical school of economic theory of William Petty, Wilfred Pareto and Francois Quenet, the head of the school of physiocrats. Petty and Quenet equated the concepts of efficiency and effectiveness, which were applied to certain state measures and contributed to the economic revitalization of countries (Darmic & Vatsyk, 2010).

The separation of the concept of efficiency as an economic category took place at the beginning of the 19th century in the writings of Ricardo who separated the concepts of efficiency and effectiveness, giving efficiency a specific meaning that is expressed by comparing the result and a certain type of costs.

The concept of effectiveness, from Latin effectivus, means “to benefit”. The nouns implementation, result and effectiveness are originated from it (Economic Encyclopedia, 2000).

As noted by Hrosul and Avanesova (2010), efficiency is a concept that characterizes the positive dynamics of the subject’s development, and the degree of achievement of planned indicators or set goals reflects effectiveness.

According to P. A. Samuelson and W. D. Nordhaus, efficiency can be regarded as the main subject of economics because in a wider perspective it is tantamount to a lack of wastefulness (Rutkowska, 2013). R. Przygodzka (2008) believes that the concept of efficiency is usually analyzed with regard to specific activities.

Considering the general formulations of the concept of *efficiency*, it is possible to formulate three principle provisions that should be present in any definition (Mahas, 2018).

1. Efficiency implies the presence of a goal and depends on a number of factors, such as, for example, the content of tasks solved by the system, the state of the system, the nature of the environment, etc.

2. Efficiency can change (it is characterized by dynamism), the nature of its changes can be measured by a certain number that fluctuates from zero to some maximum value under ideal conditions. Moreover, this number should include a lot of factors that efficiency depends on; complexity of the system, the development of the relevant regulatory framework, the level of personnel training, the optimality of the management system, etc.

3. Efficiency should adequately reflect all the results of the functioning of objects through such indicators (in most cases, we speak of a system or a set of efficiency indicators), as the probability of any event, the average expected value (mathematical expectation) of some random variable, actual the results of the task, etc. It should be noted that so far today such a general theory has not developed an indicator that would correctly reflect all factors on which efficiency depends.

According to Demchenko and Momot (2013), effectiveness is a certain indicator of some process, an indicator that at the end of the process something planned in advance is obtained. The effectiveness of the organization is understood as its ability to achieve established external goals, aiming to ensure that all its organizational decisions

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and actions meet the criteria established by the external environment.

In-depth literature review allows for finding the following definitions of effectiveness (Otola, 2010):

- effectiveness expresses a particular approach to the effort, expenditures, time consumed for its achievement. The effect itself is the result, outcome, effect of our activity or an impression we create;

- economic effectiveness is a result of economic activity, reflected in the result to expenditure ratio;

- economic effectiveness is a positive outcome of actions which demonstrates its efficacy and efficiency;

- efficiency is concerned with doing things right while effectiveness is doing the right things.

Improving both the efficiency and effectiveness of processes and activities has a positive impact on the financial results of an organization. This influence can involve: a reduction in the number of mistakes in processes, activities, and products, preventing loss of material and working time, lower costs of compensation from warranty and guarantee, as well as decreased costs of lost customers and markets (Roszkowska, 2018).

The aim of the paper is to determine the prospects for the development of agrarian entrepreneurship in Ukraine on the basis of the assessment of indicators of development, effectiveness and efficiency of large, medium and small agricultural, forestry and fishery enterprises.

3. Overview of the main activity indicators of large, medium and small agricultural, forestry and fishery enterprises

In the contemporary tough, competitive conditions, a significant share of agricultural enterprises in Ukraine suffers losses. This is caused by a variety of factors: internal, which depend on the actions and management decisions made by the managers of the enterprise itself, as well as external, such as: global market challenges, significant competition, unreliable suppliers, political, technical and technological, economic and natural influences. However, some agricultural enterprises maintain their positions, adapt to the influence of external environmental factors and restore the efficiency of their activities, while others go bankrupt and are forced to liquidate their enterprises (Voskolupov et al., 2021).

The implementation of entrepreneurial activities aimed at the production of agricultural products plays an important role both for the economy of Ukraine and for the food supply of the population. According to the data of State Statistics Service of Ukraine, in 2021 the share of agriculture in the GDP of Ukraine was the highest among all branches of the national economy and amounted to more than 10%. Agri-food products also accounted for the largest share of Ukraine's total exports – about 41% per year (State Statistics Service of Ukraine, 2022).

If Ukraine's capacity to provide food for the world's population, according to experts, was 40 million people 20 years ago, today Ukraine's contribution to food security is equivalent to about 400 million people. In addition, the Strategy for the Development of Ukraine's Agricultural Sector by 2030 envisages providing food for 1 billion people in the world (State Statistics Service of Ukraine, 2022).

Table 1 shows quantitative indicators of actually operating enterprises in Ukraine by their size; the dynamics of employment and wages at large, medium and small agricultural, forestry and fishery enterprises. Due to the limitation of the official statistical data for 2021connected with the impossibility to form a database by the size of enterprises (according to the conducted research), which is caused by the war in Ukraine, the research was

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conducted on the basis of the data of the State Statistics Service of Ukraine, and it covers the period of 2012-2020.

Table 1. The Dynamics of the Number of Operating Enterprises by Their Size, the Dynamics of Employment and Wages in Large, Medium and Small Enterprises of Agriculture, Forestry and Fisheries*

Indicator	Year									Average Annual Growth Rate
	2012	2013	2014	2015	2016	2017	2018	2019	2020	
The number of enterprises, units										
Total	47656	49848	46012	46744	44998	50115	50504	50239	49452	1,006
Large	26	27	28	29	20	18	23	34	36	1,056
Medium	3143	2915	2595	2533	2501	2383	2298	2281	2134	0,938
Small	44487	46906	43389	44182	42477	47714	48183	47924	47282	1,010
The number of employed workers at enterprises, thousands of people										
Total	712,0	687,2	628,9	597,6	614,3	593,0	581,1	566,7	534,7	0,953
Large	44,5	38,8	46,6	48,3	38,1	27,5	32,8	43,1	38,6	0,977
Medium	447,1	409,7	364,1	346	359	335,8	323,8	301,7	277,7	0,924
Small	220,4	238,7	218,2	203,3	217,2	229,7	224,5	221,9	218,4	0,998
The number of employees at enterprises, thousands of people										
Total	697,8	652,1	596,0	569,4	583,4	558,1	545,7	535,0	506,5	0,948
Large	44,5	38,8	46,6	48,3	38,1	27,5	32,8	43,1	38,6	0,977
Medium	446,7	409,4	363,8	345,7	358,7	335,5	323,5	301,4	277,4	0,924
Small	206,6	203,9	185,6	175,4	186,6	195,1	189,4	190,5	190,5	0,987
The number of employees at one enterprise, persons										
Total	15	13	13	12	13	11	11	11	10	0,942
Large	1712	1437	1664	1666	1905	1528	1426	1268	1072	0,925
Medium	142	140	140	136	143	141	141	132	130	0,985
Small	5	4	4	4	4	4	4	4	4	0,975
The average monthly salary of one employee, UAH										
Total	1972	2167	2419	3112	3870	5380	6909	8134	8808	1,283
Large	2661	2996	3405	4532	5957	8078	10147	13123	14676	1,329
Medium	2105	2319	2605	3379	4321	6111	7734	8812	9695	1,290
Small	1537	1704	1807	2195	2577	3742	4940	5934	6329	1,266

* the initial data for the calculation of the indices of development, effectiveness and efficiency
Source: calculated according to the data of the State Statistics Service of Ukraine

As evidenced by the data in the Table 1, during 2012-2020, there was an increase in the number of large and small agricultural, forestry and fishery enterprises, while the number of medium-sized enterprises was decreasing. During the studied period, the number of employed and hired workers (employees) decreased in all enterprises,

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regardless of their size. There was also a decrease in the number of employees at one enterprise. A positive factor is that the average monthly salary of 1 employee in large, medium and small enterprises grew annually. Considering the volume of the produced products (goods, services) in monetary terms, its amount during 2012-2020 was growing in all sizes of agricultural, forestry and fishing enterprises (Table 2).

Table 2. The Dynamics of Indicators of Economic and Investment Activity of Large, Medium and Small Enterprises of Agriculture, Forestry and Fisheries*

Indicator	Year									Average Annual Growth Rate
	2012	2013	2014	2015	2016	2017	2018	2019	2020	
The production costs (on goods, services), mln UAH										
Total	134318	157671	189916	274982	326545	388919	481540	508634	512270	1,250
Large	16455	18517	29736	44926	43164	43457	66030	84884	70174	1,273
Medium	90018	94316	108163	147442	179995	219434	259153	253375	255568	1,190
Small	27845	44838	52016	82614	103385	126027	156357	170375	186528	1,373
The production volume (for goods, services) of enterprises, mln UAH										
Total	175742	191655	280927	409113	465003	511163	600955	620551	660951	1,247
Large	23374	24724	41015	68731	57660	46424	63282,8	80991,8	90514,9	1,253
Medium	111772	106560	144677	213148	245522	269043	312525,7	312553,7	316443,3	1,189
Small	40596	60371	95234	127234	161821	195697	225146,4	227005,8	253992,3	1,357
The added value based on enterprise production costs, mln UAH										
Total	74407	69670	125464	183874	186933	195448	201938	205442	263617	1,235
Large	10491	9893	15683	32362	19815	8781	5913	9900	36568	1,231
Medium	43007	34208	59846	94144	96644	91921	105103	115518	121478	1,189
Small	20908	25569	49935	57369	70474	94746	90922	80024	105572	1,310
The capital (fixed assets), mln UAH										
Total	76568	94870	98790	119530	167230	211262	266300	232354	258413	1,225
Large	7664	8051	8075	11484	11131	12848	24658	31425	32689	1,273
Medium	39812	45512	47358	55346	76950	90729	108484	98452	107861	1,181
Small	29093	30387	32226	39503	58283	80560	99132	102477	117863	1,263
The equity, mln UAH										
Total	136431	156820	163932	275304	369371	436338	482979	355379	612251	1,284
Large	14636,6	21631	25534,4	59624,2	61377,7	64820,1	63650	91593	99557	1,376
Medium	69024	81565	82764,8	121674	176600	209447	251174	245099	271265	1,256
Small	39785,7	53624	55632,5	94006,1	131393	162070	168154	18687	241429	1,351
The volume of the products sold, mln UAH										
Total	162611	161130	213930	362310	403646	454380	525097	556326	605483	1,245
Large	19473,2	23441	31584,6	61214,8	53033,8	38879,9	54757,9	74132	78052,1	1,260
Medium	93979,4	88851	117041	183214	206594	237987	272210	275954	289400	1,206
Small	49158,5	48838	65303,9	117881	144018	177513	198129	206240	238031	1,301

* the initial data for the calculation of the indices of development, effectiveness and efficiency
Source: calculated according to the data of the State Statistics Service of Ukraine

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Accordingly, there was also an annual increase in production costs (goods, services) and added value based on enterprise production costs, which is fully justified. It is worth noting that the annual increase in the volume of sold products in the monetary equivalent ensured the increase of profitability by enterprises. During 2012-2020, there was an increase in capital (fixed assets) and equity, which contributed to increasing the creditworthiness of enterprises of different sizes.

The financial indicators of the activity of enterprises play an important role in the activity of enterprises of any size (Table 3).

Table 3. The Dynamics of Indicators of Financial Activity in Large, Medium and Small Enterprises of Agriculture, Forestry and Fisheries*

Indicator	Year									Average Annual Growth Rate
	2012	2013	2014	2015	2016	2017	2018	2019	2020	
The financial result of enterprises, mln UAH										
Total	26993	15147	21677,4	103138	91109,5	69344,1	71478,5	94041,4	82230,6	1,204
Large	5304,7	3837	5223	24786	12085	8063	11191	5054	8794	1,088
Medium	13813	7050	9522	44190	43185	35738	38792	69019	40610	1,197
Small	7875	4261	6932	34162	35840	25543	21496	19969	32826	1,269
The net profit (loss) of enterprises, mln UAH										
Total	26718	14985	21481,3	102849	90613,2	68858,5	71002,6	93255,4	81618,5	1,205
Large	5305	3819	5223	24786	12085	8063	11218	5026	8678	1,085
Medium	13592	6945	9371	43968	42818	35426	38482	68464	40321	1,199
Small	7821	4221	6887	34096	35711	25370	21303	19766	32620	1,269
The level of profitability (unprofitability) of the operational activities of enterprises, %										
Total	21,74	11,28	20,58	41,65	32,43	22,38	18,26	16,97	18,10	0,970
Large	29,7	20,0	23,8	54,3	29,3	24,6	22,9	8,3	16,0	0,902
Medium	19,6	8,4	20,8	37,8	30,4	20,8	17,1	26,2	18,5	0,990
Small	22,7	12,9	18,5	41,4	37,2	24,1	18,6	13,4	19,8	0,978
The level of profitability (loss) of all enterprise activities, %										
Total	15,6	8,0	8,9	29,5	24,7	16,0	13,7	13,1	12,8	0,968
Large	24,6	15,3	14,9	45,4	24,7	20,5	21,2	6,1	9,7	0,857
Medium	13,1	6,3	6,9	23,4	21,6	15,4	14,3	23,6	13,9	1,009
Small	16,7	8,1	9,8	32,4	30,0	15,6	10,9	9,6	14,8	0,980

* the initial data for the calculation of the indices of development, effectiveness and efficiency
Source: calculated according to the data of the State Statistics Service of Ukraine

According Table 3, in general, during 2012-2020, large, medium and small enterprises received profit. However, there was an unstable trend over the years, that is, the amount of profit increased in one year and decreased in another. Regarding the level of profitability of the operational activities of enterprises, in 2020, compared to 2012, it decreased at enterprises of all sizes. A similar situation is observed in terms of the indicator of the level of profitability of all enterprise activities. This indicator shows a decrease in large and small-sized enterprises and an

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increase in medium-sized enterprises.

Thus, despite the general profitability of agricultural, forestry and fishery enterprises of different sizes, it is advisable for large and small enterprises to review in detail and reduce expenditure items, which will lead to an increase in the level of profitability in the future.

4. Research methodology

In the course of the study, an integral assessment of large, medium and small enterprises in agriculture, forestry and fisheries has been carried out in terms of their competitiveness and prospects for future development, with further improvement of the management decision-making process to outline the clear competitive advantages of each group of enterprises, adjusting measures to achieve the goals of the Strategy the Food Security of Ukraine. The comprehensive (integral) assessment has been carried out according to the algorithm presented below, taking into account the recommendations outlined in the order of the State Statistics Committee of Ukraine No. 114 dated 04/15/2003 on the approval of the methodology for calculating integral regional indices of economic development (2003) regarding the specifics of calculating integral regional indices:

1. Defining a system of indicators for evaluating the activity of enterprises of different sizes in three separate blocks (directions) - development, effectiveness, efficiency, i.e. in a three-dimensional plane.

Block 1 *Development* includes the following indicators: the number of employed workers, thousands of people; the number of employees (hired workers), thousands of people; the cost of capital, million UAH; the volume of production (goods, services) of enterprises, million UAH; the volume of the products sold (goods, services) of enterprises, million UAH; the added value, million UAH; the net profit, million UAH; the cost of the manufactured products per UAH 1 of expenses, UAH; the cost of the manufactured products per UAH 1 of capital, UAH; the cost of the manufactured products per 1 employee, thousand UAH; the cost of the sold products per UAH 1 of expenses, UAH; the cost of the sold products per UAH 1 of capital, UAH; the cost of the sold products per 1 employee, thousand UAH; the added value per UAH 1 of expenses, UAH; the added value per UAH 1 of capital, UAH; the added value per 1 employee, thousand UAH; the net profit of enterprises per UAH 1 of expenses, UAH; the net profit of enterprises per 1 employee, thousand UAH; the profitability level, %; the average monthly salary of 1 employee, UAH.

Blok 2 *Effectiveness*. The effectiveness indicators include: the cost of the manufactured products per UAH 1 of expenses, UAH; the cost of the manufactured products per UAH 1 of capital, UAH; the cost of the manufactured products per 1 employee, thousand UAH; the cost of the sold products per UAH 1 of expenses, UAH; the cost of the sold products per UAH 1 of capital, UAH; the cost of the sold products per 1 employee, thousand UAH; the added value per UAH 1 of expenses, UAH; the added value per UAH 1 of capital, UAH; the added value per 1 employee, thousand UAH.

Block 3 *Efficiency*. The efficiency indicators include: the net profit of enterprises per UAH 1 of expenses, UAH; the net profit of enterprises per 1 employee, thousand UAH; the level of profitability from all activities, %; the level of profitability of sales, %; the return on equity, %; the average monthly salary of 1 employee, UAH.

2. Calculating the determined partial indicators for the studied time period (2012-2020).
3. Assessing the development according to the average rates of change of the selected indicators from 2012 to 2020.

The development index is the average annual growth rate of each of the selected indicators for 2012-2020, respectively, for large, medium and small enterprises (formula (1)):

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$$I_i = \sqrt[n-1]{\frac{x_{i_n}}{x_{i_1}}}\ , \tag{1}$$

where I_i – the development index for the i-th indicator;
i – the indicator's number;
n – the number of years;
x_{i1} – the value of the i-th indicator for 2012;
x_{in} – the value of the i-th indicator for 2020.

4. Normalizing the average indicators.
The effectiveness and efficiency indices are calculated according to the following algorithm:
4.1. The selected indicators are calculated on average for 2012-2020 (formula (2)):

$$\bar{\mathrm{x}}_{\mathrm{i}} = \frac{\mathrm{Xi1}+\ldots+\mathrm{Xi}n}{\mathrm{n}}\ , \tag{2}$$

where $\bar{\mathrm{x}}_{\mathrm{i}}$ – the arithmetic mean value of the i-th indicator;
x_{i1} – the value of the i-th indicator for 2012;
x_{in} – the value of the i-th indicator for 2020.

4.2. To compare and to make comparison, it is necessary to carry out preliminary normalization of the selected indicators. The main task of normalization (rating/standardization) is to bring the indicators to the same base (dimensionless values) on the condition that the ratio between them is preserved. It is calculated by the ratio of each indicator of the economic entity to the average for Ukraine by formula (3):

$$Ni = \frac{\mathrm{Xij}}{\bar{\mathrm{x}}_{\mathrm{i}}}\ , \tag{3}$$

where N_i – the normalized i-th indicator;
x_{ij} – the absolute value of the i-th indicator of the j-th business entity;
$\overline{x_i}$ – the arithmetic mean value of the i-th indicator.

5. Calculating the integral indices for each block (*development, effectiveness, efficiency*) and the determination of the integral assessment of the activities of large, medium and small enterprises.

The integral index of the development is calculated according to the formula (4):

$$Id = \frac{\sum_{i=1}^{m} Ii}{m}\ , \tag{4}$$

where I_d – the integral index of the development of the business entities;
I_i – development index for the i-th indicator;
m – the number of indicators.

The integral indices of the effectiveness and efficiency are calculated according to the formula (5):

$$Ir\ (Ie) = \sum_{i=1}^{m} Ni\,, \tag{5}$$

where I_r (I_e) – the integral index of the effectiveness (efficiency) of the business entities;
N_i – the normalized i-th indicator;
m – the number of indicators.

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6. Carrying out a rating assessment of the activities of large, medium and small enterprises.

7. Analysing results (actual state of enterprises) of the rating assessment.

8. Developing management decisions in accordance with the obtained results, outlining strategic directions for the further development of business entities, determining promising business areas.

3. Research findings

In accordance with the given methodology for calculating integral indices, the first stage of our research is the calculation of indices of development, effectiveness and efficiency of large, medium and small enterprises in agriculture, forestry and fisheries according to the selected indicators (Table 4).

Table 4. The Activity Indicators of Large, Medium and Small Enterprises of Agriculture, Forestry and Fisheries and Their Index Valuesbto Form Evaluation Directions: Development, Effectiveness, Efficiency*

Indicator	Year									Average Value	Growth Rate
	2012	2013	2014	2015	2016	2017	2018	2019	2020		
1	2	3	4	5	6	7	8	9	10	11	12
The cost of the manufactured products per UAH 1 of expenses, UAH											
Total	1,31	1,22	1,48	1,49	1,42	1,31	1,25	1,22	1,29	1,33	0,998
Large	1,42	1,34	1,38	1,53	1,34	1,07	0,96	0,95	1,29	1,25	0,984
Medium	1,24	1,13	1,34	1,45	1,36	1,23	1,21	1,23	1,24	1,27	1,000
Small	1,46	1,35	1,83	1,54	1,57	1,55	1,44	1,33	1,36	1,49	0,989
The cost of the manufactured products per UAH 1 of capital, UAH											
Total	2,30	2,02	2,84	3,42	2,78	2,42	2,26	2,67	2,56	2,59	1,018
Large	3,05	3,07	5,08	5,99	5,18	3,61	2,57	2,58	2,77	3,77	0,984
Medium	2,81	2,34	3,05	3,85	3,19	2,97	2,88	3,17	2,93	3,02	1,007
Small	1,40	1,99	2,96	3,22	2,78	2,43	2,27	2,22	2,15	2,38	1,075
The cost of the manufactured products per 1 employee, thousand UAH											
Total	246,8	278,9	446,7	684,6	757,0	862,0	1034,2	1095,0	1236,1	737,92	1,308
Large	525,2	637,2	880,2	1423,0	1513,4	1688,1	1929,4	1879,2	2344,9	1424,51	1,283
Medium	250,0	260,1	397,4	616,0	683,9	801,2	965,2	1036,0	1139,5	683,25	1,288
Small	184,2	252,9	436,5	625,8	745,0	852,0	1002,9	1023,0	1163,0	698,36	1,360
The cost of the sold products per UAH 1 of expenses, UAH											
Total	1,21	1,02	1,13	1,32	1,24	1,17	1,09	1,09	1,18	1,16	0,996
Large	1,18	1,27	1,06	1,36	1,23	0,89	0,83	0,87	1,11	1,09	0,990
Medium	1,04	0,94	1,08	1,24	1,15	1,08	1,05	1,09	1,13	1,09	1,014
Small	1,77	1,09	1,26	1,43	1,39	1,41	1,27	1,21	1,28	1,34	0,947

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Continuation of Table 4

1	2	3	4	5	6	7	8	9	10	11	12
The cost of the sold products per UAH 1 of capital, UAH											
Total	2,12	1,70	2,17	3,03	2,41	2,15	1,97	2,39	2,34	2,25	1,017
Large	2,54	2,91	3,91	5,33	4,76	3,03	2,22	2,36	2,39	3,27	0,990
Medium	2,36	1,95	2,47	3,31	2,68	2,62	2,51	2,80	2,68	2,60	1,022
Small	1,69	1,61	2,03	2,98	2,47	2,20	2,00	2,01	2,02	2,11	1,030
The cost of the sold products per 1 employee, thousand UAH											
Total	228,4	234,5	340,2	606,3	657,1	766,2	903,6	981,7	1132,4	650,04	1,306
Large	437,6	604,1	677,8	1267,4	1392,0	1413,8	1669,4	1720,0	2022,1	1244,91	1,291
Medium	210,2	216,9	321,5	529,5	575,5	708,7	840,7	914,7	1042,1	595,52	1,306
Small	223,0	204,6	299,3	579,8	663,1	772,8	882,5	929,4	1089,9	627,17	1,303
The added value per UAH 1 of expenses, UAH											
Total	0,55	0,44	0,66	0,67	0,57	0,50	0,42	0,40	0,51	0,53	0,988
Large	0,64	0,53	0,53	0,72	0,46	0,20	0,09	0,12	0,52	0,42	0,967
Medium	0,48	0,36	0,55	0,64	0,54	0,42	0,41	0,46	0,48	0,48	0,999
Small	0,75	0,57	0,96	0,69	0,68	0,75	0,58	0,47	0,57	0,67	0,954
The added value per UAH 1 of capital, UAH											
Total	0,97	0,73	1,27	1,54	1,12	0,93	0,76	0,88	1,02	1,02	1,008
Large	1,37	1,23	1,94	2,82	1,78	0,68	0,24	0,32	1,12	1,28	0,967
Medium	1,08	0,75	1,26	1,70	1,26	1,01	0,97	1,17	1,13	1,15	1,007
Small	0,72	0,84	1,55	1,45	1,21	1,18	0,92	0,78	0,90	1,06	1,037
The added value per 1 employee, thousand UAH											
Total	104,5	101,4	199,5	307,7	304,3	329,6	347,5	362,5	493,0	283,34	1,295
Large	235,8	255,0	336,5	670,0	520,1	319,3	180,3	229,7	947,4	410,45	1,261
Medium	96,2	83,5	164,4	272,1	269,2	273,7	324,6	382,9	437,4	256,00	1,287
Small	94,9	107,1	228,8	282,2	324,5	412,5	405,0	360,6	483,4	299,89	1,312
The net profit of enterprises per UAH 1 of expenses, UAH											
Total	0,20	0,10	0,11	0,37	0,28	0,18	0,15	0,18	0,16	0,19	0,964
Large	0,32	0,21	0,18	0,55	0,28	0,19	0,17	0,06	0,12	0,23	0,852
Medium	0,15	0,07	0,09	0,30	0,24	0,16	0,15	0,27	0,16	0,18	1,007
Small	0,28	0,09	0,13	0,41	0,35	0,20	0,14	0,12	0,17	0,21	0,924
The net profit of enterprises per 1 employee, thousand UAH											
Total	38,3	23,0	36,0	180,6	155,3	123,4	130,1	174,3	161,1	113,58	1,271
Large	119,2	98,4	112,1	513,2	317,2	293,2	342,0	116,6	224,8	237,41	1,112
Medium	30,4	17,0	25,8	127,2	119,4	105,6	119,0	227,2	145,4	101,86	1,298

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Continuation of Table 4

1	2	3	4	5	6	7	8	9	10	11	12
Small	37,9	20,7	37,1	194,4	191,4	130,0	112,5	103,8	171,2	110,99	1,286
The level of profitability of operating activities, %											
Total	21,7	11,3	20,6	41,7	32,4	22,4	18,3	17,0	18,1	22,60	0,970
Large	24,6	15,3	14,9	45,4	24,7	20,5	21,2	8,3	16,0	21,21	0,931
Medium	13,1	6,3	6,9	23,4	21,6	15,4	14,3	26,2	18,5	16,19	1,059
Small	16,7	8,1	9,8	32,4	30,0	15,6	10,9	13,4	19,8	17,41	1,029
The level of profitability of sales, %											
Total	16,4	9,3	10,0	28,4	22,4	15,2	13,5	16,8	13,5	16,17	0,968
Large	27,2	16,3	16,5	40,5	22,8	20,7	20,5	6,8	11,1	20,27	0,861
Medium	14,5	7,8	8,0	24,0	20,7	14,9	14,1	24,8	13,9	15,86	0,994
Small	15,9	8,6	10,5	28,9	24,8	14,3	10,8	9,6	13,7	15,24	0,975
The average monthly salary of 1 employee, UAH											
Total	1972	2167	2419	3112	3870	5380	6909	8134	8808	4752,40	1,283
Large	2661	2996	3405	4532	5957	8078	10147	13123	14676	7286,08	1,329
Medium	2105	2319	2605	3379	4321	6111	7734	8812	9695	5231,05	1,290
Small	1537	1704	1807	2195	2577	3742	4940	5934	6329	3418,33	1,266
The level of return on equity, %											
Total	19,6	9,56	13,1	37,36	24,53	15,78	14,7	26,24	13,33	19,35	0,938
Large	36,2	17,7	20,46	41,57	19,69	12,44	17,62	5,488	8,716	19,99	0,789
Medium	19,7	8,52	11,32	36,14	24,25	16,91	15,32	27,93	14,86	19,44	0,954
Small	19,7	7,87	12,38	36,27	27,18	15,65	12,67	105,8	13,51	27,88	0,939

* the initial data for the calculation of the indices of development, effectiveness and efficiency
Source: calculated according to the data of the State Statistics Service of Ukraine

As the data in Table 4 show, the cost of the manufactured products per UAH 1 of expenses and the cost of the sold products per UAH 1 of expenses during 2012-2020 decreased in large and small enterprises and remained unchanged in medium ones, whereas the cost of the manufactured products per UAH 1 of capital and the cost of the sold products per UAH 1 of capital decreased only in large enterprises, while the cost of the manufactured products per 1 employee and the cost of the sold products per UAH 1 employee increased in all sizes of enterprises. The added value per 1 employee increased in large, medium and small enterprises, whereas the added value per 1 hryvnia of expenses decreased. There was also a decrease in the added value per UAH 1 of capital only in large enterprises. The net profit per UAH 1 of costs decreased in large and small enterprises, while it increased in medium-sized ones. During 2012-2020, the net profit per 1 employee increased in enterprises of all sizes. It is worth noting that during the studied period, the level of profitability of sales and equity decreased in large, medium and small enterprises.

Thus, all agricultural, forestry and fishing enterprises, regardless of their size, should pay considerable attention to increasing the level of profitability of sales and equity capital.

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Table 5 shows the results of the calculation of the integral index of development of large, medium and small enterprises of agriculture, forestry and fisheries.

Table 5. Calculation of the Integral Index of Development of Large, Medium and Small Enterprises of Agriculture, Forestry and Fisheries

Indicators of the development index	Indicator's number	Enterprise size		
		Large	Medium	Small
The number of employed workers	1	1,056	0,938	1,010
The number of employees (hired workers)	2	0,977	0,924	0,987
The cost of capital	3	1,273	1,181	1,263
The volume of production (goods, services) of enterprises	4	1,253	1,189	1,357
The volume of the sold products (goods, services) of enterprises	5	1,260	1,206	1,301
The added value	6	1,231	1,189	1,310
The net profit	7	1,085	1,199	1,269
The cost of the manufactured products per UAH 1 of expenses	8	0,984	1,000	0,989
The cost of the manufactured products per UAH 1 of capital	9	0,984	1,007	1,075
The cost of the manufactured products per 1 employee	10	1,283	1,288	1,360
The cost of the sold products per UAH 1 of expenses	11	0,990	1,014	0,947
The cost of the sold products per UAH 1 of capital	12	0,990	1,022	1,030
The cost of the sold products per 1 employee	13	1,291	1,306	1,303
The added value per UAH 1 of expenses	14	0,967	0,999	0,954
The added value per UAH 1 of capital	15	0,967	1,007	1,037
The added value per 1 employee	16	1,261	1,287	1,312
The net profit of enterprises per UAH 1 of expenses	17	0,852	1,007	0,924
The net profit of enterprises per 1 employee	18	1,112	1,298	1,286
The level of profitability of operational activity	19	0,931	1,059	1,029
The average monthly salary of 1 employee	20	1,329	1,290	1,266
The integral index of development	-	**1,094**	**1,113**	**1,140**

Source: calculated by the authors

According to the data in Table 5, the integrated development index for all types of enterprises is more than 1. It is the highest in small enterprises and is 1.140, slightly lower in medium-sized enterprises – 1.113 and large enterprises – 1.094. That value of the indicator demonstrates significant success in the development of both small and large and medium-sized enterprises.

The next stage of our research is the calculation of the integral index of productivity of agricultural, forestry and fishery enterprises of different sizes (Table 6).

The data in Table 6 show that the integral effectiveness index is above unity in large (1.292) and small (1.040) enterprises. Such a value of the indicator testifies to the achievement of the set goals by these enterprises and the full performance of their functions. However, it is worth noting that in medium-sized enterprises, the integrated

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effectiveness index is below 1, which indicates the need to review the outlined goals for their attainability and make new management decisions.

Table 6. Calculation of the Integrated Effectiveness Index of Large, Medium and Small Enterprises of Agricultural, Forestry and Fisheries

The size of the enterprise	Indicator									The integral effectiveness index
	The cost of the manufactured products per UAH 1 of expenses	The cost of the manufactured products per UAH 1 of capital	The cost of the manufactured products per 1 employee	The cost of the sold products per UAH 1 of expenses	The cost of the sold products per UAH 1 of capital	The cost of the sold products per 1 employee	The added value per UAH 1 of expenses	The added value per UAH 1 of capital	The added value per 1 employee	
	1	2	3	4	5	6	7	8	9	
The value of the effectiveness index										
Total	1,33	2,59	737,92	1,16	2,25	650,04	0,53	1,02	283,34	-
Large	1,25	3,77	1424,51	1,09	3,27	1244,91	0,42	1,28	410,45	-
Medium	1,27	3,02	683,25	1,09	2,60	595,52	0,48	1,15	256,00	-
Small	1,49	2,38	698,36	1,34	2,11	627,17	0,67	1,06	299,89	-
The normalized values (relative to the average mean)										
Large	0,940	1,457	1,930	0,939	1,451	1,915	0,804	1,247	1,449	**1,292**
Medium	0,953	1,169	0,926	0,939	1,153	0,916	0,913	1,121	0,904	**0,994**
Small	1,120	0,920	0,946	1,157	0,937	0,965	1,272	1,035	1,058	**1,040**

Source: calculated by the authors

The efficiency indicator plays a leading role in the activity of any enterprise. Table 7 shows the results of calculating the integral efficiency index of large, medium and small enterprises of agriculture, forestry and fishery.

According to the data in Table 7, the integral efficiency indicator is higher than 1 only in large-sized enterprises, which indicates their efficient operation, rational distribution and cost-effectiveness. In medium and small enterprises, this indicator is below 1 and is 0.928 and 0.965 respectively.

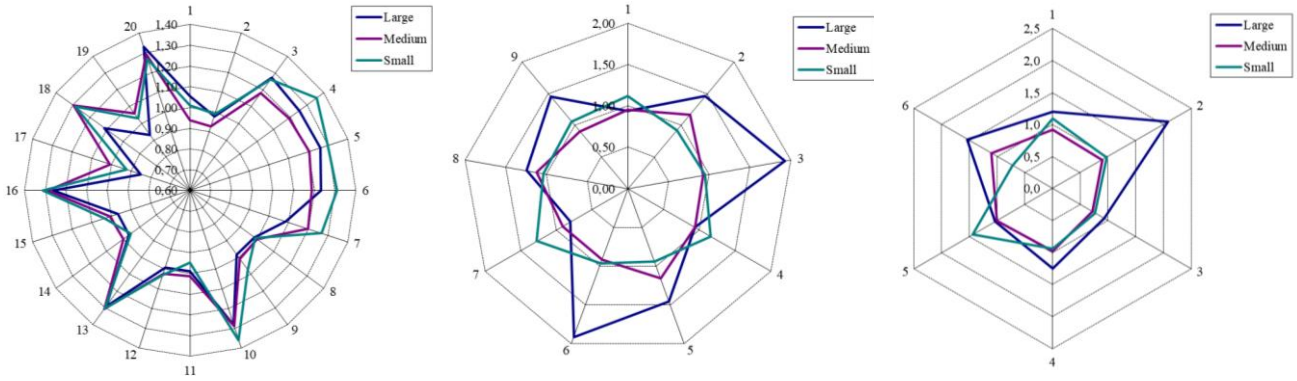
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Table 7. Calculation of the Integral Efficiency Index of Large, Medium and Small Enterprises of Agriculture, Forestry and Fisheries

The size of the enterprise	Indicator						The integral efficiency index
	The net profit of enterprises per UAH 1 of expenses	The net profit of enterprises per 1 employee	The level of profitability from all activities	The level of profitability of sales	The return on equity	The average monthly salary of 1 employee	
	1	2	3	4	5	6	
The value of the efficiency index							
Total	0,192	113,58	22,60	16,2	19,4	4752	-
Large	0,230	237,41	21,21	20,3	20,0	7286	-
Medium	0,176	101,86	16,19	15,9	19,4	5231	-
Small	0,210	110,99	17,41	15,2	27,9	3418	-
The normalized values (relative to the average mean)							
Large	1,202	2,090	0,939	1,254	1,033	1,533	**1,293**
Medium	0,919	0,897	0,716	0,981	1,004	1,101	**0,928**
Small	1,097	0,977	0,770	0,942	1,441	0,719	**0,965**

Source: calculated by the authors

Schematically, the indices of development, effectiveness and efficiency of large, medium, and small enterprises in agriculture, forestry, and fisheries according to the specified indicators are shown in Fig. 1.



a) development indices b) effectiveness indices c) efficiency indices

Fig. 1. Indices of Development, Effectiveness and Efficiency of Large, Medium and Small Enterprises of Agriculture, Forestry and Fisheries in Accordance with the Specified indicators
Source: developed by the authors

The summarized (generalized) data on the value of integral indices of development, effectiveness and efficiency of large, medium and small enterprises in agriculture, forestry and fisheries are shown in Fig. 2.

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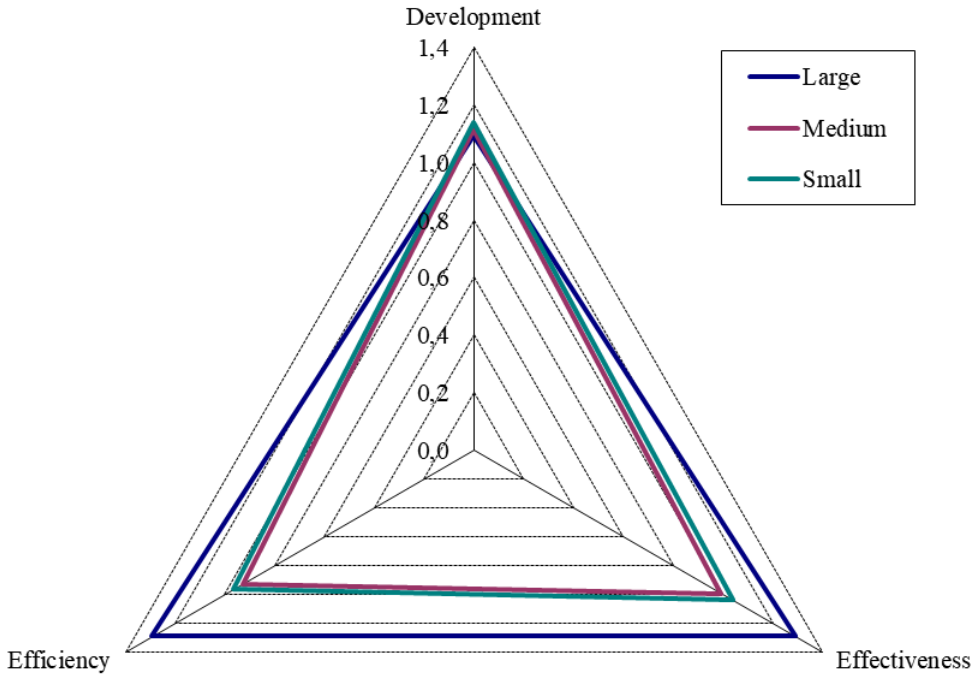


Fig. 2. The Integral Indices of Development, Effectiveness and Efficiency of Large, Medium and Small Enterprises in Agriculture, Forestry and Fisheries
Source: developed by the authors

Thus, enterprises of all sizes have significant internal potential for development. However, according to the indicator of the integral index of efficiency, medium and small enterprises are somewhat inferior to large ones. In connection with the influence of external and internal environment factors, competitive struggle on the market, it will usually be easier for large enterprises to survive and maintain their positions, while the most vulnerable in the current conditions of disruption of macroeconomic stability are medium and small business entities, which traditionally are more exposed to risks and do not have a sufficient "safety cushion". The factors that caused difficulties in their development are related to the modern global challenges: significant financial losses, forced reduction of staff, increased risk of bankruptcy, etc. However, taking into account the important structure-forming role of medium and small entrepreneurship for the modern economy of Ukraine, comprehensive support for its development is a strategic task of the country's leadership not only for the restoration of macroeconomic, but also political and social stability of the country.

Conclusions

The integrated assessment of the agricultural enterprises has novelty and practical value. This approach can be used to make management decisions regarding the substantiation of the prospective development of all enterprises, regardless of their size, as those that demonstrate internal potential. The existing internal potential will provide an opportunity to ensure the formation of competitive agrarian entrepreneurship for the recovery of Ukraine's economy in the post-war period.

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According to the results of the conducted research, one of the key strategic factors of the stable development of the economy of Ukraine and the achievement of the appropriate level and quality of life of the population is the formation of modern and effective entrepreneurial activity. According to the results of the analysis of the development of large, medium and small enterprises of agriculture, forestry and fisheries in recent years, it can be seen that the effectiveness and efficiency of medium and small enterprises is somewhat worse than that of large ones. Such a situation presupposes the solution of the following problems: improvement of the legislative and regulatory framework regulating the activities of enterprises; reducing inflation; cessation of devaluation of the national currency; overcoming corruption; strengthening of financial and credit provision of entrepreneurship; simplification of rules and procedures for their creation, etc. In addition, the recovery of the economy and its gradual growth should be based on the development of the high-tech business sector and increasing its competitiveness on the Ukrainian and European markets. The priority directions for the country's leadership should be the stimulation of innovative activity of the entrepreneurial sector, the formation of a favorable legal environment and innovative investment climate, the introduction of European approaches to the development of small and medium-sized businesses in Ukraine. The implementation of this policy should be carried out purposefully, systematically and consistently in the complex of the national innovation system.

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THE TRUST DILEMMA - CONCLUSIONS FROM A POPULAR TV SHOW*

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Abstract. Trust in co-workers and business partners is an essential factor influencing the effectiveness of the production processes of goods and services and cooperation in the market. In this paper, we analyse trust using data from a natural experiment - the Polish edition of the TV game show "Who Wants to Be a Millionaire?". We verify differences in trust between women and men, between urban and rural residents, and the case of low- and high-stake games. Trust was analysed in two ways—trust in a group of strangers and trust in a friend selected earlier. The test for two populations' proportions is conducted. Study shows that women have greater trust than men in the cases of both types of trust. This result is different from those reported in most experimental studies. Women are also more trusting than men in the case of low-stake games, while in the case of high-stake games, the gender difference is blurred. To our best knowledge, this is the first study to use data from a TV show to analyse trust so far.

Keywords: natural experiment; trust; test for two populations' proportions; gender difference

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1. Introduction

Many attempts have been made in the literature to measure and indicate the determinants of trust based on questionnaire surveys or economic experiments (Alesina & La Ferrara, 2002; Ermisch et al., 2009; Naef & Schupp, 2009). However, both approaches have significant limitations. First of all, the results of the questionnaire surveys provide information only about the declared trust, which obviously may differ significantly from what is observed in everyday economic situations (e.g., Sapienza et al., 2013).

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It seems that the solution to this problem is, therefore, experimental research in which a selected group of people is asked to take part in a game or series of games, most often partially cooperative, the aim of which is the broadly understood "victory" that gives the participants a certain reward. Meanwhile, the specific behaviour observed during the game is subject to an analysis of the trust they show (Houser et al., 2010). The collected material is then statistically analysed to find specific demographic or cultural determinants of trust (e.g. Ben-Ner, Halldorsson, 2010). However, the general problem with experimental studies (e.g., a game of trust, a gift-exchange game) is that it is difficult to motivate individuals to behave according to their views because the payments offered are usually contractual or symbolic (Ermisch et al., 2009).

Therefore, it seems that the best solution is an experiment aimed at observing people in natural conditions. In the present study, we focus on the analysis of trust based on the Polish version of the popular TV show "Who Wants to Be a Millionaire?" (WWTBAM). The game show is an excellent example of a natural economic experiment. As the participants may win or lose real money, it can be assumed that their decisions represent a good approximation of their economic preferences. Furthermore, the game show provides substantial cash prizes, which could not be ensured in laboratory settings.

Although there is a lot of research based on various TV shows, the studies mainly deal with risk propensity (Hartley et al., 2014; Daghofer, 2007). The idea of using data from WWTBAM to analyse trust is original. Our study focuses mainly on analysing gender differences in trust (Holmes, 2005). Van den Akker et al. (2020) conducted a meta-analytic review of the literature on sex differences in trust games, which showed that men were more trusting than women. This is the dominant finding of most studies on gender differences in trust. In the present study, we check whether the conclusions from the natural experiment, the WWTBAM game show, are similar. Additionally, we analyse two types of trust—in a friend and a group of strangers—as well as differences in trust between rural and urban citizens and in the case of high- and low-stake games.

The next chapter contains a literature review and the motivation for this study. In section three, we familiarise the reader with the rules of the WWTBAM TV game show. In section four, we discuss the database used. In the fifth section, we present the quantitative method used in the present study. The sixth part is devoted to the presentation of the results of the calculation. The paper ends with a discussion of the results and a summary.

2. Literature Review

The theory of economic growth mentions social capital as one of the vital growth factors, defined as the strength of interpersonal relations in a given economy (Whiteley, 2000; Chou, 2006; Claridge, 2018, Thompson, 2018). Thanks to those relations, the production process is more effective due to the natural cooperation between economic entities (Fedderke et al., 1999; Guzhavina, 2020). With the trust between entrepreneurs, production costs are reduced, usually because protection against the dishonesty of business partners is no longer needed. In an economy where everyone trusts everyone, people work together more effectively (Zhang, Xin, 2019; Choi, Storr, 2020, 2022).

The problem, however, appears in the growth econometrics - it is hard to find a sufficiently good measure of social capital (Durlauf, 2002; Durlauf et al., 2005; Gannon & Roberts, 2020). Despite many attempts of modeling economic growth with a use of such variables as voter turnout, share of blood donors, crime rates etc. (Sztaudynger, 2003) as social capital approximations, it seems that the most frequently used measure is the variable denoted in the literature as "trust", proposed by Zack and Knack (2001). This variable is the share of positive responses to the survey question, "is it true that most people can be trusted?". Values of this variable range from 4% (Colombia) to 78% (Norway) in individual countries. Econometric studies show that this is one of the best approximations of social capital (Beugelsdijk et al., 2004; Bjørnskov, 2007).

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Of course, it is still clear that the estimates of "trust" could be improved. To do this, however, it is necessary to estimate better the level of trust in society. It is clear that the percentage of positive answers to the question "is it true that most people can be trusted?" measures only the declarative level of trust, not necessarily the real one. You can also find examples of similar survey trust measures in the literature, such as "the lollipop index". This index represents the share of positive responses to the question, "would you be willing to let your 7-year-old child go, with money in a hand, to a store outside your area of view to buy a lollipop?" and, according to experts, it measures the relative sense of security of citizens in the neighbourhood in which they are currently located, which of course is also related to the trust of the respondents to the people around them. This example, however, also measures only declarative trust.

To make a reliable measurement of actual trust, it is, therefore, necessary to conduct an economic experiment that places people, without the awareness of being observed, in a situation of need to trust a stranger or to trust people with specific and known socio-demographic characteristics (Karlan, 2005; Naef, Shupp 2009; Bohnet, 2010). There are also many examples of similar experiments in the literature. One of the best known is the so-called "game of trust" (Engle-Warnick & Slonim, 2006; Brülhart & Usunier, 2012; Chetty et al., 2021). In this game, one of the players receives a certain amount of funds and can "trust" and allocate some of them to the other player without any additional conditions and the requirement to repay. The second player may be trustworthy and return a certain amount of funds, multiplied accordingly, to the first player. They may also, without any penalties or reprisals, decide not to give back any money to the first player, left with more funds and thus fail the received trust. Whether granted and respected or not, this trust is the object of interest for researchers in this setup.

A lot of studies were based on this game, where not only the level of trust was examined but also differences in the degree of trust between genders, age groups, inhabitants of cities and villages, wealth, etc. (Croson & Buchan, 1999; Johansson-Stenman et al., 2005; Schwieren & Sutter, 2008; Müller & Schwieren, 2020; Zou et al., 2022). Despite many research successes in this and other experiments, the main issue should be noted. In such experiments, the financial incentives to behave following one's preferences are, for obvious reasons, either contractual (such as intangible rewards for students participating in the experiment - e.g. additional points on an exam in a given subject) or symbolic (i.e. small amounts of money). For researchers, the financial constraint is unfortunately impossible to ignore (Levitt, List, 2007). Moreover, in many cases, participants familiar with the rules of the games and with some experience in gaming (e.g. from education in the field of economic game theory) achieve better results by following their knowledge of what needs to be done to win, while in real situations they would show a higher trust and willingness to cooperate (Frank et al., 1993; Yezer et al., 1996).

Hence the obvious conclusion is that the best opportunity to observe the real trust of individual people would be a natural experiment in which, on the one hand, one could win large amounts of money and on the other - show trust or lack of trust in other people, whose role is to facilitate or make it difficult to win a given game. A great example of such an experiment is the popular game show "Who Wants to Be a Millionaire?" the rules will be presented in detail in section three.

This game show has been the object of interest of researchers: economists, sociologists and linguists. On its basis, factors determining the propensity of players to take the risk were considered (i.e. based on their willingness to answer subsequent questions, taking into account potential losses, see, among others, Johnson, Gleason (2009); the overall risk propensity was estimated based on the CRRA function (Hartley et al., 2014); cultural differences were observed in the set of questions asked to players (Hetsroni, 2005); an attempt was made to determine the optimal game strategy (Perea, Puerto, 2007). So far, however, no study has been conducted with the task to observe the trust placed by players, who have the opportunity to win massive amounts of money or leave with nothing, into a group of strangers, i.e. the audience, or in a "friend" they know, whom they invited themselves to the show.

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The aim of this study is, therefore, to examine the differences between men and women, inhabitants of villages and cities, and the high and low stakes games in the level of trust placed in the audience or a chosen friend. This is the first study using game show data to examine trust factors. The results of this study constitute another argument in the discussion that has been going on for years on the determinants of trust at the microeconomic level. Generalising the results, further research may also attempt to capture macroeconomic differences between economies in the level of trust.

3. Rules of the TV show

"Who Wants to Be a Millionaire?" (WWTBAM) is an international television game show franchise of British origin. Although it is officially known in Poland as "Millionaires", it is based entirely on the original British format. "Millionaires" was broadcast on Polish television several times in 1999–2003 and 2008–2010. In 2017, the game show was resumed using a slightly refreshed formula. Currently, it remains a top-rated program in Poland. According to estimates, the following seasons of the game show were watched by an average of 1.56–2.35 million viewers, comprising 10.83%–14.86% of the country's TV market share among all viewers.

As for the official format, candidates who pass the casting stage participate in the first part of the game based on the "Fast Fingers" qualifiers. Six players are given a closed question with four answers that must be properly lined up. The person who does it the fastest and without errors moves to the following central part of the game: "Hot Seats." During this part of the program, the player answers closed questions concerning general knowledge in various fields. There are four answers to each question, and only one of them is correct in each case. Each subsequent question is associated with an increasing amount of money. In the Hot Seats game, a maximum of 12 questions can be used, and the highest possible prize (one million Polish zlotys) is assigned to the last question.

After hearing the question in the Hot Seats part, the players have two options: answer the question by selecting one of the possible answers or quit the game and take the amount of money accumulated so far. Providing the correct answer will result in winning the amount of money assigned to the question and the continuation of the game, thereby ensuring the possibility of answering the following question to which the more excellent payout value is set. However, if the players give an incorrect answer, they automatically end the game and lose all or part of the amount of money accumulated thus far. There are two thresholds for guaranteed payouts in the game - after the second question (PLN 1,000) and after the seventh question (PLN 40,000). After exceeding them, the players will receive the amount assigned to the guaranteed threshold that has been overcome, even if they answer the following questions incorrectly. The exact values of the cash prize set to the 12 questions in the game ("Correct Answer Value") and the amount of payment received when quitting the game ("Walk Away Value") or giving the wrong answer ("Miss Answer Value") are presented in Table 1.

Table 1. The cash prize in the Millionaires (in Polish zlotys).

Question No.	Correct Answer Value	Walk Away Value	Miss Answer Value
1	500	0	0
2	1000	500	
3	2000	1000	1000
4	5000	2000	
5	10000	5000	
6	20000	10000	
7	40000	20000	
8	75000	40000	40000
9	125000	75000	
10	250000	125000	

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11	500000	250000	
12	1000000	500000	

Source: based on the regulations of the Millionaires

Additionally, to help determine the correct answer, players are given three lifelines: "50:50" (rejection of two wrong answers), "Ask the Audience" (a question is given to the audience, and the players receive detailed statistics on the frequency of each answer given by the audience), and "Phone-A-Friend" (the players are allowed to make a 30-second call to a friend). Each lifeline can be used only once per game for any question that appears in the game. This means that the players can even use up to three different lifelines in one question; however, they will not be able to use them for subsequent questions. Notably, only the "50:50" lifeline gives the players a 100% guarantee that the rejected answers will be wrong. In comparison, the other two lifelines may provide the wrong hint.

In other words, if the players decide to answer the question, they risk being eliminated from the game and losing some or all the money accumulated so far. Using an indication received from a friend on the phone or from an audience in the studio concerns the issue of trust. From the perspective of this paper, it is interesting whether the player decides to trust these suggestions and whether there are gender differences in trust.
In the next section, we present the collected database.

4. Data

The data was collected from 329 episodes of the Polish edition of WWTBAM, broadcast from December 2017 to February 2020. The data included information on 456 Hot Seat games, during which the players were asked 3,199 questions.

In WWTBAM, the issue of trust arises when players use lifelines – "Ask-the-Audience" or "Phone-A-Friend". In the first case, the player receives information about the voting results (on a percentage scale) for the possible correct answer from the studio audience. Therefore, from the player's perspective, the audience is a group of strangers consisting of individuals with various socio-demographic characteristics. The player can then trust that the answer with the highest percentage of votes is correct, choose a different solution, take another lifeline or give up another play. The player's behaviour may thus approximate generalised trust, often used as an approximation of social capital, which plays a vital role in the econometric modelling of long-run economic growth (Zak, Knack, 2001; Bjørnskov, 2012).

For the "Ask-the-Audience" lifeline, trust is represented by a binary variable. It has a value of 1 when, in a given question, the player decides to trust the audience's suggestion (regardless of whether the suggestion is correct or incorrect). It has a value of 0 if the player does not trust the audience (selects a different answer, uses another lifeline, or withdraws from the game).

In the case of the second considered lifeline ("Phone-A-Friend"), the player can have a 30-second telephone conversation with a person selected by the player before the recording. It is, therefore, a person the player knows well and trusts initially. However, during the game, the players do not always trust the friend's suggestions - despite a clear hint, there are cases of giving up the game, using another lifeline, or choosing a different answer. The case when the player answers that the friend previously pointed out may be classified as a case of trust in a friend, while other decision, such as using another lifeline, means that the player did not trust the friend enough to take the risk. Therefore, trust in a friend is also represented by a binary variable, taking the value of 1 when the player trusts the friend's suggestion. There is also a possibility that the friend may not give a clear suggestion (e.g.

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selects two answers and gives them equal probabilities or denies to point any answer at all). Cases of such games have been removed from the sample.

In the next section, the statistical test used in this study is presented.

5. Methods

The collected database was divided into games played by female and male participants, rural and urban participants, and games with high or low stakes.[†] Each of these groups calculated a fraction of trust (the share of the cases where the players trusted a friend or the audience). Then, using the test for statistical differences in two populations' proportions, the occurrence of statistically significant differences in fractions of trust in different populations was verified.

In the test for two populations' proportions, the following hypotheses were adopted:

$$H_0: p_1 = p_2$$
$$H_1: p_1 > p_2,$$

and the following test statistics were used:

$$U = \frac{\frac{m_1}{n_1} - \frac{m_2}{n_2}}{\sqrt{\frac{\bar{p}\bar{q}}{n}}},$$

where p_i denotes the proportion of successes in a group i, n_i refers to the size of the sample i, m_i represents the number of successes in sample i, $\bar{p} = \frac{m_1+m_2}{n_1+n_2}$, $\bar{q} = 1 - \bar{p}$, $n = \frac{n_1 n_2}{n_1+n_2}$, $i = 1, 2$.

When the sample size $n_1 n_2$ is less than 100, an effect size correction with the following test statistic was applied (Cohen, 1988):

$$\widetilde{U} = \left(2 \arcsin \sqrt{\frac{m_1}{n_1}} - 2 \arcsin \sqrt{\frac{m_2}{n_2}} \right) \cdot \sqrt{\frac{n_1 \cdot n_2}{n_1 + n_2}}.$$

The tested hypothesis remains the same as in the case of large samples. If the null hypothesis is true, the test statistic has a standardised normal distribution.

In the next section, we present the results of the tests.

6. Results

All questions ($n = 376$) in which the player decided to use the Ask-the-Audience lifeline were divided according to the player's gender, place of residence, and the amount of stake related to the question. In each of these categories, the trust fraction $\frac{m_i}{n_i}$ was calculated. Then, the statistics U (for $n_1 \geq 100 n_2 \geq 100$) and/or $\widetilde{U}$, with a small subsample size) were determined. The results are presented in Table 2.

[†] Low-stake games match questions 1–7, up to PLN 40,000. High-stake games start from PLN 75,000 (questions 8–12).

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Table 2. The test results for two populations' proportions in the case of trust in the audience's suggestions.

Population 1	n_1	Population 2	n_2	$\frac{m_1}{n_1}$ [%]	$\frac{m_2}{n_2}$ [%]	U or $\widetilde{U}$	p-value
Women	151	Men	225	90.07	85.33	2.75011***	0.0030
Urban	328	Rural	48	88.72	77.08	2.0275**	0.0213
Urban women	127	Rural women	24	90.55	87.5	0.4396	0.3301
Urban men	201	Rural men	24	86.07	79.17	0.8473	0.1984
Urban women	127	Urban men	201	90.55	86.07	2.4803***	0.0066
Low-stake	333	High-stake	43	89.79	67.44	3.4804***	0.0003
Women, low-stake	139	Women, high-stake	12	92.09	66.67	2.1957**	0.0141
Men, low-stake	194	Men, high-stake	31	88.14	67.74	2.611***	0.0045
Women, low-stake	139	Men, low-stake	194	92.09	88.14	2.3758***	0.0088
Women, high-stake	12	Men, high-stake	31	66.67	67.74	0.0674	0.4731

Notes: ***p < 0.001, **p < 0.01, *p < 0.05

Source: own calculations

A similar analysis was carried out for the games where the problem of trusting a friend appeared ($n = 180$ total questions). The results are presented in Table 3.

Table 3. The test results for two populations' proportions in the case of trust in a friend's suggestions.

Population 1	n_1	Population 2	n_2	$\frac{m_1}{n_1}$ [%]	$\frac{m_2}{n_2}$ [%]	U or $\widetilde{U}$	p-value
Women	71	Men	109	85.92	76.15	1.6463**	0.0498
Urban	157	Rural	23	82.17	65.22	1.7448**	0.0405
Urban women	59	Rural women	12	88.14	75.00	1.086	0.1387
Urban men	98	Rural men	11	78.57	54.55	1.6265*	0.0519
Urban women	59	Rural men	11	88.14	54.55	2.3642***	0.009
Low-stake	127	High-stake	53	86.61	64.15	3.2699***	0.0005
Women, low-stake	49	Women, high-stake	22	91.84	72.73	2.024**	0.0215
Men, low-stake	78	Men, high-stake	31	83.33	58.06	2.674***	0.0037
Women, low-stake	49	Men, low-stake	78	91.84	83.33	1.4349*	0.0757
Women, high-stake	22	Men, high-stake	31	72.73	58.06	1.1115	0.1332

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Notes: ***p < 0.001, **p < 0.01, *p < 0.05

Source: own calculations

7. Discussion and Conclusions

The obtained results indicate that women decide to trust both the audience (p-value = 0.0030) and friends (p-value = 0.0498) more often than men. This is the opposite of the conclusions drawn from numerous experimental studies (including Van Den Akker et al., 2020). In particular, Schwieren and Sutter (2008) show that men trust more in the abilities of their interaction partners than women do. Conversely, women are more likely to forgive a breach of trust (Haselhuhn et al., 2015). The main theoretical reason women appear to be less trusting than men is the higher risk-taking of men, which has been observed in many studies. Trust, especially in unknown people, is a testimony of this tendency. In the case of our research, we observe the opposite result, which also appears in some studies (Eckel, Grossman, 1998). Perhaps when the money to be won is at stake, women behave differently than in laboratory settings. The obtained results argue the necessity to conduct further research based on natural economic experiments.

Interestingly, on the one hand, urban residents are also more trusting (for both types of trust) compared with rural residents (p-value = 0.0213 or 0.0405, respectively). This may also be related to the higher risk aversion of city dwellers or the natural habit of meeting more strangers every day and, ultimately, instinctively trusting them (Nummela et al., 2008). On the other hand, no statistically significant differences in trust between urban and rural women are confirmed; analogous results are obtained among men (except for the "Phone-a-friend" lifeline, p-value = 0.0519), even though in each case, the percentage of trust of urban residents is higher. However, it is worth noting that the share of rural players in the sample is relatively low, which is most probably, connected with different risk propensity or, on the other hand, with the process of casting to the show (Reback, Stowe, 2011), which might be easier for urban residents.

The division into high- and low-stake games confirms the conclusions in line with intuition; players are more trusting in low-stake games than in high-stake ones (p-value = 0.0003 in the case of "Ask-the-Audience", or 0.0005 in the case of "Phone-a-friend"). Similar results are obtained, among others, by Johansson-Stenman et al. (2005). It should be assumed that this is associated with a general risk in the game show; during the initial questions, players risk losing relatively small winnings, which facilitates trust, even the one connected with a strange group of people. Risk aversion increases with the number of potential winnings, contributing to a lower tendency to trust, even in the case of a friend's suggestion. The same results appear while studying differences in women and men players groups, despite the type of trust (in the group of strange people or friends).

Interestingly, in the case of low-stake games, women are more trusting than men (p-value = 0.0088 or 0.0757, respectively), but when the amount at stake increases, the gender difference is blurred (p-value = 0.4731 or 0.1332, respectively).

Summing up, based on the data from the Polish edition of the WWTBAM game show, women are more trusting than men in both the cases of trust in a group of strangers ("Ask-the-Audience") and a friend ("Phone-A-Friend"). Similarly, urban residents are, in general, more trusting than their rural counterparts. However, no differences in a trust are found between urban and rural women (or men).

The results also confirm intuitive assumptions: players more often trust the suggestions of the audience and a friend in the case of low-stake games. In the case of low-stake games, women are more trusting than men. In contrast, for high-stake games, the gender difference in trust disappears.

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The present study has some limitations. First of all, some subsamples are very small, which is strictly connected with the rules of the game – the question at high stakes are more complicated, the answers are harder to choose, and there are fewer lifelines to use due to the fact of taking them earlier in the game. Therefore the pressure arises and forces players to resign or give incorrect answers. This implies a much lower number of high-stakes games in comparison to low-stake games (in the case of the "Ask-the-Audience" lifeline, it is 333 to 43 games, and in the case of "Phone-a-Friend" lifeline – 127-53). In the case of the lower number of cases in the subsamples, it is harder to find statistically significant differences. In addition, the available number of women in the game is lower, probably because women are generally less willing to participate in TV shows. This, in turn, also raises the problem of pre-selection players for a game show, which is associated with casting. Studies show that the lower number of women willing to participate forces organisers of the show (who would like to keep a similar number of men and women) to qualify almost all of them, while a substantially higher number of men willing to participate implies inner competition, which results in choosing only better ones. Therefore, the sample might be biased and not representative of the entire population in the country (see Reback, Stowe, 2011).

The method and results of this study can be used in other analyses. The contribution of this study is as follows. First, to the best of our knowledge, this is the first trust analysis using data from a natural experiment like a TV show. Secondly, the obtained results partially confirm and contradict previous results from other studies. In particular, the greater trust placed by women in both the audience and the friend remains in contradiction with the results of the other experiments.

It should be noted, however, that most often, these experiments were not natural experiments but only experiments based on a series of games (e.g. trust games). Third, the results of this study may serve as another argument in the discussion about the determinants of trust towards strangers and friends. Finally, fourthly, the approach used in this paper can serve as an example in other studies, both those based on WWTBAM and other game shows.

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IMPACT OF SUPPLY CHAIN MANAGEMENT STRATEGIES ON FIRMS' SUSTAINABLE PERFORMANCE: A CASE OF AN EMERGING ECONOMY

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Abstract. In recent times, there has been growing popularity and importance of supply chain management (SCM) among academics and the business fraternity in emerging economies. At present, every company's long-term survival, prosperity, and value chain creation are at risk since they rely on an enterprise's level of supply chain growth. The increasing demand for sustainable development of large companies in emerging economies indeed entails an inclusive array of SCM practices beyond mere logistics enhancement and automation so that these companies can overcome the persistent concerns in the current supply chain ecosystem. Therefore, this study attempts to fill these gaps by examining how sustainable supply chain management strategies can assist firms in emerging economies, especially South Africa, to achieve sustainable growth and a competitive advantage in the global market. The study used a mixed method approach and surveyed 100 JSE-listed companies, supplemented with in-depth interviews from 46 respondent companies. The findings expose a significant positive impact of SCM practices in achieving success and sustainable growth for multinational companies. These results suggest that firms operating within emerging markets should adopt SCM practices in their business processes with a broader consideration of environmental sustainability issues and production cost implications. This study contributes significantly to the literature to assist in planning supply chain practices linked with the UN SDGs. The paper also offers robust insight and an excellent understanding of the implications of the SCM strategies on promoting opportunities for sustainable growth in an emerging economy context.

Keywords: supply chain management strategies; JSE listed companies; success and sustainable growth of multinational companies; emerging economies; South Africa

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JEL Classifications: F20, F23, G15

1. Introduction

These days, companies are under pressure to demonstrate evidence of sustainable business growth from different players, such as customers, development partners, government, and shareholders (Diabat et al., 2014; Meixell & Luoma, 2015; Sanchez-Flores et al., 2020). Supply chain management (SCM) started addressing sustainability issues to uphold green growth and business success (Moktadir et al., 2018; Vivek, Tobias & Parikshit, 2018;

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Tseng et al., 2019). Consequently, many multinationals have been recognised as the substantial drivers in facilitating the smooth execution of sustainable SCM practices (Ali et al., 2020), as well as the demand to look into the interests of investors and engender competitive advantage for their enterprises (Roy, Silvestre & Singh, 2020). The primary focus of SCM practices is to optimise the level of customer satisfaction because customers are the critical stakeholders of organisations. However, the question of how SCM practices can enhance a firm's success and sustainable growth is a research question yet to be answered.

The evolution of global value chains in diverse sectors, such as commodities, apparel, electronics, tourism and business service outsourcing, has significant implications on international trade, production and employment, and on how companies in emerging economies like South Africa can participate in the global economy (Gerrefi & Fernandez-stark, 2016). In contrast, Koksal et al. (2017) posit that the textile and apparel industries that demand SCM practices to boost their sales volume and meet customer demands with quicker response time face the most challenging issues for maintaining sustainable growth. Likewise, Avittathur and Jayaram (2016) assert that supply chain challenges have become even more critical because customers and suppliers of firms are globally located. Yet, every company's long-term survival, prosperity, and value chain creation are at risk since they rely on an enterprise's level of supply chain growth (Szczepanski, 2021). Thus, triggering a deficiency of clarity. These challenges were exacerbated by the hostile chaos of the Covid-19 pandemic, which exposed large companies to disrupting value chains. They reversed hard-earned growth for many countries, for instance, dwindling foreign direct investment, cross-border trade closures, supply shocks from the manufacturing industries and decreasing GDP per capita. The emerging countries recognised with less significant domestic markets, limited capacity to adjust, and heavy reliance on vulnerable sectors (World Bank, 2020) reported adverse consequences about sustainable growth. This study aimed to extend our knowledge by empirically examining the impact of supply chain management strategies on firms' sustainable performance using Johannesburg Stock Exchange (JSE) market-listed companies in South Africa.

Previous works expose a rising number of scholarly articles that support the integration of SCM strategies within corporate firms. Unfortunately, the impact of supply chain management strategies on firms' sustainable performance has not remained unresolved. Furthermore, research indicates that realising sustainable production within an SCM framework has been one of the most crucial challenges in emerging markets, as it does not entail acquiring financial advantages (Esfahbodi, Zhang & Watson, 2016). Yet SCM practices are essential for companies that struggle to generate a competitive advantage to augment their sustainable evolution capabilities. As a result of the shortage of empirical studies, this scholarly article delivers novel insights and implications for adopting SCM practices by listed companies in South Africa. We compare how corporate companies can remain relevant amidst the global bubble of adhering to the sustainable SCM framework (Silvestre, 2016; Schrettle et al., 2014; Scnchez-Flores et al., 2020). Prior scholars argue that the supply chain management system is demand-driven because final customer demands are widely considered the most crucial (Barbosa-Póvoa, Da Silva & Carvalho, 2018). There is an upsurge in interrelated notions such as green supply chains and green operations (Sajjad et al., 2020). The primary motivation in the wake of SCM practices was to balance the firm's growth and the external finance needed. The greater the percentage of development in assets, the better the required external finance ceteris paribus (OECD, 2015).

Even though prior scholars have made various extrapolations about SCM with a call to search for and expand rising areas of interest, our review of the literature reveals a lack of studies that certainly discuss the influential role of SCM in encouraging a company's sustainable growth, because many of them are confined to the market, workplace, environment, and society (Esfahbodi, Zhang & Watson, 2016). Therefore, this article attempts to fill these gaps by conducting an empirical study in South Africa that examines how sustainable supply chain management strategies can encourage sustainable growth and competitive advantage among JSE market-listed companies.

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The rest of the paper is structured as follows: Section 2 presents the theoretical background to sustainable supply chain management; Section 3 discusses empirical literature relating to SCM. Section 4 offers the research design and approach employed for collecting data, section 5 explores results and discussion, and Section 6 states conclusions, implications, and future research directions.

2. Theoretical background to sustainable Supply chain management

Recent studies reveal that expanding regional value chains across Africa, particularly South Africa, offers more significant opportunities to produce both local and international market linkages between regions, integrate critical supply chains, and substitute some products that are now being imported from outside Africa. The African market embodies an R7-trillion market opportunity for goods that can be produced on the continent (Dtic, 2021). However, for these opportunities to emerge, there is a demand to settle the structural limitations that may inhibit Africa and South Africa from capturing these opportunities. Although there appear to be significant opportunities as identified above, there is an apparent need to pursue the problems that hinder manufacturing in South Africa and open these opportunities to the rest of the continent. The significant constraints that require urgent government intervention to boost the supply chain management system include energy supply, energy prices, and the efficiency of logistics systems, including rail, roads, and ports (Dtic, 2021).

According to the World Bank (2020), Africa has a much lower global value chain (GVC) trade performance of merely 8% of GDP, matched to 11% of emerging countries in Asia and 14% in developed countries from 2000-2015. Furthermore, Africa's GVCs exports have mostly been obstructed by worldwide trade trends, bashed by the 2008 financial crisis and the rise of labour-saving skills, inhibiting incentives to outsource manufacturing. Africa largely continued to supply raw materials to countries at the high end of the GVCs task chain, while other developing regions deepened regional trade in GVCs (OECD, 2022).

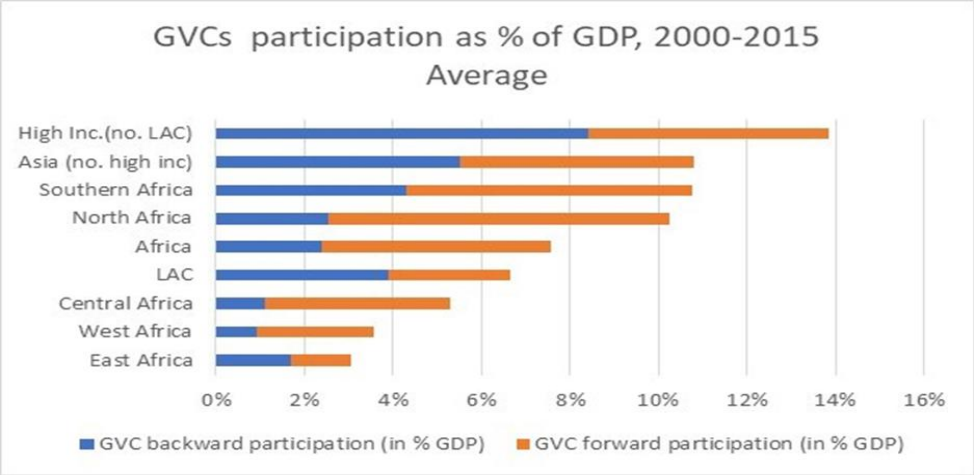


Figure 1. Africa's percentage Global Value Chain performance from 2000-2015
Source: World Bank, 2020

As it can be noticed in Figure 1, Africa's GVCs contribution is focused on a handful of resource-based and simple manufacturing sectors, with an inadequate account for superior manufacturing and services. All through 2015, we found that 50% of Africa's GVCs were essentially directly in mining and interrelated sectors such as petroleum and minerals. However, the global push for decarbonising transportation and global production networks, as well as investments in renewables, will shape the future of resource-based GVCs activities and the inflow of FDI to these sectors in Africa (OECD, 2022). In contrast, there is a belief that famous companies listed on the stock exchange markets are more privileged to adapt to SCM practices compared to SMEs. Because they are endowed

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with better resources, such as the capacity to conduct robust research and development to preserve sustainable growth, in South Africa, the situation seems to be unique. It is, therefore, necessary to develop models that will support the integration process and make it easier for business decision-makers to choose the optimal implementation strategy for UN SDGs in the supply chain.

In the last two years, the global supply chain suffered a shock wave as it could not adapt to disruptions triggered by the Covid-19 outbreak. We found that China's automotive manufacturing sector nearly fell below 50% before the outburst, lowering automotive manufacturing across the globe (Betti & Ni, 2020). In light of GVCs in Africa, Covid-19 enlarged the continent's dependence on imported goods and strengthened the pressure to build up competitive, resilient, and robust value chains in this sector (Cyn-Young et al., 2022). Regrettably, SCM strategies remain a term frequently found in the literature and suffer from inconsistent use, lack of an accurate description, and lack of a universally accepted definition.

3. Literature review

3.1 Role of supply chain management in firms' success

Recently, SCM practices have garnered greater attention from academics, policymakers, and investors for numerous causes: The main objective of SCM is to build and enhance competitive advantage through cost reduction without compromising customer satisfaction (Saeed & Kersten, 2019). Furthermore, Mukhsin and Suryanto (2022) discover that SCM practices are vital for a firm's sustainable growth and survival in the existing competitive business market. Because SCM primarily facilitates the smooth flow of products, data and finances, which permits firms to create better customer relationships, thus enhancing their value-added and adherence to the operating financial procedures. In other words, adopting SCM strategies have been observed as a fundamental instrument to strengthen the corporate industries' competencies, to remain relevant and develop while sustaining their needed funding streams. Reflecting on the debate of Silvestre (2016), it is observed that the propagation and achievement of learning in this field can be understood at distinct levels in specific supply chain components. The literature review shows that ground-breaking companies have explored SCM innovations and extended them into other supply chain sections.

We aim to determine how managers and investors have integrated SCM strategies into their operational activities to meet customer satisfaction. We address two fundamental questions:

- *What is the role of SCM in promoting a company's sustainable growth rates in an emerging economy like Southern Africa?*
- *How have the barriers to SCM influenced the growth rate of companies in emerging economies?*

The SCM system is fundamental for enhancing the business success, customer satisfaction, and sustainable growth of nearly all companies. The primary focus of SCM is on customer satisfaction since they are the critical stakeholders of any organisation. Avittathur and Jayaram (2016) assert that supply chain challenges have become even more vital because customers and suppliers of firms are globally located. Therefore, the evolution of global value chains in diverse sectors, such as commodities, apparel, electronics, tourism, and business service outsourcing, has significant implications in terms of global trade, production, and employment and how developing country firms, producers, and workers integrate into the global economy (Gerrefi & Fernandez-Stark, 2016).

However, as all supply chains are demand-driven, final customer demand information is widely considered essential information in the supply chain system. We discover that not only does the adoption of SSCM practices develops the environmental and social performance of firms and the supply chains, but it also delivers an opening for organisations to gain a new set of proficiencies, which can benefit them to realise a competitive advantage by undertaking sustainability creativities within and outside of the structural limitations of the companies.

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Studies on SCM demonstrate that this field is gaining attention. Saeed and Kersten, 2019; Mukhsin and Suryanto (2022) investigated sustainable supply chain management drivers. Diabat et al. (2014) examined enablers for implementing sustainable supply chain management and explored sustainable logistics. Meixell et al. (2015); Avittathur and Jayaram (2016); World Bank, 2020) concentrated on global value chains and supply chain management. Esfahbodi, Zhang & Watson (2016) examined sustainable supply chains in promoting sustainable growth in emerging economies. Lately, the literature has developed increasingly and more robustly (Silvestre, 2016; Baig et al., 2020; Ali et al., 2020; Mani, Jabbour & Mani, 2020). These studies have raised substantial ambiguity among researchers, business fraternity, and policymakers. Besides, many empirical studies about SCM are primarily made in developed countries; hence the interrogation of how SCM practices can encourage a firm's success to sustainable growth in an emerging economy is lacking.

In addition to SCM being intelligent, strategic supply chain programs such as lean management and agility, which have yielded considerable benefits for supply chain processes in developed economies, are being adopted by developing economies (Avittathur & Jayaram, 2016; Mancidi, 2020). The reality of the competitive environment for businesses is inevitable, whether in a developing or a developed economy. The difference, however, is that, in developing economies, the inadequate distribution channels do not reach most consumers, unlike in developed economies, where there are large retailers in the supply chains (Sodhi & Tang, 2012). Furthermore, to survive competition in developing economies, enterprises must be able to deal with external and internal uncertainties by adopting supply chain flexibility as an approach to coping with sources of uncertainty (Manchidi, 2020). Therefore, assessing the role of SCM practices in a firm's success and sustainable growth requires understanding the indicators used to measure its impact. We discovered that the central indicators for a successful implementation of SCM practices revolve around social and environmental sustainability issues which consider the concerns of the legislators and policymakers about negative ecological and social impacts across the world (Baig et al., 2020)

This concept is complicated and necessitates a different approach from arbitrary and volatile pursuits. Corporate directors must encourage adopting SCM practices with proficiency to account for social, economic, and ecological performance. Moreover, applying sustainable solutions in the supply chain is time-exhausting and can create several difficulties that deter business management from engaging in environmentally friendly approaches. For that reason, business leaders and future entrepreneurs with knowledge of advancing business prosperity and sustainable growth rates must know the limitations and opportunities of sustainable SCM (Zimon, Tyan & Sroufe, 2018).

3.2 Drivers of sustainable supply chain management practices

While it has been continually conveyed in previous studies that the textile and apparel industries are the major global players in the SCM landscape in terms of GDP per capita and employment share. These sectors confront the utmost complex problems in upholding sustainability limitations with the United Nations (UN) development goals. Furthermore, the worldwide disintegration of the textile industry has made it challenging since high levels of outsourcing are completed in emerging countries. Suppliers are situated in varied geographical places, triggering a lack of clarity, specifically while less important levels are concerned (Köksal et al., 2017). Because of the textile sector's reputation, its manufacturing's sustainability tribulations to the environment and the world ought to be tackled instantly (Baig et al., 2020). Therefore, in this article, we aim to deliver good insights into how adopting SCM practices can assist corporate companies in achieving prosperity and sustainable growth while balancing customer demands. We further illuminate the significance of SCM in promoting change within friendly companies and its impact on society.

SCM emerged as a way to realise the overall firms' performance and respond to sustainability issues within the industry's resources (Diabat et al., 2014; World Bank, 2020). Nearly scholars have made efforts to advance SCM focused on achieving a firm's prosperity and sustainable growth in the context of Supply chain green environment

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and corporate social responsibility to help out companies accomplish implementation of their economic, social, and environmental dimensions (Saeed & Kersten, 2019; Scavarda et al., 2019). South Africa has not been excluded in advocating for sustainable SCM practices, although efforts in this field relatively draw significant attention from government programs regarding strategic priorities. Whereas companies in emerging economies have attempted to adapt SCM practices, they have been onerous as companies encounter relatively substantial social and environmental sustainability barriers compared to their counterparts operating in developed countries (Silvestre, 2016; Köksal et al., 2017). Recent research uncovers SCM practices in developing countries are comparatively underdeveloped. Therefore, research in countries like South Africa is still limited (Esfahbodi, Zhang & Watson, 2016; Silvestre, 2016).

Moreover, corporate companies may not direct their attention to social and environmental sustainability issues since they do not involve any financial returns; hence their adaptability capacity often is influenced by the volatile demands of today's customers. For instance, nearly 90% of supply chain leaders in the healthcare sector confirm that their highest challenge is a quicker response to customer demands. The demand to adopt and implement effective SCM strategies is inevitable to defeat these problems. As a result, scholars and policymakers ought to understand how sustainability is integrated into the textile/apparel supply chain while mitigating risks.

SCM is achieved mainly through partnerships with suppliers/transporters and customers through the expansion of upstream and downstream firms' activity (Vasiliu & Dobrea, 2013). Supply chain managers are therefore compelled to be closely in touch with cultural, historical, and political trends that can change the playing field virtually overnight (Stank, 2015).

Similarly, despite the significance of a firm's size and the prosperity of a company's growth, more prominent companies execute environmental and social habits as corporate responsibility to deliver universal sustainability concerns (Tebaldi, Bigliardi & Bottani, 2018; Saeed & Kersten, 2019). Well-known companies listed on the stock exchange markets are more privileged to adopt SCM approaches when compared to SMEs because they are endowed with better resources, capacity to conduct robust research and development, funding, marketing, and social compact, and practice these traits to chase sustainable development. On the contrary, they appear to strive for their reality, hence, not enough focus on sustainability questions (Sodhi &Tang, 2012; Touboulic & Walker, 2015). But again, the more significant hurdle is that there is partial evidence in earlier literature to underpin sustainable supply chain development in emerging economies. Although reaching the desired sustainable growth rate has become the main objective for every firm's manager, in today's severe competition and quickly changing economic and political environment, reaching the desired sustainable growth rate is not easy.

3.3 Barriers to implementation of SCM practices in emerging economies

Many regimes, in an effort to adhere to the UN SDGs, have designed policies that ultimately consider all manufacturing and service companies liable for their actions that impact the environmental aspects of the economy arising from their businesses in conjunction with their supply chain contributors (Saeed, Week & Kersten, 2017). As the firms get larger, they are more affected by their buyers from the global textile supply chain (Ali et al., 2017). Baig et al. (2020) exhibit that economic, managerial, and supplier-related barriers directly impact the adoption of SCM practices negatively or positively.

Alternatively, García-Arca, Garrido and Prado-Prado (2017) posit that the internationalisation of actions and the surge in raw material prices demand actual performance of sustainable mixtures in the supply chains. Thus, effective implementation of the SCM idea requires new methods for permanent set-up and tools that enable the integration of different spheres that are so far considered distinctly (Kot, 2018)

Lately, the Covid-19 pandemic has had a significant impact on international trade and supply chains. The world has witnessed cross-border trade closures, condensed demand for traded goods, and supply shocks in the supply

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chains, including South Africa. Indeed, the persistent susceptibility of regional supply chains impacts the long-term socio-economic development trajectory of the nation (Pretorius et al., 2022). This was due to labour shortages, fluctuations in expenditure patterns, supply networks, and cross-border transport service disruptions globally to implement Covid-19 national protocols. Additionally, just-in-time inventory and lean manufacturing widened the worldwide supply chain to a breakeven point in times of pressure (Cyn-Young et al., 2020). Furthermore, we also discovered diverse effects on the SCM system from barriers linked to red tape and bureaucracy in implementing these practices by local authorities; for instance, uncertainty was detected in parts of KwaZulu-Natal and Gauteng. Consequently, understanding these encounters and other issues influencing the implementation of SCM sustainability issues of different business and society practices in Africa entails nuanced analysis.

On the other hand, even if the concept of sustainability aspect has gained a high level of importance in Europe, America, and Asia due to its ability to ensure environmental sustainability, in Africa, the integration and application of the sustainability concept are facing several challenges (Giunipero, Hooker & Denslow, 2012; Moktadir et al., 2018). Several studies have investigated the barriers affecting sustainability practices at the country's levels (Sajjad, Eweje & Tappin, 2015; Moktadir et al., 2018). Research also recently exposed that several companies in emerging economies in Africa dropped back in quantifying, registering, and adopting sustainability issues. For example, only 5% of all registered businesses in Kenya are accounted for in the national Global Compact Network. Yet the government is robust in shipping finished goods to Western countries. This suggests that African suppliers in GVCs have yet to adopt the sustainability practices that prevail in GVCs. Unfortunately, the corporate procurement policies and procedures lack a good fit for the African context. This paper aims to fill this gap.

Similarly, it is imperative to stress that the diversity of national laws, resident organisations, transparency, and detachment between organisations manifested in the global value chains drive change in the sustainability practices of corporate companies in emerging economies in Africa across all sectors (Hofstetter et al., 2021).

Besides, the growing pressures from various players, such as governments and customers, have provoked business corporations to address the economic, environmental, and social sustainability issues associated with their supply chain activities (Diabat et al., 2014; Meixell & Luoma, 2015).

We notice that different barriers inhibit the integration of sustainability in the firms' supply chain (Giunipero, Hooker & Denslow, 2012) in attempting to adapt to SCM practices in their businesses. This has been identified in some of the studies focusing on firm or country-specifics (Luthra et al., 2011; Moktadir et al., 2018; Baig et al., 2020).

On the other hand, several of these studies have repeatedly observed supplier's lack of resources, lack of commitment from top management, and difficulty in changing company practices and policies as a fundamental barriers to adopting SCM practices (Moktadir et al., 2018; Murillo-Luna et al., 2011; Trianni et al., 2017). Although (Giunipero, Hooker & Denslow, 2012; Oelze, 2017) believe that the frail regulatory orders and controls have significantly failed the implementation of sustainability initiatives in emerging economies.

Despite the lack of good literature on this study from a developing economy perspective, careful consideration was given to the choice of literature. In our review, the literature reveals a lack of studies comprehensively discussing the impact of SCM practices in achieving sustainable growth in an emerging economy.

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4. Materials and Methods

This study employed the mixed-method approach in which qualitative and qualitative methods were sequentially used to collect data. Specifically, an exploratory sequential design strategy was chosen to use qualitative findings from the purposively selected participants for this study. The study began with a quantitative method in which theories and concepts were tested, followed by a qualitative approach involving a detailed exploration of individuals. This approach was adopted by earlier scholars who recommended a mixed method approach for this kind of study (Bryman, 2010). Therefore, an empirical study concerning quantitative and qualitative data was conducted for this research work to examine and test the efficacy of sustainable supply management strategies in fostering sustainable growth rates of corporate companies in South Africa. The study derived critical practical insights for SCM to benefit the business fraternity by adopting sustainable approaches to business development.

4.1 Sample and data collection

This study's primary data collection was executed through semi-structured interviews for the qualitative data, while survey questionnaires were used for the quantitative data collection. The researcher posed a series of questions to the participants using a five-point Likert-scale questionnaire to indicate the extent to which they agreed or disagreed with statements ranging from strongly agree-5 to strongly disagree-1.

The database utilised for this study in 2015 comprised 400 Johannesburg Stock exchange (JSE) market-listed companies (N = 400), i.e. well-known organisations seeking to attain the next level in growth. A purposive sample of the top 100 JSE-listed companies was considered for this study (n = 100) based on the impact of their highest shareholder returns over the past five years. Their achievements became evident when they were acknowledged by the Sunday Times in 2015 as the best-performing businesses on the JSE due to their highest shareholder returns over the past five years.

Table 1. Sample composition of 100 companies listed on the JSE market

Standard industrial classification	**Percentage**
Manufacturing	9%
Retail, wholesale trade, commercial agents, and allied services	18%
Mining, quarrying, and agriculture	8%
ICT, transport, logistics, and storage	18%
Finance and business services	25%
Catering, accommodation, property, and hospitality	22%
TOTAL	**100%**

Source: Primary data, 2020

As illustrated in Table 1, the sample structure of the respondent companies comprised: manufacturing 9(9%); retail, wholesale trade, commercial agents and allied services 18 (18%); mining, quarrying, and agriculture 8 (8%); ICT, transport, logistics, and storage 18 (18%); finance and business services 25 (25%); and catering, accommodation, property, and hospitality 22 (22%). The study depended on a survey approach for data collection because, according to Page (2014), survey research is efficient since many variables can be measured with less time and costs, and the respondents can answer the questionnaires at their convenience without being subdued in answering sensitive questions (Goddard & Melville, 2001).

The interview schedule was used to collect data in a face-to-face interview.

However, the interviewer read the questions on the interview schedule and recorded the participants' answers. This method is associated with the advantage that it provides an opportunity for the researcher to ask for clarity from the participants instantly and follow up on responses that appeared to be interesting for the research. On the other hand, our small interview sample size is reinforced by the earlier study by Gentles et al. (2015). They

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claimed that qualitative research uses smaller samples because it aims to acquire information that is useful to comprehend the intricacy, depth, variation, and context surrounding a phenomenon. There is a consensus from scholars that a selection of anywhere between five and 50 participants in an interview is adequate. It is against this backdrop that a purposive sample of eight industry specialists was selected for this study (n = 8). These specialists worked in industries specialising in SCM, logistics, chemical and industrial engineering, and production and manufacturing engineering. Six of these specialists were purposely selected locally from South Africa and two from abroad to have opinions from both local and international perspectives. The study was conducted in South Africa because it is one of the top 73 middle-income countries (OECD, 2015) and one of the 11 advanced emerging economies; therefore can be comparable to developing economies of the world.

4.2 The measure of performance variables

Many research projects fail because of selecting tests or measurement techniques that are either unreliable, invalid, or both (Bart et al., 2012). Whether the research project is a qualitative, quantitative, or mixed study, the researcher's responsibility is to ensure that the measurement techniques in use represent the most elementary sense of what measurement involves and are valid indicators of the variables under investigation (Leedy & Ormrod, 2013). For the quantitative data analysis in this study, preference was given to the use of descriptive statistical analysis and inferential statistical methods of testing for relationships among variables such as t-tests, analysis of variance (ANOVA), and tests for normality and homogeneity of variance. In addition, factor analysis was used to obtain the study's results. The main objective of quantitative research analysis is to quantify the differences between groups, a change over time, or the existence of a measurable phenomenon.

In contrast, in qualitative research, the emphasis is on telling a story or putting together a puzzle that can help to explain a particular phenomenon and its relationship to other factors (Bart et al., 2012). Against this backdrop, for the quantitative data analysis in this study, preference was given to the use of descriptive statistical analysis and inferential statistical methods of testing for relationships among variables, such as t-tests, analysis of variance (ANOVA), and tests for normality and homogeneity of variance. In addition, factor analysis was used to obtain the results of the study.

Descriptive statistics were also used to analyse the raw data to describe and summarise data in a way conducive to recognising emerging patterns. In addition, descriptive statistics helped to create tables and graphical summaries in the form of graphs and charts that facilitated statistical comments for discussion of the results. The variables (dependent and independent) in this study informed the use of t-tests and ANOVAs for non-parametric analyses in the form of Mann-Whitney and Kruskal Wallis tests as ANOVA tests. Descriptive statistics are helpful for the presentation of data in a more meaningful way. However, they are not immune to shortcomings. The main limitation of descriptive statistics is that they only allow for summations of the measured people or objects. The use of inferential statistical analysis provides the researcher with an opportunity to draw inferences about a population from the sample. This study made inferences about the JSE-listed companies by estimating the parameters and testing the hypotheses. The limitation of inferential statistical analysis is that the researcher can never be entirely sure that the values or statistics calculated are correct. These construct values were calculated for every company on the top 100 JSE-listed companies list.

The three measures of validity, reliability, and trustworthiness were applied. During the interviews for qualitative data collection, the researcher, as the interviewer, immediately recorded the responses using a voice recorder and individually took notes. Bart et al. (2012) posit that content analysis aims to quantify or categorise qualitative data. For the quantitative data, an online web-based questionnaire was used to collect the data, and therefore an automatic recording of data was made possible by the pre-programmed system.

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4.3 Ethical clearance

Ethical clearance was obtained from the Unisa Graduate School of Business Leadership in line with the university's policy on research and ethics. Assurance was given to the participants regarding the confidential treatment of their responses and participation in the study.

5 Results and discussion

5.1 Demographic statistics of the respondent companies

This study employed a mixed-method approach in which both qualitative and qualitative approaches were successively applied to collect data. We embraced a purposive sample of the top 100 JSE-listed companies for this study (n = 100), for which the selection was based on the highest shareholder returns over the past five years. The top 100 JSE-listed companies are categorised as medium to large enterprises in terms of the Small Business Act, No. 102 of 1996 (Dti, 1996), because approximately 50% of them employed over 1500 employees, while over 30% generated annual turnover above 5 billion rands, and reported total assets value of between 100 million and 10 billion rands.

This study depended on a response rate of 40% (100 out of 400) JSE listed companies which are acceptable according to prior literature. Doane and Seward (2011) resolved that if the sample size is ≥30%, it is satisfactory for statistical analysis. Similarly, Nulty (2008) and Creswell and Garrett (2008) suggest that a response rate of 50% and above is ideal, while a mail survey structured questionnaire can be 20% or low. While these results might convey a fair distribution of the correspondent companies from each sector, we noticed that the manufacturing industry, which largely depends on a practical, sustainable supply management system, constituted only 9% of the sample size. It can be concluded that there is less production of goods and more imports in the country; hence, such trade patterns certainly necessitate a solid upstream and downstream SCM system in the country.

5.2 Descriptive statistical analysis

The debate under this section was centred on measuring how SCM practices ultimately contribute towards the achieving prosperity and sustainable growth of JSE-listed medium and large companies in South Africa. Consequently, we performed various statistical data analyses, which included, among other things: descriptive statistics and inferential tests.

The data were summarised in the form of tables and graphs to generate relevant results to answer.

Ho1: Supply chain management strategies positively impact companies' success and sustainable growth.

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Figure 2. JSE listed companies classified as either tangible goods or intangible services
Source: Primary data, 2019/2020

As shown in figure 2, 38.5% (15 of 100) of the respondent companies produced tangible goods. These results demonstrate that a significant percentage of the top 100 JSE listed companies are manufacturing companies matched to the service industries. Our findings are supported by the recent report (Dti, 2020), which discloses that a well-founded manufacturing sector offers many opportunities to prospective investors looking to expand their portfolio in South Africa. This structure suggests that investors can pick the niche industries they wish to explore, such as food processing, beverages, motor manufacturing, and wood products, which have attained maturity and are ripe for foreign direct investment. Despite the Coronavirus disrupting the economy, South Africa's manufacturing sector contributed 13% to the GDP and almost 50% to total export earnings in 2020. South Africa is home to some of the world's biggest automotive manufacturers due to *its ease of doing business*, the rule of law, and reasonable labour practices (360 Mozambique, 2022). In addition, South Africa has been trading in the surplus from 2016-2020 with the rest of Africa). In June 2019, the manufacturing industry in South Africa sold goods to a value of R203.7 billion compared to South Africa's total imports of R 103 billion. (South Africa's Manufacturing industry, 2021)

SADC is South Africa's major trading block for exports and imports, accounting for over 70% of all the country's exports in Africa, comprising key markets like Botswana and Namibia. Zambia, Zimbabwe, and Mozambique (Dti, 2020). These results suggest that these companies are well established in adopting SCM practices with the maximum level of agility as the leading cause of their competitiveness (Vasiliu & Dobrea, 2013). We can therefore conclude that the vibrant manufacturing sector might have been a significant player in these companies' success and sustainable growth amidst the difficulties caused by the pandemic. This decision in the literature is coherent with the attributes of SCM that involve the strategic actions that will bring about a definite impact towards realising sustainable growth and, hence, a competitive advantage.

Influence of firm geographical location on supply chain performance
Both global and regional supply chains have definite geography that entails the scope of production, distribution, and consumption. Supply chain managers and academics examining SCM practices frequently overlook this structure at the heart of several sourcing strategies. This article emphasises how the firm's geographical location may influence the management's decision to adopt SCM practices. In recent times emerging nations South Africa inclusive, have made deliberate efforts to expand the supply chain terminals in a way to remain relevant in the wake of the VGC; hence significant sections of SCM are present merely to provide for this three-dimensional discrepancy, for instance, public transport (road, water, airport) terminals and cross border entry ports. Therefore, firms privileged to these supply chain management channels are highly adaptable, and variations in the locational performance are expected to reflect fluctuations in outsourcing and SCM strategies.

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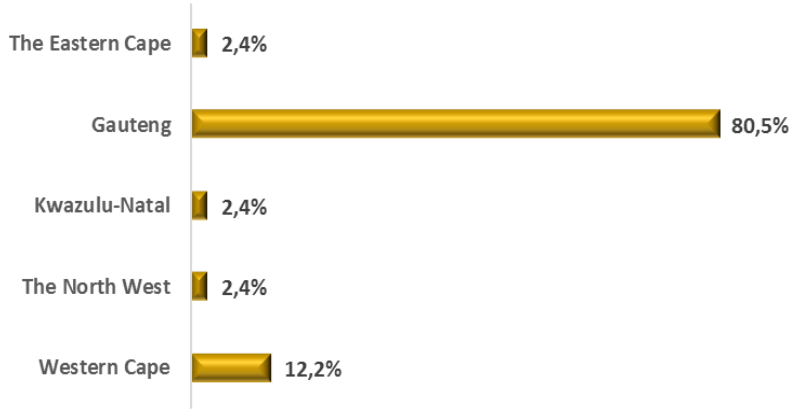


Figure 3. Company's geographical location by provinces in South Africa
Source: Primary data, 2019/2020

As it can be seen in Figure 3, 80.5% (33 of 100) of the top 100 JSE listed companies are situated mainly in Gauteng province. These results convey that Gauteng is the economic hub of South Africa, where business activities are primarily taking place. It is estimated that over 10,000 companies are involved in the province's manufacturing sector, employing over 500,00 workers. The significant companies in this sector include iron and steel, chemical products, appliances, electrical supplies, food, machinery, fabricated and metal products, motor vehicle parts, and accessories. We discover that the concentration of JSE-listed companies within the primary central business districts in Gauteng province is attributable to management's desire to create close interactions with their main clients through primarily maintaining corporate head offices within such locations. This is especially critical for those companies targeting the retailing sector. Hence, an area near a central airport terminal enabling the 3PL to deal with the time sensitivity of air cargo effectively is desirable to facilitate on-time custom clearance and delivery. Such strategic actions have been critical for attracting new markets for growth and opportunities that have motivated multitudes of global corporations to invest in developing economies (Subramaniam et al., 2015).

While several industries are located in Gauteng province, the critical question is how these companies have responded to the increasing demand to adapt to global value chain practices to meet customer satisfaction and minimise operational costs. The global geography of production has been accompanied by restructuring worldwide transportation and distribution networks. Transport terminals are unique bottlenecks in global freight distribution as they consume scarce land. Yet, their location and characteristics allow supply chain managers to adapt to their imposed constraints (Rodrigue, 2012).

Therefore, developing economies have also become a podium for various multinational companies targeting large regional and cross-border markets. Hence, a location that facilitates access and service to the leading regional markets through proximity to a significant cross-border gateway is desirable to assist customs-related procedures and take advantage of cargo opportunities.

Despite the standing attributed to SCM in emerging economies, crucial considerations for achieving SCM strategic actions like public transport, accessibility of skilled labour, and business environment are barely present in SCM literature.

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Previous scholars suggest emerging nations with less significant entry to different resources might not be competent to reproduce to a similar level the supply chain strategies implemented in advanced countries (Avittathur & Jayaram, 2016; Sodhi & Tang, 2012).

Role of SCM practices in achieving success and sustainable growth of the JSE listed companies

To successfully measure the role of SCM practices in achieving success and sustainable growth for the JSE-listed companies, we asked the respondents to present their level of success in adoption and the implications of SCM practices within their companies. The primary goal for implementing the SCM practices is to enhance a company's competitive advantage and customer service, mainly through higher reliability of distribution that guarantees demands are met on time. For this reason, these companies opened offices in the different metropolitan districts in Gauteng province to increase their supply value chain with proficiency to meet customer demands.

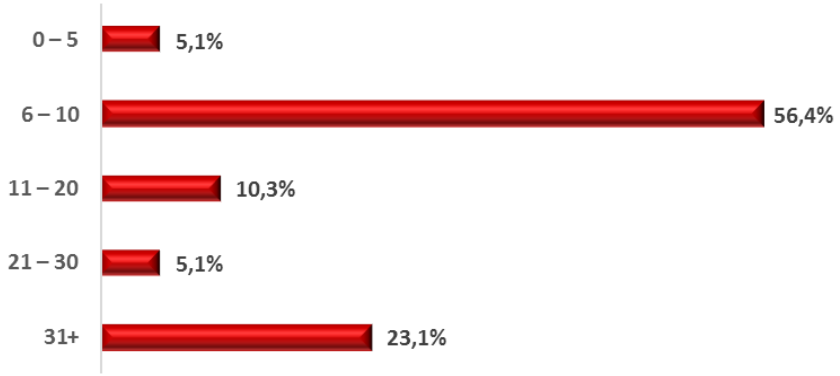


Figure 4. Percentage of the 100 JSE-listed companies which adopted SCM practices

As illustrated in Figure 4, 56.4% (22) of the respondent companies have about 1-10 branches in South Africa. While on the other hand, we discovered that 65% of these companies own up to 5 branches outside of South Africa. These results show the extraordinary efforts exhibited by JSE-listed companies to enhance their supply chains, mainly where they have spotted potential markets for their goods and services. Recent studies uncover that supply chain management and geo-location are an ideal match. When geo-location services and capabilities are deployed, companies can optimise their transportation route, track assets, identify bottlenecks, and better understand how and where their assets are going (Knellinger, 2020).

More so, an effective and informed supply chain is critical to continue to produce products and meet demand. Companies need to understand the impacts of certain links in the global value chain that will affect operations and decide route changes, operation schedules, and manufacturing capabilities. Effective and efficient SCM practices must maximise customer value and achieve sustainable competitive advantage. Location services can significantly improve worker protection and the flow of goods and services at many levels of the supply chain. In addition, location technology and data help businesses gain visibility into how the current situation has influenced their supply chain and what changes could maximise efficiency (Rodrigue, 2012).

Some studies expose that the geographical location of companies in terms of physical distance has revealed an adverse impact on nations' bilateral global trade relations. However, this geography is a complex network of crucial and flexible spending patterns that can mainly be embodied as a metropolitan system contemplating the amount of material consumption as municipalities are places of ultimate consumption (Rodrigue, 2012). Although the results expose that JSE-listed companies are spread over different provinces in South Africa and outside the country, we did not investigate further the location decision outcomes of these companies in terms of what

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influenced their location of regional offices and distribution centres. We suggest future research to assess the decision-making process that has led to site selection.

We also evaluated the role of SCM practices focusing on if these companies operated separate SCM departments and their implication for achieving sustainable growth. In figure 5, we illustrate the percentage of companies that created a designed SCM section to enhance their overall performance in terms of sales volume balanced with customer service.

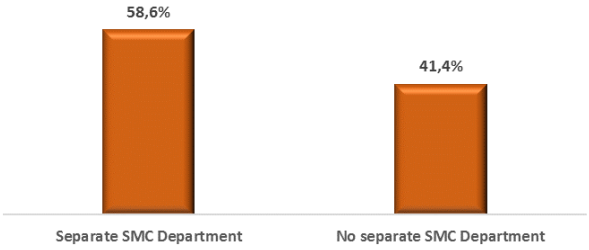


Figure 5. JSE listed companies operating SCM practices within a separate SMC
Source: Primary data, 2029/2020

As Figure 5 shows, 58.6% of the respondents reported having a separate SCM department. The above establishes a link between the company's particular department and a strategic plan for SCM. In both instances, SCM significantly affects whether the company has a strategic plan or whether it has a separate department for SCM. The results testify that a successful company (i.e., those on the top 100 JSE list) owes some of its success to effective SCM by separating the supply chain department from other functional departments. Therefore, the results indicated that different departments within the chain have different flexibility needs, which need to be separated from others.

Fundamentally, supply chains are demand-driven, so the information about final customer demand is generally considered the most critical information in the supply chain systems (Wu et al., 2016). In this context, the top 100 JSE-listed companies recognise the benefits of generating data into valuable information since it can make it accessible and usable in improving processes (Wu et al., 2016). In other words, the results suggest that strategic planning creates a platform to collect, store and manage data for ultimate transformation into implementable decisions to achieve supply chain operational performance.

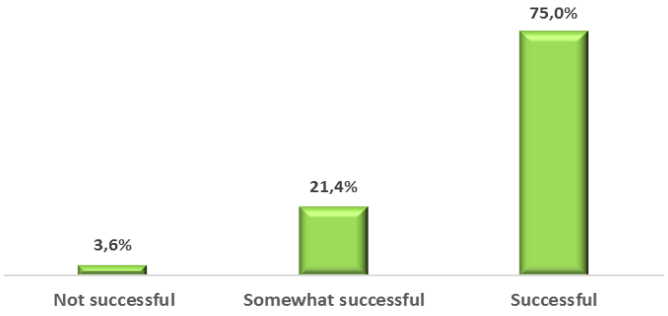


Figure 6. The level of success in adopting SCM practices with JSE-listed companies
Source: Primary Data 2019/2020

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Figure 6 illustrates the level of success in adopting SCM practices with JSE-listed companies. Three quarters (75.0%, n=21) of the respondents reported that their company's general management of SMC operations is successful. SCM remains an emergent concept to most companies, whether small or large. Yet, it has now become an activity of strategic importance that determines either the success or failure of a business (Kot 2018). It may further be argued that knowledge about applying the SCM concept to top JSE-listed companies in South Africa is still in its infancy, which increases the necessity of continual empirical studies directed to this critical sector (Kot, 2018)

Ho2*: *Barriers to adapting SCM strategies in encouraging sustainable growth of corporate companies

Companies in emerging economies like South Africa encounter challenges while integrating sustainable SCM practices, such as burdens for execution with a constant demand for low point prices and increasing disputes for textile and apparel suppliers. We discover that the barriers to sustainable SCM practices delay the operation and comparative performance valuation of managerial SCM practices in emerging countries. The difficulties recognised in this research centred on lasting performance since health-related services, trade, manufacturing, and agriculture were the most significant positive contributors to South Africa's economic growth. Yet, these sectors essentially require just-in-time delivery of goods and services hence compelling setting up effective SCM systems.

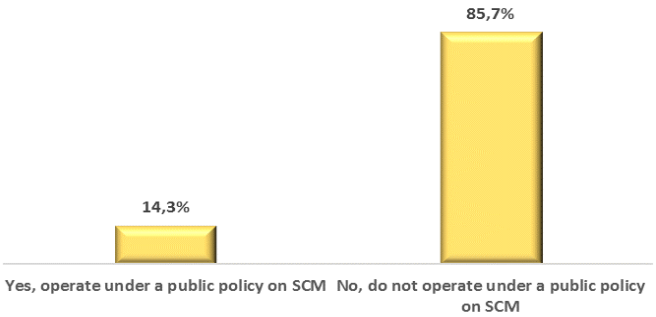


Figure 7. JSE listed companies operating under the public preferential procurement policy
Source: Primary data 2019/2020

As indicated in Figure 7, the results show that more than 85.7% of the respondents' companies do not operate under any public policy on SCM. Such results convey whether preferential public policies are essential for facilitating SCM practices operations in JSE-listed companies. These are large multinational companies; therefore, it is blurred which country transnational public policies should adhere to. Such a considerable percentage (85) demonstrates noncompliance with public policy on SCM in South Africa.

Fundamentally, the high percentage of noncompliance to public SCM policies by JSE-listed companies, as mentioned in paragraphs, compelled the researcher to investigate further the possible contributing factors to this question. As a result, we examined the JSE-listed companies' capacity and willingness to adopt public SCM practices.

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Table 2. The capacity of JSE-listed companies to adopt SCM practices

Crosstab					
			How well is the company positioned for effective SCM		
			Well positioned	Still to get there	Total
Q14 Does your company have a separate SCM department?	Yes	Count	4_a	13_b	17
		% within How well the company is positioned for effective SCM	36.4%	76.5%	60.7%
	No	Count	7_a	4_b	11
		% within How well the company is positioned for effective SCM	63.6%	23.5%	39.3%
Total		Count	11	17	28
		% within How well the company is positioned for effective SCM	100.0%	100.0%	100.0%
Each subscript letter denotes a subset of How well the company is positioned for effective SCM categories whose column proportions do not differ significantly from each other at the .05 level.					

Source: Primary data, 2019/2020

When we asked the affiliated companies how well they were positioned to implement effective SCM practices, 76.5% (Table 2) reported that they had not achieved the required performance of SCM practices for their companies. Yet SCM practices significantly affect the company's overall success and sustainable growth. In addition, one important aspect was that respondents whose companies were not entirely positioned for effective SCM were identified with a separate SCM department than those well set and vice versa. But of course, the figure for well-positioned companies of 34.6% is not satisfactory, thus calling for government intervention to address this problem. These results are consistent with earlier literature demonstrating that public SCM policies have not benefited the participating companies.

Barriers to adopting SCM practices in the JSE-listed companies

Supply chain questions have become even more critical, given that customers and suppliers of firms are now located globally. For that reason, we performed a robust analysis of the significant barriers to the success of SCM practices with the medium and large companies listed on the JSE market. This was intended to accentuate why there is high noncompliance to especially public SCM practices. In an ideal business world, companies would like SCM to be as smooth as possible and without problems confronted. However, the reality is that challenges are unavoidable and thus must be predicted and dispensed with once engaged.



Figure 8. Barriers to effective implementation of SCM practices in medium and large companies
Source: Primary data, 2019/2020

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As seen in Figure 8, the significant barriers to adopting SCM practices in the top 100 JSE-listed companies were rising labour costs, energy or fuel price volatility, market changes, raw material fluctuations, unplanned IT disruptions, geopolitical instability, and currency fluctuations which all generated a mean score of above 3.5. A mean score of 3.5 designated a response of agreement, while a score below 3.4 indicated disagreement. On the other hand, the rising labour costs as a barrier suggests that the top 100 JSE-listed companies are confronted with escalating demand for higher wages and salaries. While regard to energy or fuel price volatility indicates that the top 100 JSE-listed companies have little control over the price of energy or fuel, in the same way, there is little control over changes in the market for consumer goods and services. From the above, the measures taken to mitigate barriers to SCM are creating and implementing a business continuity plan, collaborating with suppliers and customers, and implementing a dual sourcing strategy. To decrease their production costs, notably labour costs, several companies have moved sectors of their industrial production systems to new locations, a process generally known as offshoring (De'murger et al. 2002). Despite the various barriers described above, it was surprising that most companies reported successful performance and continuous, sustainable growth, regardless of many of them ignoring government public SCM procedures. This kind of trend creates an impression that government SCM policies are perhaps unconnected or the business fraternity has noticed any economic benefit from such policies.

Due to limited resources and capacity, it is recommended that companies in developing economies embark only on strategic actions that have a direct link with SCM. This will enable companies to concentrate on what they do best and avoid a meagre deployment of resources. From the emerging economies' perspective, manufacturing firms in developing countries have recently started to pay more attention to green concepts in their supply chain management activities as they have faced tighter environmental restrictions from their governments and intense scrutiny from an increasingly educated society and competitors (Esfahbodi, Zhang, & Watson, 2016).

However, manufacturing firms often struggle to implement SCM initiatives in emerging economies as they are not self-sufficient concerning their internal resources (Paulraj et al., 2008). Given this, SCM practices enable manufacturers in emerging markets to meet their domestic expectations and permit them to compete in the global market because they conform to international legislation (Esfahbodi, Zhang & Watson, 2016).

Moreover, we also investigated the role of preferential public policies in boosting the sustainable growth of the listed companies in the JSE market. In our view, these multinational companies demand conducive national policies guaranteeing their competitiveness. To encourage equal opportunities for a government contract, the Republic of South Africa enacted a *Preferential Procurement Policy Framework Act* No 05 of 2000 (PPPFA), which intended to advance equal opportunities for government contracts, especially for the deprived black-owned South African businesses communities, along with bridging a crated gap by previous governments (Sibanda & Tshikovhi, 2022).

In this article, we evaluated the extent to which companies listed on the JSE market are satisfied with the government's preferential procurement policy and its integration into the SCM system.

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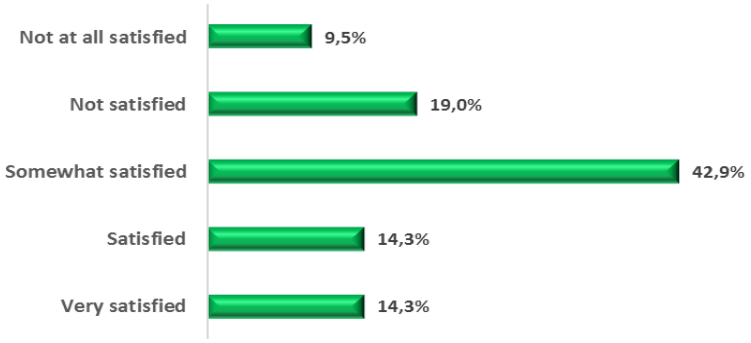


Figure 9. Satisfaction with the public policy regarding SCM
Source: Primary data, 2019/2020

As demonstrated in Figure 9 above, 71.4% (42.9+19+9.5) of the respondent companies disclosed that they were unsatisfied with the current public policy regarding SCM. These results demonstrate public policies on SCM in South Africa and similar emerging economies like India, Brazil, and China. Given that JSE-listed companies are multinationals, they are not sure which country's public policies they adopt in their Supply chain. Worse still, a quick comparison where we discovered that 85% of listed JSE companies do not adhere to any SCM public policy indicates significant neglect of SCM in developing economies. These results are consistent with the findings of (Sibanda & Tshikovhi, 2022), who exposed that the Preferential Procurement Policy Framework Act No 05 of 2000 (PPPFA) had an impact on supply chain performance attributable to the gap between policies and implementation. Moreover, some managers within the supply chain framework lack a complete understanding to adapt to their companies' public policy SCM practices effectively.

On the other hand, Ambe and Maleka (2016) indicated that poor implementation of policies such as the PPPFA were some of the root causes of service delivery problems, leading to poor supply chain performance. Other scientists argue that there is still a gap between the PPPFA and its implementation in the government supply chain, implying the PPPFA is either incorrectly applied or misunderstood altogether (Tshikovhi & Sibanda, 2022).

In contrast, despite noncompliance, we received conflicting results from the respondents, where approximately 72% reported being satisfied with public policies. So, why are they not using these public policies, as illustrated in figure 4? While the answer is not definite, perhaps the point of departure should be whether the policies are needed for multinational companies and from which country they apply to global companies. Despite the prominence of the public preferential SCM function as a significant indicator in estimating government expenditure, Fourie and Malan (2020) reported that this sector remains a big challenge, as it is characterised by criticisms from the different players in the SCM framework. We suggest that government departments study their SCM practices by creating technological improvements in the SCM practices. We also consider making reforms to accommodate the global value chain dynamics to benefit the mutational companies across the globe, as this could enhance supply chain performance.

5 Implications and future research agenda

In terms of practical implications, this research has demonstrated the challenges in managing international or global supply chains. It has provided insights into the role of SCM practices in boosting the sustainable growth of corporate companies and including sustainable approaches to mitigating the barriers to implementing these principles. This article offers vital research insights which contribute to earlier literature since there was a lack of prior research studies on the topic of SCL from a developing economy perspective. Indeed, the study results may

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have a restricted level of argument relative to the entire population of listed companies on the JSE market because of the somewhat small sample utilised in the survey.

These results most likely differ from those obtained within European developed economies and in developing economies in Asia or Africa (Kot, 2018). Since the study was conducted in South Africa only, which is just one of the myriad developing economies, the researcher suggests that in the future, it would be reasonable to achieve a more extensive study embracing more countries from developing economies. Furthermore, with only the top 100 JSE-listed companies as the sample, the researcher suggests using a more significant piece for future research would be worthwhile. The study provides an opportunity for future comparative studies between developing and developed economies to compare the outcomes from the two perspectives of the different economies. It would be interesting to establish both economies' similarities and contrasting results in such a comparison. The top 100 JSE-listed companies are large multinational companies. Therefore, the study provides an opportunity for future studies focusing on small and medium-sized enterprises, excluding the big companies.

6 Conclusions

This paper aimed to examine through an empirical study the impact of supply chain management strategies on firms' sustainable performance for JSE-listed companies in South Africa. SCM questions have become steadily more crucial, given that customers and suppliers of firms are now located globally. We discovered that a large percentage of JSE-listed companies were concentrated within the CBD in Gauteng province. CBDs are bestowed with good infrastructure, for instance, central airport terminals, railway networks and high-way roads, which are critical for air cargo and facilitate on-time custom clearance and delivery.

In addition, the desire of management to create close interactions with their primary clients, for instance, through their corporate head offices located within CBDs, partly explains these questions. While several industries are situated in Gauteng province, the critical question is how these companies have responded to global value chain practices, met customer satisfaction, and minimised operational costs. Therefore, a location that facilitates access to the leading regional markets through proximity to the cross-border gateway is desirable to assist customs-related procedures and take advantage of cargo opportunities.

Regarding how well-listed companies were positioned to implement effective SCM practices to boost sustainable growth, seventy-five (76.5%) stated that they were not well positioned to adapt the SCM practices within their companies. Due to limited resources and capacity, it is recommended that companies in developing economies embark only on strategic actions that have a direct link with SCM. This will enable companies to concentrate on what they do best and avoid a meagre deployment of resources.

The increasing uncertainty of supply networks, internationalisation of companies, and production of a variety of products with shorter life cycles have compelled multinational companies in emerging economies like South Africa to pursue SCM practices outside conventional supply chain approaches.

In summary, knowledge, and implementation of SCM strategies are crucial to the efficiency and effectiveness of multinational companies. Consequently, if multinational companies remain relevant in a competitive global business environment, it is inevitable to integrate SCM strategies within their business processes. It ought to be aware of supply chain uncertainties and environmental sustainability issues. In this regard, we discovered that maintaining a separate SCM department from other functional departments might enhance visibility, reliability, coordination of functions, and resilience to overcome current and future economic challenges.

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CROSS-BORDER MERGERS AND ACQUISITIONS IN MANUFACTURING SECTOR IN THE EUROPEAN AREA*

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Abstract. Ongoing globalization tendencies of business in general and manufacturing in particular has increased rapidly during the last decades as companies have internationalized their value-chains in a search of competitive advantage through scale and scope throughout the world. Precisely cross-border mergers and acquisitions represent a key strategic and dynamic tool for gaining long-term competitive advantage, diversification, geographical expansion or strengthening its own position in the global market. The main goal of the paper is to analyze the impact of the predictors we have chosen on the volume and frequency of realized cross-border mergers and acquisitions in the manufacturing sector with regard to the origin of the source (19) and target (28) countries in the European area in the time period of 1998 and 2021 through analysis of variance (ANOVA). Through partial analyses, we find out how the manufacturing sector affects the total value of cross-border mergers and acquisitions transactions and whether there is a significant difference in the total value of cross-border mergers and acquisitions within the branches of the manufacturing sector. Attention is also paid to the impact of source and target country membership in the EU on the overall value of cross-border mergers and acquisitions. In the analyses, we also identify other significant influences that have an impact on the conditional value of cross-border mergers and acquisitions.

Keywords: cross-border mergers; cross-border acquisitions; ANOVA; analysis of variance, manufacturing sector; sustainability

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1. Introduction and theoretical framework

Mergers and acquisitions (M&As) simply refer to the coming together of two or more enterprises into a single entity. It is an effective way to sustain growth in performance (Zhang et al., 2022) and socio-economic conditions (Stefko et al., 2022a). They play an important role in companies' growth and competitiveness. Nowadays, when the impact of globalization is visible in every respect, but especially in business activity and human resources (Mura et al. 2017), competitiveness is the main factor that can differentiate companies and increase their performance (Pereira-Moliner et al., 2021; Čabinová et al., 2021). Competitiveness is significantly influenced by the latest knowledge, whether in the field of innovation, technology or digital economy (Kiseľaková, Širá, Šofranková 2021). Industry competitiveness might also be increased by the innovativeness in industrial processes and products (Stefko et al., 2019). Innovativeness also increases competitive advantages that firms can gain against their rivals (Ključnikov et al., 2021; Cortes et al., 2021; Škare et al., 2022, Al-Omoush et al., 2022) because businesses can create innovative tools (Civelek et al., 2020; Ključnikov et al., 2020; Kolková & Ključnikov, 2021), new ideas and products more than other companies (Civelek et al., 2021; Stefko et al., 2021). Thus, firms firstly need to focus on innovative activities for their operations (Stefko et al., 2020) to increase their competitiveness (Stefko et al., 2022b; Nassar, Strielkowski, 2022; Gavurova et al. 2021). In this regard, according to Dezi et al. (2018), mergers and acquisitions are a suitable solution to the need for rapid integration of innovative elements into the business model, especially in this global and dynamic environment. Cross-border M&As are defined as mergers and acquisitions, where the acquiring and target firms are from different countries (Dzenopoljac et al., 2022). Merger is defined as the fusing of two or more companies, whether voluntary or enforced (Anyanwu and Agwor, 2015). According to Ahmed (2000), mergers are the joining and unification of separate businesses into one corporation. Nelson (2018) emphasizes that the assets and liabilities of the selling firms are absorbed by the buying firm. In an acquisition, the acquiring company purchases a majority ownership or purchase property to merge the interest of two or more companies. The purchase of assets is the main aspect of an acquisition. Mergers and acquisitions can occur in the form of a vertical or horizontal (Anyanwu and Agwor, 2015). Horizontal cross-border acquisitions are acquisitions within an industry, between competing firms, with the aim of increasing market share. The essence of a vertical acquisition is that the acquirer and the target are connected through the supply chain (Dzenopoljac et al., 2022). The third type is conglomerate acquisitions, which do not include horizontal or vertical forms of acquisitions. In a conglomerate acquisition, an undervalued company is purchased, which is mainly for financial reasons (Dzenopoljac et al., 2022). Emerging multinational enterprises venturing into advanced economies emerge as a timely and important phenomenon that contributes to the theoretical refinement of internationalization of firms and has practical implications for a firm's globalization endeavors in both emerging and advanced economies (Xing et al., 2017; Masood et al. 2017). The market for mergers and acquisitions is characterized by waves. Specifically, there are regularly alternating periods of low and high levels of M&As activities. Especially in the manufacturing industry, regulatory, economic and technological changes cause industry waves and therefore also M&As waves (Andriuškevičius and Štreimikienė, 2021). According to Harford (2005), whether regulatory, economic and technological shocks would lead to a real M&As wave depends on sufficient capital liquidity. There are few factors that can influence the spread of mergers and acquisitions creating the waves, such as economic, financial and legal. In fact, M&As are not extraordinary events that cause these waves but are only one of the strategic options for how a business can prosper (Dezi et al., 2018), (Wang et al., 2022).

In recent years, sustainability has become a key factor in several industries. Adopting a sustainable strategy (Adamišin et al., 2015) contributes to the development of the company and the industry (Risitano et al., 2022; Gavurova et al. 2019). In today's globalized world, more and more emphasis and importance are placed on M&As processes. In addition, the role of sustainability as a prerequisite for success is highlighted in this area. Sustainability is still an open concept which can be divided into three sections; economic, environmental and social, while the mergers and acquisitions have a very specific definition (Belas et al. 2019; Dvorsky et al. 2021). With the pillar of economics, firms aim to attain economic sustainability, through which companies can contribute

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to prosperity. Preserving the environment and the resources for the future generations is the pillar of the Environment. Lastly, providing a lasting value to the society is the aspect of the social pillar (González-Torres et al., 2020). From the long-term point of view of sustainability, a company's position in the competitive environment competitiveness, knowledge, research, and development is the priority (Širá et al., 2020), (Škare et al., 2021).

From the point of view of competitiveness and sustainability, it is an advantage for the company and its business activity, if it operates in a country that is part of a larger economic unit. The advantage of monetary union is undoubtedly the facilitation of the movement of equity capital by promoting financial integration. It has several indisputable financial advantages, mainly consisting in the reduction of capital costs, the elimination of exchange rate risk, the sharing of common trading platforms and others. In addition, membership in the monetary union has an advantage for the country in that it reduces macroeconomic uncertainty by eliminating exchange rate volatility and stabilizes inflation. Subsequently, already made cross-border capital investments between the countries of the monetary union are considered less risky (Coeurdacier et al., 2009).

There are different motives behind cross-border mergers and acquisitions. M&As have a great impact on the resulting corporate strategy and management of corporate finances. Their importance is mainly to ensure the rapid growth of the company, significant consolidation of the place in a specific region or sector, and all this without creating a subsidiary company (Anyanwu and Agwor, 2015). Mergers and acquisitions are in many ways the most important way to increase the value of a business. It is also the fastest way to increase market share, e.g., enter a new market. This time factor is the subject of research at Dezi et al. (2018), too. Dzenopoljac et al. (2022) pointed out that M&As strategies appear to be crucial for knowledge flows.

Other benefits include, for example, that mergers and acquisitions increase the efficiency of the participating companies in the short term, which in the long term can manifest as a monopoly on the market (Mishra 2019). According to González-Torres (2020), the motivation for M&As is also increasing financial synergy alongside a clear expansion strategy. Global trends in mergers and acquisitions show that market leaders prefer to act quickly when expanding and therefore opt for these forms. M&As mainly represent solutions of a strategic nature. In the long term, with the right configuration, they can ensure economies of scale, efficient use of excess resources and increase the efficiency of managers (Pandya et al., 2018). The other motive for M&As is also to avoid the disadvantages of working through a foreign firm.

A firm can gain resources such as a knowledge base, technology and human resources from a local company through the process of cross-border mergers (Warter and Warter, 2014). Lehto and Böckerman (2008) found that cross-border mergers and acquisitions lead to a reduction in the number of employees in production. The impact on employment in the service sector is much weaker.

Manufacturing enterprises, due to the processes and technologies used in production, are to a large extent global and interconnected. For this reason, in the manufacturing sector, restrictions on competition can be considered rare in all types of mergers and acquisitions (Lehto and Böckerman, 2008). In service industries, a domestic buyer may be more interested than a foreign buyer in buying another firm in order to limit competition. This applies to services such as retail (Lehto and Böckerman, 2008; Škare and Riberio Soriano, 2022).

Development trends and procedures are often the impetus for M&As. Especially for the manufacturing sector, technological change, innovation, liberalization, and others are driving forces for M&As, as they have the ability to reconfigure resources and improve business efficiency. Whether economic and technological shocks will lead to an M&A wave depends on sufficient capital liquidity (Andriuškevičius and Štreimikienė, 2021).

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Given that the market for services and some manufacturing industries is sometimes geographically limited (Rovňák, 2020), the sharing of assets may encounter these geographical limitations. Thus, in the aforementioned sectors, asset sharing, and downsizing are more typical for domestic mergers and acquisitions than for cross-border M&As. Therefore, in the service and construction industries, domestic mergers and acquisitions have a greater negative impact on employment than cross-border mergers and acquisitions. In production, such a difference is not expected (Lehto and Böckerman, 2008).

2. Research methodology

The localization of cross-border transaction flows of multinational companies in the form of mergers and acquisitions in the manufacturing sector was based on scientific studies by Head and Ries (2008), McFadden's discrete choice (McFadden, 1974) and studies by Hečkova et al. (Hečková et al., 2016). The database consisted of 117,561 data on cross-border mergers and acquisitions implemented in the countries of the European area in the period from 1998 to 2021, divided into 19 source countries (*i*): *Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Poland, Portugal, Spain, Sweden, Turkey, United Kingdom* a 28 cieľových krajín (*j*): *Austria, Belgium, Bulgaria, Cyprus, Czech republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom.* The basic information sources within the analyzed database were data from the Zephyr and Orbis databases (Bureau van Dijk, 2022) and Eurostat (European Commission, 2022). The extreme value of a cross-border transaction in 2000 with a capitalization volume of 204.73 million euros between the source country United Kingdom and the destination country Germany was excluded from the data-base. The subject of the analysis was cross-border transactions of mergers and acquisitions in the manufacturing sector with a minimum value of one transaction in the amount of 1 million euros. After excluding extreme values, the total number of analyzed data for the manufacturing sector was $N = 2527$. The analyzed manufacturing sectors are based on the classification of manufacturing sectors used by Bureau van Dijk in the Zephyr and Orbis databases (Bureau van Dijk, 2022) divided into *(s): 1 - Chemicals, rubber, plastics, non-metallic products, 2 - Food, beverages, tobacco, 3 - Gas, Water, Electricity, 4 - Machinery, equipment, furniture, recycling, 5 - Metals & metal products, 6 - Primary Sector (agriculture, mining, etc.), 7 - Publishing, printing, 8 - Textiles, wearing apparel, leather, 9 - Wood, cork, paper, 10 – Construction.*

The main goal is to analyze the influence of our selected predictors on the volume and frequency of realized cross-border mergers and acquisitions in the manufacturing sector with regard to the origin of the source and destination countries within the countries of the European area between 1998 and 2021. The partial objectives (research questions) of the paper are to identify whether, (a) the manufacturing sector affects the total value of cross-border mergers and acquisitions, (b) there is a significant difference between manufacturing sectors in the total value of cross-border mergers and acquisitions, (c) the membership of the source and target countries in the EU total value of cross-border mergers and acquisitions, (d) there is a significant interaction between the manufacturing sector and the EU membership of the target and source country with an impact on the total value of cross-border mergers and acquisitions.

The dependent variable in the analysis is the total value of cross-border assets acquired through mergers and acquisitions by the source country *i* in the target country *j* in the sector *s* and at time *t* ($M\&A_{ij,s,t}$). The independent variables are the branches of the manufacturing sector (*s*) and dummy variable source membership (*i*) and target country (*j*) in European Union ($EU_{i,t}\,EU_{j,t}$) acquiring the value 1 in the event that both the source country *i* and the target country *j* were members of the European Union at time *t*, otherwise acquiring the value 0.

In order to fulfill the partial goals of the contribution, the Analysis of Variance (ANOVA) was chosen, where we implemented the basic statistical analysis of the general factor model (1) to predict the investigated response *y*

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depending on the change of the investigated independent variables x_i. The variance analysis for the investigated parameter y represents a basic statistical analysis of the appropriateness of the used general model (1).

$$\hat{y} = b_0 \cdot x_0 + \sum_{j=1}^{N} b_j \cdot x_j + \sum_{\substack{u,j=1 \\ u \neq j}}^{N} b_{uj} \cdot x_u \cdot x_j \quad (1)$$

where b_0, b_j, b_{uj}, b_{jj} are the respective regression coefficients and x_j are the respective independent variables, factors.

Using variance analysis, on the one hand, it is analyzed whether the variability caused by random errors is significantly smaller than the variability of the measured values explained by the model. The second statistical view of ANOVA arises from its basic nature, where we test the null statistical hypothesis, which states that none of the effects used in the model has an effect on a significant change in the investigated variable (y). The basic general ANOVA table is shown in Table 1.

Table 1. General ANOVA table

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Model	$DF_{Model}=a-1$	S_{Model}	$MS_{Model}= S_{Model}/ DF_{Model}$	$F= MS_{Model}/ MS_{Error}$	p_M
Error	$DF_{Error}=N-a$	S_{Error}	$MS_{Error}= S_{Error}/ DF_{Error}$		
C. Total	$DF_{C.Total}=N-1$	$S_{C.Total}$	$MS_{C.Total}= S_{C.Total} / DF_{C.Total}$		

Source: own sourcing

Thus, if we consider as a dependent variable the total value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) and the independent variables of the manufacturing sector (s) and the membership of countries in the European Union $EU_{i,t}EU_{j,t}$, where the value 1 means that the source country i as the target country j was also a member of the European Union at time t, otherwise it takes on the value 0, so in accordance with the general model (1) and in terms of partial goals (research questions), we will also subsequently analyze the mutual interaction of the variables of the manufacturing sector (s) and membership of countries in the European Union $EU_{i,t}EU_{j,t}$.

3. Methodology

The presented The data preparation process started with the extraction of 117 561 data on the number and volume of realized cross-border mergers and acquisitions with a minimum value of one transaction in the amount of 1 million euros in 19 source and 28 target countries of the European area and the values of the other predictors selected by us. We use a comprehensive dataset on global mergers and acquisitions from Bureau van Dijk Zephyr and Orbis database (Bureau van Dijk, 2022), spanning the period 1998-2021. The dataset consists of individual cross border equity deals between the home country of the acquirer and the host country where the target firm is domiciled. The source of other statistical data used is Eurostat (European Commission, 2022). The basis for the modeling was the scientific studies of Head and Ries (2008), Coeurdacier, De Santis, Aviat (2009), McFadden's discrete choice (McFadden, 1974) and the study of Hečkova, et al. (Hečková, et al., 2016). The extreme value of the capitalization volume of 204.73 million euro was excluded from the research set between the United Kingdom as a source country and Germany as a target country implemented in 2000.

$M\&A_{ij,s,t}$ represents the total value of assets acquired through cross-border mergers and acquisitions by source country i in target country j in sector s and at time t. An important predictor that affects the volume of cross-border mergers and acquisitions can be considered the value of the gross domestic product of the source (i) and target country (j) in sectore s and at time t ($GDP_{j,s,t}$, $GDP_{i,s,t}$). Using the logarithm of their values eliminates their

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elasticity and does not affect the overall result. The following variables were further included in the model: the proximity of the countries, the specificity of their culture and the relatedness of the language. Proximity of the source and target countries is quantified by the distance of their capitals denoted as $distance_{ij}$, the sharing of a common border is quantified by the binary variable $border_{ij}$, which takes the value 1 in the positive case and the value 0 in the negative case. The binary variable $common\ language_{,j}$ assumes the value 1 in the case of the same official language and the value 0 otherwise, and was considered to quantify the influence of language relatedness on the volume of cross-border assets. The goal is to estimate the weights of the considered predictors on the total value of assets acquired through cross-border mergers and acquisitions $M\&A_{ij,s,t}$ by source country *i* in target country *j* in sectore *s* and at time *t*. The other predictors in the considered model represent dummy variables that relate to the membership of the source and target countries in the European Union and in the European Monetary Union, namely $EU_{i,t}EU_{j,t}$ takes the value 1 if the source country *i* as well as the target country *j* was a member of the European Union at time *t*, otherwise it takes the value 0. The variable $EMU_{i,t}EMU_{j,t}$ take the value 1, if the source country i as well as the target country j was a member of the European Monetary Union at time t, otherwise it takes the value 0.

Analysis of the effect of selected predictors and estimation of their regression weights on the total value of assets acquired through cross-border mergers and acquisitions $M\&A_{ij,st}$ by source country *i* in target country *j* in sector *s* and time *t* is carried out using a regression equation in the form:

$$\log(M\&A_{ij,s,t}) = \beta_0 + \beta_1 \cdot \log(HDP_{i,s,t}) + \beta_2 \cdot \log(HDP_{j,s,t}) + \beta_3 \cdot \log(Distance_{i,j}) + \\ + \beta_4 \cdot Border_{i,j} + \beta_5 \cdot ComLang_{i,j} + \beta_6 \cdot (EU_{i,t}EU_{j,t}) + \beta_7 \cdot (EMU_{i,t}EMU_{j,t}) \quad (1)$$

For the analysis itself, a generalized linear regression model with a gamma distribution and a logarithmic linking function was chosen. Generalized regression models, both linear and non-linear, cover a wide range of statistical methods with different types of variables that are widely used in economics and management fields. As part of the analysis itself, several regression models were tested, while their results were comparable in terms of the significance of the regression coefficients.

Generalized linear regression model with normal distribution and linking function ident was identical to the selected model in terms of the significance of the predictors and their effect. A similar result was also achieved with the classical linear model by forward stepwise regression analysis with the achieved level of significance p = 0.000 for Fisher's F-test, and with a value of adjusted index of determination at the level of 0.883. The simulation of the model by expanding the interactions of individual predictors no longer led to a clearly better result in terms of quality.

4. Results

The analysis of the source countries *(i)* shows that the largest number of cross-border mergers and acquisitions in the manufacturing sector in the period under review was directed from Great Britain with a total of 363 mergers and acquisitions with a total value of €95,337 million, while the average value of the total value for one cross-border merger and acquisition in the manufacturing sector thus represents €262,637,001 ± €110,698,034. The second most important source country in terms of the number of cross-border mergers and acquisitions in the manufacturing sector is France with a total of 309 transactions, followed by Germany with 297 transactions and the Netherlands with 288 transactions. In terms of the total value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) the most important position in the manufacturing sector belongs to France, with a total volume of cross-border mergers and acquisitions worth €205,425 million. In a more detailed analysis, we find that French cross-border mergers and acquisitions were directed primarily to Italy with a total value of €48,085 million with the number of 50 cross-border mergers and acquisitions. Other important countries where French cross-border assets

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went were the Netherlands (€33,291 million; 27), Germany (€31,869 million; 41), Great Britain (€28,314 million; 47) and Belgium (€27,005 million; 31). The second most important country in terms of the total amount of cross-border mergers and acquisitions in the manufacturing sector is Germany with a total volume of assets of €200,548 million (297), whose cross-border assets were directed primarily to Spain (€53,379 million; 27), Great Britain (€53,186 million; 54), France (€42,594 million; 32) and the Netherlands (€15,559 million; 31)). The third most important country in terms of the amount of cross-border mergers and acquisitions is the Netherlands with a total value of €126,424 million and 288 completed mergers and acquisitions, which were directed primarily to Luxembourg (€31,786 million; 5), Great Britain (€24,449 million; 50), Germany (€15,727 million; 44), France (€13,287 million; 33) and Sweden (€11,289 million; 6). Within the analysis of the three most important source countries *(i)*, we also see cross-border mergers and acquisitions that were directed in the manufacturing sector from France (€162,453,570; 4), from Germany (€3,259 million; 3) and from the Netherlands (€9,168,550; 3) to Slovakia.

From the analysis of target countries *(j)*, the most significant country with the most cross-border mergers and acquisitions within the manufacturing sector is Germany with a total of 402 transactions, followed by France with 333 transactions, Great Britain with 249 transactions, Spain with 220 transactions, the Netherlands with 218 transactions and Italy with 212 transactions. From the point of view of the total value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) the most important target country *(j)* is Spain with the amount of cross-border assets of €163,733 million. Cross-border assets went to Spain primarily from Italy (€57,962 million; 44), Germany (€53,379 million; 27), Great Britain (€24,007 million; 30) and France (€13,296 million). The second most important target country to which cross-border assets in the form of mergers and acquisitions were directed is Germany (€150,695 million; 402), while cross-border assets were directed to Germany primarily from Ireland (€33,015 million; 9), France (€31,869 million; 41), Great Britain (€15,918 million; 87), the Netherlands (€15,727 million; 44), Luxembourg (€14,087 million; 19) and Denmark (€10,347 million; 19). The third most important target country in terms of the total amount of cross-border assets in the form of mergers and acquisitions is Great Britain (€135,481 million; 249), while cross-border assets to Great Britain were directed primarily from Germany (€53,186 million; 54), France (€28,314 million; 47), the Netherlands (€24,449 million; 50) and Belgium (€12,292 million; 23) and Italy (€5,567 million; 20). A total of 19 cross-border mergers and acquisitions in the amount of €5,288 million were implemented in Slovakia as the target country, primarily from Germany (€3,259 million; 3); Denmark (€970,281,750; 3), Italy (€840,000,000; 1) and France (€162,453,570; 4). From the point of view of the basic variance analysis, it follows that the first independent variable manufacturing sector *(s)* with a significant influence on the change in the total value of cross-border mergers and acquisitions at the chosen significance level $\alpha = 0.05$ ($p = 0.00030$) also significantly influences the change in the value of the investigated variable ($M\&A_{ij,s,t}$) and membership of the source *(i)* and destination *(j)* countries at time *t* in the European Union ($p = 0.009053$), as documented in Table 2. At the same time, however, we also observe the influence of the absolute member of the model (Intercept) with a significance level of $p = 0.000249$. This fact suggests that there are other significant influences that affect the conditional value of cross-border mergers and acquisitions, which we did not consider in the paper.

Table 2. ANOVA table for the analysis of the manufacturing sector

Effect	*SS*	*df*	*MS*	*F*	*p*
Intercept	3.950629E+13	1	3.950629E+13	13.45767	0.000249*
Sector	1.083702E+14	9	1.204113E+13	4.10177	0.000030*
$EU_{i,t}EU_{j,t}$	2.002965E+13	1	2.002965E+13	6.82302	0.009053*
Error	7.385963E+15	2516	2.935597E+12		

*SS – Sum of Squares, df – degree of freedom, MS – Mean Square, F – F-ratio, * - signifikatné na hladine významnosti α = 0.05*
Source: own sourcing

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As already mentioned, the first analyzed independent variable is the manufacturing sector. From the point of view of the total value of cross-border mergers and acquisitions, most of them went to the *Gas, Water, Electricity* (*s3*) sector, amounting to €211,525 million € (245), followed by the *Chemicals, rubber, plastics, non-metallic products sector* (*s1*) with 416 acquisitions and mergers with a total value of €210,164 million, followed by the *Machinery, equipment, furniture, recycling sector* (*s4*) with 805 acquisitions and mergers with a total value of €175,759 million and the *Food, beverages, tobacco sector* (*s2*) with 310 acquisitions and mergers in the total value of €104,309 million. Cross-border mergers and acquisitions in the *Metals & metal products sector* (*s5*) with the number of 177 transactions and a total value of €77,692 million can also be considered significant and to the *Construction sector* (*s10*) with 152 acquisitions and mergers with a total value of €73,679 million, with a value higher than 50 million euro. More detailed average values of cross-border mergers and acquisitions according to the individual analyzed production sectors are provided in Figure 1.

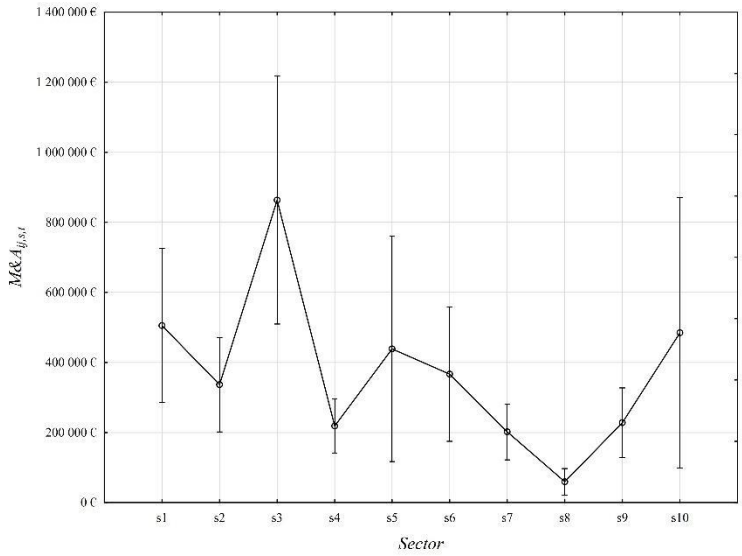


Figure 1. Average values cross-border mergers and acquisitions by individual analyzed manufacturing sectors (s1 - Chemicals, rubber, plastics, non-metallic products, s2 - Food, beverages, tobacco, s3 - Gas, Water, Electricity, s4 - Machinery, equipment, furniture, recycling, s5 - Metals & metal products, s6 - Primary Sector, s7 - Publishing, printing, s8 - Textiles, wearing apparel, leather, s9 - Wood, cork, paper, s10 – Construction)
Source: own sourcing

Within the mean values of cross-border mergers and acquisitions (M&Aij,s,t) there are some significant differences at the significance level $\alpha = 0.05$ between the individual analyzed manufacturing sectors. The stated differences between the mean values are given with consideration of ± 95% confidence intervals of the individual values, and it is also necessary to remember that in the case of a positive sign of the difference, the first mentioned sector has a higher mean value than the second in order. Significant differences in mean values are observed primarily between the sector Gas, Water, Electricity (s3) and the sector Chemicals, rubber, plastics, non-metallic products (s1) with a difference value of €358 582.108 ($p = 0.009$), between the sector Machinery, equipment, furniture, recycling (s4) and the Chemicals, rubber, plastics, non-metallic products sector (s1) with a difference value of – €308 205.034 ($p = 0.003$), other significant differences are observed between the Textiles, wearing apparel, leather sector (s8) and the Chemicals, rubber, plastics, non-metallic products (s1) (- €449 438.113; $p = 0.044$), between Gas, Water, Electricity sector (s3) and the Construction sector (s10) (€387 791.808; $p = 0.028$), between the Gas, Water, Electricity sector (s3) and the Food, beverages, tobacco sector (s2) (€518 085.083; $p = 0.028$), between the Machinery, equipment, furniture, recycling sector (s4) and the Gas, Water, Electricity sector (s3) (- €666 787.142; $p = 0.000$), between the Metals & metal products sector (s5) and the Gas, Water, Electricity sector (s3) (- €426 641.821; $p = 0.012$), between the Primary Sector (s6) and the Gas, Water, Electricity sector

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(s3) (- €487 312.105; p = 0.021), between the Publishing, printing sector (s7) and the Gas, Water, Electricity sector (s3) (-€697 934.894; p = 0.000), between the Textiles, wearing apparel, leather sector (s8) and the Gas, Water, Electricity sector (s3) (- €808 020.221; p = 0.001) and between the Wood, cork, paper sector (s9) and the Gas, Water, Electricity sector (s3) (- €642 403.547; p = 0.000). Figure 2 provides a graphical representation of all the differences in the mean values of the average height of cross-border mergers and acquisitions for individual manufacturing sectors.

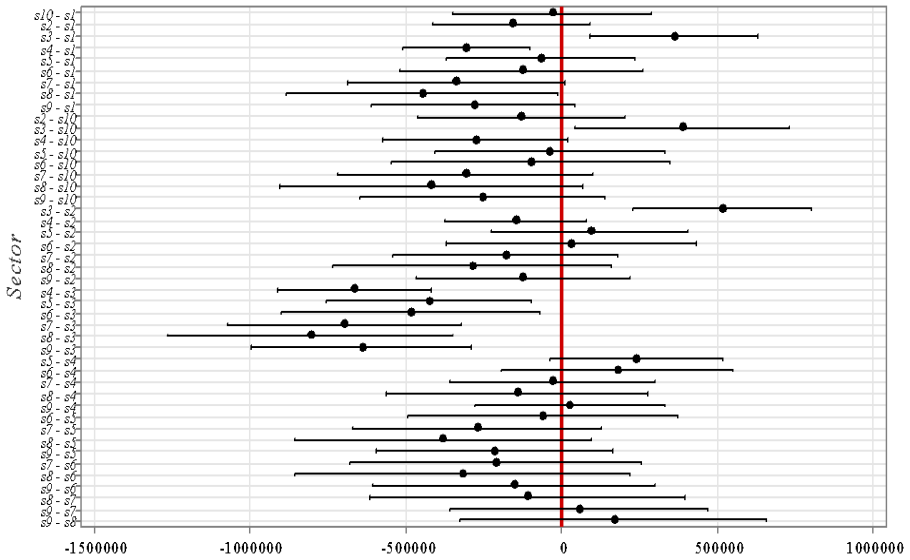


Figure 2. Graphic representation of the differences in the mean values of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) for individual manufacturing sectors (s1 - Chemicals, rubber, plastics, non-metallic products, s2 - Food, beverages, tobacco, s3 - Gas, Water, Electricity, s4 - Machinery, equipment, furniture, recycling, s5 - Metals & metal products, s6 - Primary Sector, s7 - Publishing, printing, s8 - Textiles, wearing apparel, leather, s9 - Wood, cork, paper, s10 – Construction)
Source: own sourcing

The second analyzed independent variable, which, according to the results of the variance analysis (Table 1), is significant at the selected significance level α = 0.05, is the membership of the source *(i)* and target *(j)* countries at time *t* in the European Union. From the point of view of the total value of cross-border mergers and acquisitions, the most cross-border financial assets were among the countries that were members of the European Union at time *t*, namely €916,361 million (*N* = 2306). In the opposite case ($EU_{i,t}EU_{j,t}$ = 0) the total amount of cross-border mergers and acquisitions is €30,676 million (*N* = 221). Based on this fact, there is at the same time a significant difference between the mean values of the amount of cross-border mergers and acquisitions in the case where $EU_{i,t}EU_{j,t}$ = 1 a $EU_{i,t}EU_{j,t}$ = 0. The total amount of the difference, taking into account the confidence intervals of individual mean values, amounts to €318,366,308 which reached the level of significance *p* = 0.009 (Figure 3).

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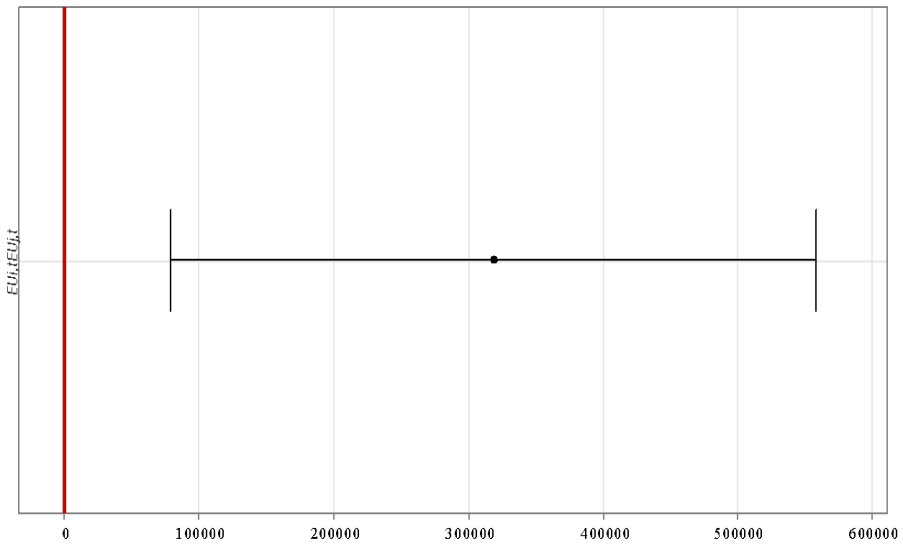


Figure 3. Graphic representation of the difference in the mean values of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$)for the membership of the source (i) and target (j) countries in the European Union
Source: own sourcing

The last partial goal was to identify the impact of the existence of a significant interaction between the industry of the manufacturing sector *(s)* and the membership of the source *(i)* and target *(j)* countries in the European Union at time *t*. Based on the analysis, we can say that the analyzed interaction is not significant at the selected level of significance $\alpha = 0.05$ (p=0.958), which is also evident from Figure 4.

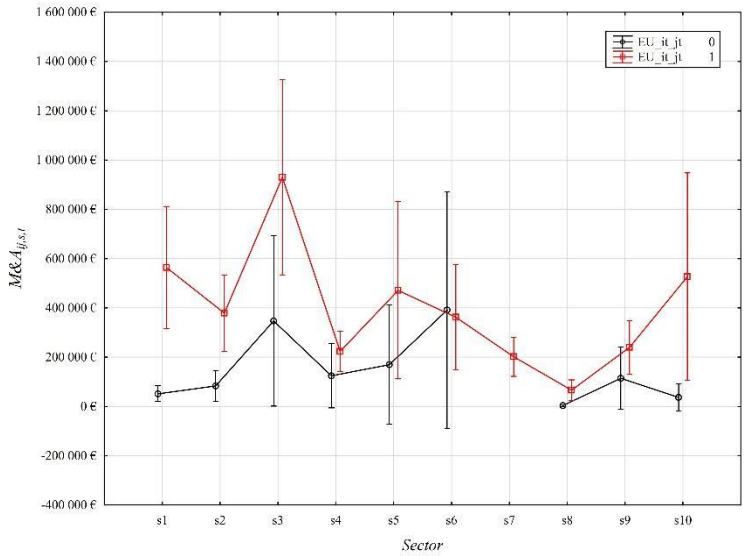


Figure 4. Average values of cross-border mergers and acquisitions according to the individual sectors analyzed and the EU membership of the source and target countries (s1 - Chemicals, rubber, plastics, non-metallic products, s2 - Food, beverages, tobacco, s3 - Gas, Water, Electricity, s4 - Machinery, equipment, furniture, recycling, s5 - Metals & metal products, s6 - Primary Sector, s7 - Publishing, printing, s8 - Textiles, wearing apparel, leather, s9 - Wood, cork, paper, s10 – Construction)
Source: own sourcing

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In conclusion, it can be summarized that the analysis confirmed the significant influence of the manufacturing sector *(s)* and the membership of the source *(i)* and target *(j)* country in the EU on the conditional mean value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) at the selected level of significance $\alpha = 0.05$ and at the same time there was no statistically significant effect of their joint interaction. Likewise, based on the results of the variance analysis (tab.1), where the absolute term (Intercept) of model (1) is significant, this model has further refinement potential by considering other possible significant influences.

5. Discussion and Conclusion

In conclusion, it can be concluded that the analysis confirmed the significant influence of the manufacturing sector and the membership of the source and destination countries in the EU on the conditional mean value of cross-border mergers and acquisitions (at the chosen level of significance $\alpha = 0.05$), and at the same time there was no statistically significant effect of their joint interaction.

Various regional, economic and currency agreements between countries have a significant impact on cross-border mergers and acquisitions. They make it possible to increase profitability, as regional agreements increase the size of the market and promote competition, while also reducing the costs of financial transactions related to financial integration, taking into account the stability of the exchange rate and the level of inflation (Coeurdacier, De Santis, Aviat 2009). The analysis of the source countries shows that the largest number of cross-border mergers and acquisitions in the manufacturing sector was directed from Great Britain. From the analysis of the target countries, Germany is the most significant country where the flow of cross-border mergers and acquisitions within the manufacturing sector was directed. From the analysis of the source and target countries, significant specificities related to the countries of Europe emerge. Moschieri and Campa (2014) also draw attention to this fact. Vasconcellos, Kish (1998) also pointed out the attractiveness of the M&As market in Europe. Another of our conclusions pointed to the fact that the manufacturing sector variable significantly affects the value of cross-border mergers and acquisitions and also has an equally significant effect on the membership of the source and target countries in the European Union. In this respect, our results agree with the conclusions of, for example, Coeurdacier, De Santis, Aviat (2009), who examined M&As in the manufacturing sector and pointed out that the membership of both countries in the EU is a significant determinant of the volume and number of M&As. If we were to analyze more closely the influence of individual production branches of the manufacturing sector, only the *Gas, Water, Electricity* branch with a significance value of $p = 0.000$ has a significant change in the value of assets acquired through cross-border mergers and acquisitions, while its influence on the investigated value of $M\&A_{ij,s,t}$ represents 19.983% and *Machinery, equipment, furniture, recycling sector* with an achieved significance value of $p = 0.000$ and 10.334% due to the change in the value of the analyzed dependent variable. Thus, the *Gas, Water, Electricity sector* achieved the first place among manufacturing sectors in our survey. In previous studies, the potential of this sector within M&As was pointed out in particular by Niemczyk et al. (2022), but also other authors, such as Andriuškevičius, Štreimikienė (2021), Codognet et al. (2002), Monastyrenko (2017). Codognet et al. (2002) also outlined that the leading countries in this area are Germany and the UK, which we also confirmed with our analyses. The last significant conclusion we reached is that the influence of the absolute member of the model (Intercept) with a significance level of $p = 0.000249$ points to the fact that there are other significant influences that affect the conditional value of cross-border mergers and acquisitions which was not considered within this contribution. In this context, it would be appropriate to verify with further research whether and what effect goodwill has on M&As in the manufacturing sector, as investigated by Zhang et al. (2022). However, their research was only carried out in Chinese manufacturing enterprises. It would be interesting to apply this predictor also in our research sample in order to confirm or refute their conclusions. The results of Liu et al. (2021) show that prospective firms are more likely to conduct innovation-driven M&As. In this regard, we could also examine the impact of innovation on M&As. The study by Kim, Davis (2019) is also interesting, according to which it would be appropriate to verify productive resource efficiency in connection with M&As on our sample.

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ASSESSING THE TRANSPORT DEVELOPMENT OF THE EUROPEAN UNION COUNTRIES*

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Abstract. In their previous publication, the authors proposed to assess the transport development of any territory (but mainly the territories of the world's countries) according to the following three components: transportization level of a territory, transport internationalization level of a territory and quality of transport in a territory. The authors assessed three components of the transport development of a territory each separately, including them in further empirical analysis. In the course of the authors' empirical research, it became necessary to improve the methodology for assessing the transport development of a territory. The purpose of this study is to develop a single tool for measuring the transport development of a territory – an index – and to test it on the example of the European Union countries. Methods used in the study: monographic method, logical analysis and synthesis of the conceptual essence of the phenomenon 'transport development of a territory', index method – a quantitative technique for assessing the transport development of a territory based on the minimum and maximum values. The information base of the study is the data of the Global Competitiveness Report, as well as data from GlobalEconomy.com and the World Factbook for the EU countries. As a result of the study, the authors developed a new Territory Transport Development Index (TTDI), which includes not three, but four components: transportization level of a territory, transport internationalization level of a territory, quality of the transport infrastructure in a territory, efficiency of the transport services in a territory. These four components of the Index developed by the authors differ from the previously proposed components of the transport development of a territory. This difference is determined by the results of study carried out by researchers of the Riga Technical University (RTU), which confirm the importance of transport infrastructure in the use of a territory's resources, as well as the results of other comparative studies on the transport infrastructure of the EU countries. Thus, the third component (quality of transport in a territory) was divided into two separate components: quality of the transport infrastructure in a territory and efficiency of the transport services in a territory, including additional indicators in the first of them. The authors tested the new Index by assessing the European Union countries and comparing them both in general transport development and separately in its different aspects.

Keywords: transport development of a territory; assessment methodology; Territory Transport Development Index (TTDI); the European Union countries; economic growth; sustainable transport; transportation infrastructure; carbon emissions; environmental degradation.

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1. Introduction

The transport sector is a key part of the economy. The economist of *Latvijas Banka* I. Kasyanovs called this the bloodstream of the economy emphasizing the special role of various indicators of the transport development in a territory's macroeconomic development (Kasjanovs, 2012). Even more so in a global economy where economic possibilities have become more linked to the movement of people and goods, including information and communication technology (Kherbash & Mocan, 2015). Transport infrastructure that is dense and well-connected is often correlated with high levels of economic growth. Multiplying impacts such as increased market access, employment possibilities and more investments occur when transportation networks are well-functioning. Deficient transportation networks can have an economic impact in terms of diminished or lost opportunities and worse quality of life, as well as an impact on the environment (Wang et al., 2018; Meng & Han, 2018; Prus & Sikora, 2021).

In their previous publications (Komarova et al., 2021; Balodis, 2022), the authors proposed to evaluate the transport development of any territory (but mainly the territory of the world's countries) according to three components: transportization level of a territory, transport internationalization level of a territory and quality of transport in a territory. The authors separately assessed each of the three components of the transport development of a territory, including them in the further empirical analysis. In the course of the authors' empirical research (Komarova et al., 2021; Balodis, 2022), there is a need to improve the methodology for assessing the transport development of a territory. Thus, the purpose of this study is to develop a single instrument for measuring the transport development of a territory – an index – and to test it on the example of the European Union countries.

To achieve the purpose of this study, the authors used empirical data from the Global Competitiveness Report of the World Economic Forum (World Economic Forum, 2019), as well as GlobalEconomy.com (GlobalEconomy.com, 2022a, 2022b, 2022c) and the World Factbook of the Central Intelligence Agency (Central Intelligence Agency, 2021) data on the transport development of the territories of 27[†] European Union countries in 2019. The following methods were used to achieve the purpose of the study: monographic method, logical analysis and synthesis of the conceptual essence of the phenomenon 'transport development of a territory', index method – a quantitative technique based on minimum and maximum values (Motoryn et al., 2020; Rybalkin, 2022), which is applicable to the assessment of the transport development of a territory (Ambarwati et al., 2017; Gudmundsson & Regmi, 2017; Walters et al., 2022).

2. Literature review

In order to achieve the purpose of this study, the authors carried out the literature review on the most significant components of the transport development of a territory, especially in the European Union countries. In the scientific literature, there are some comparative studies on the transport sector of the EU countries – in particular, on the transport infrastructure development, public performance and long-run economic growth in the EU countries (Cigu et al., 2018), on resilient transport infrastructure systems and sustainable economic growth in the EU countries (Gherghina et al., 2018), on the development of intermodal transport in new European Union states (Šakalys & Palšaitis, 2006), as well as on the impact of transport infrastructure on international competitiveness of Europe (Purwanto et al., 2017).

Thus, a review of recent scientific publications on the transport development of a territory allows the authors to conclude that the conceptual essence of the phenomenon 'transport development of a territory' includes several

[†] Malta is not included in the empirical data analysis due to its very small territory (316 km^2).

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aspects, covering at least such areas as the efficiency and sustainability (including 'green transportation' – Negrutiu et al., 2020) of transport services, the state of the transport infrastructure, connectivity and density of transport routes. The main trajectory for the transport development of a territory is the sustainable transport (Greene & Wegener, 1997; Steg, 2007; Szczuraszek & Chmielewski, 2018; Mesjasz-Lech & Wlodarczyk, 2022) – within the Smart City concept (Bubeliny & Kubina, 2021; Burlacu et al., 2022) and other conceptual frameworks (Lejda et al., 2017; Hermelin & Henriksson, 2022).

In the scientific literature, there are also some attempts to develop a single instrument for measuring the transport development of a territory – an index. For example, the Sustainable Urban Transport Index (SUTI) for cities in the Asia-Pacific region, which reflects urban transport-related SDGs relevant for Asian cities, based on literature review and expert consultations (Gudmundsson & Regmi, 2017). Another metric expressing the aggregate performance of the city's transport systems is the Transport Performance Index (TPI), in which the total cost of transport system (operational and environmental costs) is divided by willingness to pay (WTP) for transport plus the willingness to accept (WTA) the environmental effects on residents (Ambarwati et al., 2017). The most recent index in the area of transport is the Rural Transport Implementation Index – a much-needed tool to support the implementation of connected, autonomous and electric vehicles (CAEVs) in rural areas (Walters et al., 2022). All these indices are applicable to the assessment of the transport development of a specific – urban or rural – territory (or of a specific aspect – for example, an Index of Transport-User Vulnerability (Glensor, 2018)), but not of a country's territory as a whole.

Transport sector not only provides support for economic and social development, but also has an important impact on carbon emissions. Therefore, some researchers have developed special indices to measure the contribution of the transport sector to environmental degradation (Zhou et al., 2022). For example, based on the DPSIR model, the constraint index of the transportation carbon emissions in the Pearl River Delta under Dual carbon' was constructed (Zhou et al., 2022). The study found that there are six levels of constraints. The economic development level, carbon emission scale and the 'Dual carbon' goals are the core factors of the entire system. Developing public transport and intelligent transportation and increasing investment in new energy infrastructure and technology are conducive to the development of transportation system in the Pearl River Delta and the realization of 'double carbon' goals (Zhou et al., 2022).

3. Theoretical basis and methodology of the research

As described in the Introduction, in their previous publications (Komarova et al., 2021; Balodis, 2022), the authors proposed to evaluate the transport development of any territory (but mainly the territory of the world's countries) according to three components: transportization level of a territory, transport internationalization level of a territory and quality of transport in a territory, but in the course of the empirical research (Komarova et al., 2021; Balodis, 2022), it became necessary to improve the methodology for assessing the transport development of a territory for the following reasons:

- while analyzing more scientific publications on the topic of the study, the authors realized that there are not enough components in the conceptual understanding of the transport development of a territory, which would characterize the studied phenomenon in the most comprehensive way;
- measuring each separate component of the transport development of a territory, the authors saw the need to develop a single instrument for assessing the transport development of a territory – an index that would allow easier comparison of territories with each other and follow the dynamics of the transport development of a territory in relation to itself.

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I. NIedole and D. Averyanov conducted a study on the example of Kuldiga county (Latvia), the results of which confirmed the importance of transport infrastructure in the use of the territory's resources (Niedole, Averyanov, 2011). I. NIedole and D. Averyanov empirically proved that the use of the territory's resources is a function of the development of its transport infrastructure. Thus, the results of the analysis based on energy, transport, ICT, and financial infrastructure indices exhibit that cumulative and disaggregated (transport, energy, financial, and information and communication (ICT)) infrastructure development increase resources consumption in BRIGS countries (Sun et al., 2022). The significance of the transport infrastructure in the long-run sustainable economic growth has been proved also in other comparative studies on the transport sector of the EU countries (Cigu et al., 2018; Gherghina et al., 2018). Moreover, the Polish scientists A. Mesjasz-Lech and A. Wlodarczyk within their study on the role of the transport infrastructure in development of sustainable road transport confirmed that the development of the transport infrastructure leads to a limited negative impact of road transport on the natural environment (Mesjasz-Lech & Wlodarczyk, 2022).

Therefore, the authors included the quality of the transport infrastructure in a territory as a necessary component in the conceptual understanding of the phenomenon 'transport development of a territory'. As a result, the transport development of a territory includes the following four components with the corresponding indicators:

1) transportization[‡] level of a territory:
   - road density per 1000 km^2;
   - railroad density per 1000 km^2;
   - inner waterways density per 1000 km^2.
2) transport internationalization level of a territory:
   - airport connectivity;
   - liner shipping connectivity.
3) quality of the transport infrastructure in a territory:
   - quality of road infrastructure;
   - road connectivity;
   - quality of railroad infrastructure;
   - quality of port infrastructure;
   - quality of air transport infrastructure.
4) efficiency of the transport services in a territory:
   - efficiency of train services;
   - efficiency of air transport services;
   - efficiency of seaport services.

[‡] More detailed analysis of difference between terms 'transportization' and 'transportation' see in Balodis, 2022.

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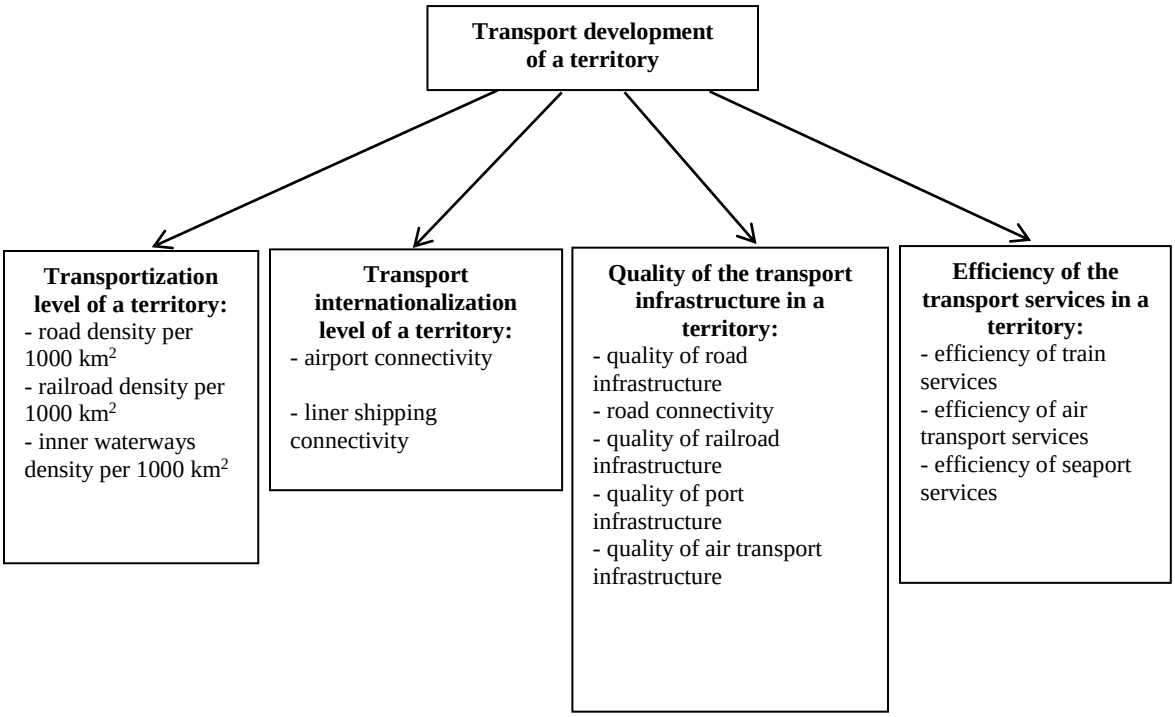


Fig. 1. The structure of the concept 'transport development of a territory'

Source: the authors' scheme based on Komarova et al., 2021; Balodis, 2022; Niedole, Averyanov, 2011.

All components of the transport development of a territory – transportization level of a territory, transport internationalization level of a territory, quality of the transport infrastructure in a territory and efficiency of transport services in a territory – are selected for further empirical analysis for two main reasons:

1) they describe the transport development of a territory;

2) there is empirical data on them for the European Union countries.

The following table presents the system of components and indicators of the transport development of a territory, which [system] includes the names of components and indicators, their empirical interpretation, measurement unit and scale, as well as the source of empirical data for each indicator.

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Table 1. The system of components and indicators of the transport development of a territory

Indicator title	Indicator empirical interpretation	Indicator unit and scale	Empirical data source
Transportization level of a territory			
Road density per 1000 km^2	Length of roads in kilometers per 1000 square kilometers of a territory	In absolute terms	World Factbook 2021
Railroad density per 1000 km^2	Length of railways in kilometers per 1000 square kilometers of a territory	In absolute terms	Global Competitiveness Report 2019
Inner waterways density per 1000 km^2	Length of internal waterways in kilometers per 1000 square kilometers of a territory	In absolute terms	World Factbook 2021
Transport internationalization level of a territory			
Airport connectivity	Airport international connectivity indicator, which measures the degree of a territory integration into the global air transport network	Score scale from 0 to 100 (logarithmically transformed weighted number of passengers served)	Global Competitiveness Report 2019
Liner shipping connectivity	An indicator of the international connectivity of seaports that measures connectivity of a territory with the global maritime transport network	An open score scale with a benchmark score of 100 corresponding to the most globally connected country in 2004 (China)	Global Competitiveness Report 2019
Quality of the transport infrastructure in a territory			
Quality of road infrastructure	The experts' weighted mean answer to the question: "How would you rate the quality (width and condition) of road infrastructure in your country?"	Rating scale from 1 (extremely bad) to 7 (extremely good)	Global Competitiveness Report 2019
Road connectivity	An indicator that measures the average speed and straightness of a driving route between 10 or more major cities that [route] covers at least 15% of the country's population	Score scale from 0 to 100 (excellent)	Global Competitiveness Report 2019
Quality of railroad infrastructure	Weighted mean assessment made by experts	Rating scale from 1 (low quality) to 7 (high quality)	GlobalEconomy.com
Quality of port infrastructure	Weighted mean assessment made by experts	Rating scale from 1 (low quality) to 7 (high quality)	GlobalEconomy.com
Quality of air transport infrastructure	Weighted mean assessment made by experts	Rating scale from 1 (low quality) to 7 (high quality)	GlobalEconomy.com
Efficiency of the transport services in a territory			
Efficiency of train services	The experts' weighted mean answer to the question: "How efficient (i.e. frequency, punctuality, speed, price) are the railway transport services in your country?"	Rating scale from 1 (extremely inefficient) to 7 (extremely efficient)	Global Competitiveness Report 2019
Efficiency of air transport services	The experts' weighted mean answer to the question: "How efficient (i.e. frequency, punctuality, speed, price) are air transport services in your country?"	Rating scale from 1 (extremely inefficient) to 7 (extremely efficient)	Global Competitiveness Report 2019
Efficiency of seaport services	The experts' weighted mean answer to the question: "How efficient (i.e. frequency, punctuality, speed, price) are sea port services (ferries, boats) in your country?"	Rating scale from 1 (extremely inefficient) to 7 (extremely efficient)	Global Competitiveness Report 2019

Source: compiled by the authors based on World Economic Forum, 2019; Central Intelligence Agency, 2021; GlobalEconomy.com, 2022a, 2022b, 2022c.

Based on all the components and indicators included in the structure of the transport development of a territory (Figure 1 and Table 1), the authors will further develop a single instrument for measuring the transport

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development of a territory – an index – and test it on the example of the European Union countries. Unlike the individual components that were empirically analyzed in the authors' previous studies (Komarova et al., 2021; Balodis, 2022), the synthetic index allows for a comprehensive evaluation of the studied phenomenon in the respective countries and for comparing the European Union countries according to their progress in terms of transport development.

In order to obtain the total value of the index for each studied territory, further calculations are made with the entire set of transport development indicators of a territory for the EU countries in 2019. These data form the empirical basis of the study, which [data] is processed with the index method – a quantitative technique based on minimum and maximum values (Ajvazian, 2005; Gudmundsson & Regmi, 2017; Rybalkin et al., 2021; Rybalkin, 2022), which is applicable for evaluating the transport development of a territory.

$$x' = a + \frac{(x - min(x))(b - a)}{max(x) - min(x)}$$

where:
x' – the standardized value of an indicator;
x – the initial value of an indicator;
min(x) – the minimum value of an indicator in a sample;
max(x) – the maximum value of an indicator in a sample;
a – a user defined minimum;
b – a user defined maximum.
Source: Rybalkin, 2022.

Next, the standardized value of each component of the index is calculated as the arithmetic mean of the standardized values of the indicators included in it, while the total value of the index is calculated with the arithmetic mean of the standardized values of the four components of the transport development of a territory:

$$Ind = (x'_1 + x'_2 + x'_3 + x'_4)/4$$

where:
Ind – the total value of the index;
x'_1 – the standardized value of the index component 'transportization level of a territory';
x'_2 – the standardized value of the index component 'transport internationalization level of a territory';
x'_3 – the standardized value of the index component 'quality of the transport infrastructure in a territory';
x'_4 – the standardized value of the index component 'efficiency of the transport services in a territory'.
Source: compiled by the authors based on Rybalkin, 2022.

Thus, the newly developed index includes all four components of the transport development of a territory: transportization level of a territory, transport internationalization level of a territory, quality of the transport infrastructure in a territory, efficiency of the transport services in a territory. The authors of the newly developed Index propose to call it the Territory Transport Development Index (TTDI), which can be used for assessing and comparing the transport development of the European Union countries (as well as other countries).

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4. Research results and discussion

The analysis of the research results begins with the calculation of the non-standardized values of the TTDI components of the European Union countries in 2019. The first is transportization level of a territory, which includes the density of roads, railways and inner waterways per 1000 km^2 (Table 2).

Table 2. Transportization level of territories in the European Union, n = 27 countries,* 2019

EU countries**	Indicators of the transportization level of a territory			Transportization level of a territory***
	Road density per 1000 km^2	Railroad density per 1000 km^2	Inner waterways density per 1000 km^2	
Belgium	5027.8	119.0	66.9	5213.7
Netherlands	3338.3	89.4	171.0	3598.7
Hungary	2222.8	80.0	17.4	2320.2
France	1920.6	53.4	15.5	1989.5
Germany	1806.7	95.9	20.9	1923.5
Czechia	1646.8	121.8	8.1	1776.7
Denmark	1675.2	50.2	9.3	1734.7
United Kingdom	1626.3	67.2	13.1	1706.6
Austria	1465.2	60.0	4.3	1529,5
Ireland	1394.4	27.4	13.6	1435.4
Poland	1355.9	60.5	12.8	1429.2
Spain	1353.3	31.1	2.0	1386.4
Cyprus	1363.7	No railroad	No inner waterways	1363.7
Lithuania	1295.9	30.5	7.0	1333.4
Estonia	1300.6	23.8	7.1	1331.5
Luxembourg	1119.3	113.2	14.3	1246.8
Slovenia	986.7	60.0	172.7	1219.4
Latvia	901.6	29.9	4.6	936.1
Portugal	897.3	27.8	2.3	927.4
Greece	886.5	17.4	No inner waterways	903.9
Italy	825.9	57.1	8.0	891.0
Slovakia	798.2	75.4	3.5	877.1
Croatia	520.2	46.6	12.9	579.7
Sweden	473.3	23.8	4.6	501.7
Romania	362.7	46.8	7.3	416.8
Bulgaria	372.0	37.1	4.2	413.3
Finland	310.9	19.5	23.2	353.6

* Malta is not included in the empirical data analysis due to its very small territory (316 km^2).
** Countries are ranked by their transportization level.
*** The sum of the indicators' values of the transportization level.
Source: compiled and calculated by the authors based on data from World Economic Forum, 2019; Central Intelligence Agency, 2021.

As can be seen from the data in Table 2, the most transportized EU countries, in terms of the density of all types of transport roads per 1000 km^2, are Belgium, the Netherlands and Hungary, while the least transportized are Romania, Bulgaria and Finland.

The following table presents the non-standardized values of the second TTDI component – the transport internationalization level of a territory – in the European Union countries in 2019. This component includes

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indicators such as the degree of a territory integration into the global air transport network and the possibility of a territory to "connect" to the global maritime transport network (Table 3).

Table 3. Transport internationalization level of territories in the European Union, n = 27 countries,* 2019

EU countries**	Indicators of the transport internationalization level of a territory		Transport internationalization level of a territory***
	Airport connectivity, score scale from 0 to 100	Liner shipping connectivity, an open score scale with a benchmark score of 100	
Germany	100.0	97.1	98.6
United Kingdom	100.0	95.6	97.8
Spain	100.0	90.1	95.1
France	95.8	84.0	89.9
Netherlands	77.0	98.0	87.5
Italy	97.1	67.2	82.2
Belgium	62.0	91.1	76.6
Portugal	72.0	65.1	68.6
Greece	77.2	59.4	68.3
Austria	65.3	No data	65.3
Poland	64.7	63.1	63.9
Sweden	66.9	59.7	63.3
Denmark	66.3	58.5	62.4
Czechia	56.5	No data	56.5
Hungary	52.5	No data	52.5
Croatia	55.2	38.4	46.8
Romania	54.5	29.8	42.2
Ireland	68.1	10.7	39.4
Luxembourg	37.8	No data	37.8
Finland	59.4	13.4	36.4
Cyprus	50.9	19.5	35.2
Slovenia	30.4	39.3	34.9
Lithuania	36.1	21.0	28.6
Bulgaria	49.0	6.8	27.9
Slovakia	27.5	No data	27.5
Latvia	40.1	8.1	24.1
Estonia	33.3	7.2	20.3

* Malta is not included in the empirical data analysis due to its very small territory (316 km^2).
** Countries are ranked by their transport internationalization level.
*** The arithmetic mean of the indicators' values of the transport internationalization level.
Source: compiled and calculated by the authors based on data from World Economic Forum, 2019.

As can be seen from the data in Table 3, Germany, the United Kingdom and Spain took the leading positions in the European Union in terms of the transport internationalization of their territories in 2019, while Slovakia, Latvia and Estonia took the last places.

The following table presents the values of the third TTDI component – the quality of the transport infrastructure in a territory (one of the indicators of this component was standardized according to a scale from 1 to 7) in the European Union countries in 2019. This component includes indicators such as road infrastructure quality, road connectivity within the territory, railway, port and air transport infrastructure quality (Table 4).

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Table 4. Quality of the transport infratsructure in the European Union, n = 27 countries,* 2019

EU countries**	Indicators of the quality of the transport infrastructure in a territory					Quality of the transport infrastructure in a territory****
	1	2***	3	4	5	
Netherlands	6.4	4.9	5.7	6.4	6.4	6.0
Spain	5.7	7.0	5.4	5.4	5.6	5.8
Finland	5.3	5.4	5.5	6.4	6.3	5.8
France	5.4	6.3	5.0	5.2	5.5	5.5
Germany	5.3	6.1	4.9	5.2	5.5	5.4
Sweden	5.3	6.2	4.0	5.3	5.7	5.3
Denmark	5.6	4.4	4.5	5.8	5.8	5.2
Portugal	6.0	5.9	4.2	4.9	5.0	5.2
Belgium	4.4	5.3	4.1	5.6	5.6	5.0
United Kingdom	4.9	5.3	4.3	5.2	5.3	5.0
Lithuania	4.8	5.1	4.6	4.8	4.9	4.8
Austria	6.0	3.5	5.3	3.7	5.2	4.7
Ireland	4.4	4.8	4.0	5.0	5.5	4.7
Latvia	3.6	4.9	4.6	4.9	5.7	4.7
Estonia	4.7	4.5	3.1	5.6	4.6	4.5
Italy	4.4	4.3	4.1	4.7	4.9	4.5
Czechia	3.9	5.5	4.5	3.2	5.0	4.4
Luxembourg	5.5	1.5	5.0	4.4	5.6	4.4
Poland	4.3	4.7	3.9	4.5	4.8	4.4
Croatia	5.6	2.9	2.4	4.7	4.8	4.1
Greece	4.6	2.4	3.0	4.8	5.4	4.0
Hungary	4.0	4.4	3.8	3.2	4.6	4.0
Cyprus	5.1	1.0	No railroad	4.3	5.1	3.9
Slovenia	4.9	2.1	3.1	4.7	4.6	3.9
Slovakia	4.0	3.8	4.0	3.1	3.8	3.7
Bulgaria	3.4	2.5	3.1	4.3	4.5	3.6
Romania	3.0	3.0	2.8	3.9	4.6	3.5

* Malta is not included in the empirical data analysis due to its very small territory (316 km^2).
** Countries are ranked by the quality of the transport infrastructure in a territory.
*** Initial data is standardized on a scale from 1 to 7, applying the method of minimum and maximum values.
**** The arithmetic mean of the indicators' values of the quality of the transport infrastructure in a territory.
1 – quality of road infrastructure, rating scale from 1 to 7;
2 – road connectivity, score scale from 0 to 100;
3 – quality of railroad infrastructure, rating scale from 1 to 7;
4 – quality of port infrastructure, rating scale from 1 to 7;
5 – quality of air transport infrastructure, rating scale from 1 to 7.
Source: compiled and calculated by the authors based on data from World Economic Forum, 2019; GlobalEconomy.com, 2022a, 2022b, 2022c.

As can be seen from the data in Table 4, in terms of the quality of the transport infrastructure, the leading positions in the European Union in 2019 were occupied by the Netherlands, Spain and Finland, while the last places are occupied by Slovakia, Bulgaria and Romania.

The following table presents the non-standardized values of the fourth TTDI component – the efficiency of the transport services in a territory – in the European Union countries in 2019. This component includes indicators such as the efficiency of train, air transport and seaport services (Table 5).

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Table 5. Efficiency of the transport services in the European Union, n = 27 countries,* 2019

EU countries**	Indicators of the efficiency of the transport services in a territory			Efficiency of the transport services in a territory***
	Efficiency of train services, rating scale from 1 to 7	Efficiency of air transport services, rating scale from 1 to 7	Efficiency of seaport services, rating scale from 1 to 7	
Netherlands	5.5	6.3	6.3	6.0
Finland	5.5	6.2	6.2	6.0
Germany	5.5	5.6	5.3	5.5
Spain	5.4	5.6	5.2	5.4
Denmark	4.3	5.8	5.7	5.3
France	5.1	5.5	5.0	5.2
Sweden	4.4	5.8	5.5	5.2
United Kingdom	4.6	5.7	5.4	5.2
Belgium	4.1	5.6	5.6	5.1
Estonia	4.7	4.6	5.6	5.0
Portugal	4.6	5.4	5.0	5.0
Latvia	4.5	5.5	4.8	4.9
Luxembourg	4.9	5.5	4.4	4.9
Ireland	3.9	5.4	5.0	4.8
Austria	5.3	5.1	3.6	4.7
Cyprus	No railroad	5.1	4.2	4.7
Lithuania	4.5	4.6	4.6	4.6
Czechia	4.7	5.2	3.5	4.5
Italy	3.9	4.8	4.5	4.4
Poland	4.0	4.8	4.4	4.4
Greece	3.0	5.2	4.6	4.3
Slovenia	3.2	4.6	4.7	4.2
Bulgaria	3.3	4.4	4.2	4.0
Croatia	2.7	4.6	4.5	3.9
Romania	3.1	4.7	3.9	3.9
Slovakia	4.1	3.9	3.3	3.8
Hungary	3.8	4.1	3.3	3.7

* Malta is not included in the empirical data analysis due to its very small territory (316 km^2).
** Countries are ranked by the efficiency of the transport services in a territory.
*** The arithmetic mean of the indicators' values of the efficiency of the transport services in a territory.
Source: compiled and calculated by the authors based on data from World Economic Forum, 2019.

As can be seen from the data in Table 5, in terms of the efficiency of the transport services, the leading positions in the European Union in 2019 were occupied by the Netherlands, Finland and Germany, while the last places are occupied by Romania, Slovakia and Hungary.

The following table presents the standardized values of TTDI in the the European Union countries in 2019.

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Table 6. Territory Transport Development Index (TTDI) in the European Union, n = 27 countries,* 2019

EU countries**	Components of the Territory Transport Development Index (TTDI)				TTDI****
	Transporti-zation level of a territory***	Transport internationali-zation level of a territory	Quality of the transport infrastructure in a territory***	Efficiency of the transport services in a territory***	
Netherlands	67.1	87.5	100.0	100.0	88.7
Belgium	100.0	76.6	61.6	59.8	74.5
Germany	33.0	98.6	77.5	75.6	71.2
Spain	22.0	95.1	94.5	72.7	71.1
France	34.3	89.9	81.4	64.1	67.4
United Kingdom	28.6	97.8	62.2	65.6	63.5
Denmark	29.1	62.4	70.9	67.0	57.4
Finland	1.0	36.4	92.8	97.1	56.8
Sweden	4.0	63.3	74.0	65.6	51.7
Portugal	12.7	68.6	69.8	55.5	51.6
Austria	25.0	65.3	51.8	41.2	45.8
Italy	11.9	82.2	41.2	29.7	41.3
Ireland	23.0	39.4	51.4	45.5	39.8
Czechia	30.0	56.5	38.9	32.6	39.5
Poland	22.9	63.9	39.7	29.7	39.0
Luxembourg	19.2	37.8	38.1	52.7	36.9
Lithuania	21.0	28.6	55.3	36.9	35.4
Latvia	12.9	24.1	51.8	52.7	35.4
Estonia	20.9	20.3	42.1	54.1	34.3
Greece	12.2	68.3	23.5	24.0	32.0
Hungary	41.1	52.5	21.8	1.0	29.1
Cyprus	21.6	35.2	17.2	40.5	28.6
Slovenia	18.6	34.9	17.2	19.7	22.6
Croatia	5.6	46.8	25.4	9.6	21.8
Slovakia	11.7	27.5	12.2	2.4	13.4
Romania	2.3	42.2	1.0	8.2	13.4
Bulgaria	2.2	27.9	4.8	11.0	11.5

* Malta is not included in the empirical data analysis due to its very small territory (316 km^2).
** Countries are ranked by the Territory Transport Development Index (TTDI).
*** Initial data (Tables 2, 4 and 5) is standardized on a scale from 1 to 7, applying the method of minimum and maximum values.
**** The arithmetic mean of the components' values of the Territory Transport Development Index (TTDI).
Source: compiled and calculated by the authors according to data of Tables 2–5.

As can be seen from the data in Table 6, the Netherlands, Belgium and Germany took the leading positions in the European Union in terms of their transport development in 2019, while Slovakia, Romania and Bulgaria took the last places.

The following table summarizes the European Union countries with leading positions according to the Territorial Transport Development Index (TTDI) and its individual components in 2019.

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Table 7. European Union countries with leading positions according to the Territory Transport Development Index (TTDI) and its components, 2019

TTDI	Components of the Territory Transport Development Index (TTDI)			
	Transporti-zation level of a territory	Transport internationali-zation level of a territory	Quality of the transport infrastructure in a territory	Efficiency of the transport services in a territory
Netherlands (88,7)	Belgium (100,0)	Germany (98,6)	Netherlands (100,0)	Netherlands (100,0)
Belgium (74,5)	Netherlands (67,1)	United Kingdom (97,8)	Spain (94,5)	Finland (97,1)
Germany (71,2)	Hungary (41,1)	Spain (95,1)	Finland (92,8)	Germany (75,6)
Spain (71,1)	France (34,3)	France (89,9)	France (81,4)	Spain (72,7)
France (67,4)	Germany (33,0)	Netherlands (87,5)	Germany (77,5)	Denmark (67,0)

Source: compiled by the authors according to data of Table 6.

As can be seen from the data in Table 7, the Netherlands is the leading country in the transport development of a territory in the European Union, which occupies a leading position in two of the four TTDI components – the quality of the transport infrastructure in a territory and the efficiency of the transport services in a territory, as well as in TTDI in general.

As for Latvia, its position among countries in terms of the transport development of a territory can generally be assessed as slightly lower than average, as Latvia ranks 18th among 27 EU countries according to TTDI, one position behind Lithuania and one position ahead of Estonia (Table 6). In Latvia, the strongest field in terms of the transport development is the efficiency of its transport services – 12th place among 27 EU countries (Estonia is 10th, Lithuania – 17th) (Table 5). The weakest field of Latvia in terms of the transport development is its transport internationalization level – 26th place among 27 EU countries (Estonia is 27th, Lithuania – 23rd) (Table 3), which is the weakest field of all Baltic countries in terms of their transport development.

The reason for the low transport internationalization level of the Baltic countries may be the long period when they functioned as a gateway for other EU countries to the Russian market (Spens et al., 2004; Mauris, 2022), and this cannot be changed in a short and even medium run. In this regard, great hopes are pinned on the Rail Baltica (Jonaitis & Butkevičius, 2005) called 'the project of the century' (Pomykala, 2018) – the largest and most important project currently being implemented in Europe by three Baltic countries. This project is a tool for the integration of the Baltic countries and Europe, as railway infrastructure of Lithuania, Latvia and Estonia does not fulfil the requirements of competent network (Laisi & Saranen, 2013), although nowadays the Rail Baltica is undermined due to some reasons, including institutional fragmentation (Briškens, 2022).

5. Conclusions

The transport development of any territory of the world (but mainly the territories of the world's countries) can be assessed using the authors' newly developed Territory Transport Development Index (TTDI), which includes four components: transportization level of a territory, transport internationalization level of a territory, quality of the transport infrastructure in a territory, efficiency of the transport services in a territory. The use of this index makes it possible to comprehensively assess and compare territories – countries or regions – according to the progress achieved in them in terms of the transport development, as well as to assess the progress of the specific territory in relation to itself. In the modern scientific space, there is no other 'transport' index (for example, the Sustainable Urban Transport Index (SUTI) for cities in the Asia-Pacific region, the Transport Performance Index (TPI), the Rural Transport Implementation Index) that could face the same challenge.

Among the European Union countries, the leading position in terms of the transport development is held by the Netherlands with a TTDI value of 88.7 points in 2019 on a scale from 0 to 100, while Bulgaria has the lowest

position with 11.5 points. Latvia's position among the European Union countries in terms of the transport development in general can be assessed as slightly lower than the average. The strongest field of Latvia in terms of the transport development is the efficiency of its transport services, but the weakest is the transport internationalization level, which is the weakest field of the transport development of all the Baltic countries compared to the EU leaders in the field of transport internationalization – Germany, the United Kingdom and Spain.

The limitation of the research is the empirical analysis for one year, but considering that the purpose of the article was mainly methodological – to develop a single instrument for measuring the transport development of a territory, this limitation was not critical for achieving the research goal within the scope of this article. In addition, the specificity of most indicators of the transport development of a territory is that they practically do not change (especially the transportization level of a territory) in the short term.

The results obtained during the approbation of the newly developed Territory Transport Development Index (TTDI) on the example of the EU countries are novel, since they allow to analyze the transport development of the EU countries both in general and separately in different aspects. The results of empirical analysis are valuable and applicable in the practice of sustainable management – in particular, to justify the need for a particular transport project for each EU country. For example, for the Baltic countries, the most relevant transport projects today are those that will allow these countries to increase their transport internationalization level – the weakest field of all Baltic countries in terms of their transport development.

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DESIGN AND VERIFICATION OF IMPLEMENTATION FACTORS OF CROSS-BORDER MERGERS AND ACQUISITIONS PROJECTS*

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Abstract. The aim of the contribution is to identify the implementation factors influencing the successfulness of cross-border mergers and acquisitions projects extracted on the basis of an analysis of the opinions of managers of 244 companies (international corporations) based in 45 countries of the European Economic Area, which were the subject of a cross-border merger or acquisition. Another objective is to verify the original methodology labeled as "M&A Project Implementation Factors – M&APIF". Factor analysis of the obtained data (Principal Component Analysis and Varimax Rotation methods were used) enabled extraction of three key implementation factors influencing the successfulness of M&A project implementation: Prerequisites for project implementation, Elimination of project implementation risks, Cooperation of partners within project implementation. The paper also presents the basic parameters of the M&APIF methodology, i.e. Eigenvalues, the percentage of explained variance, Cronbach's alpha of the extracted factors and inter-correlations of the extracted factors.

Keywords: implementation factors, M&A implementation, M&APIF, prerequisites, elimination of risks, cooperation of partners, management, stakeholders

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JEL Classifications: F15; F21; F23

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1. Introduction

Corporations, as the basic link of the global economy in the current period, cannot be perceived as separate entities but as network structures of interconnected enterprises, often of different legal forms between industries, countries, and continents, which occupy their specific place in the world markets. The tools to create these dynamic and diverse corporate structures are primarily mergers and acquisitions. In case of choosing a suitable partner, adequate implementation and post-transaction management, these transactions contribute significantly to the growth of the value of the entire corporation. In the current global economy with a wide variability of transactions and participating entities, as well as the effects of these transactions, assessing the benefits of the successful implementation of cross-border mergers and acquisitions projects from the point of view of the value of the company or value for owners is multifactorial and requires an interdisciplinary approach to research. A company can prosper in the long run only if the demands of all direct interest groups, i.e., stakeholders are satisfied. The aim of the contribution is therefore to identify the implementation factors influencing the successfulness of the implementation of cross-border mergers and acquisitions projects.

2. Theoretical framework and hypothesis development

Despite the fact that the process of implementing each merger or acquisition is unique and unrepeatable, most authors (Davis, 2012; Finkelstein and Cooper, 2012; Galpin and Herndon, 2014 and others) classify it within at least three basic successive phases, namely: planning, implementation, and integration. Planning and preparation imply operational, managerial, and legal techniques and optimization with particular regard to the two following phases. In this phase, it is crucial to define the objectives of the merger or acquisitions and to clarify the ways of measuring inputs and outputs. The coordination of all resources to carry out the planned transaction and its management processes is to ensure the achievement of the set goals (more in Hlaváč, 2016; Mejstřík et al., 2011). Implementation and integration are the phases in which the formulated strategy and plans are implemented. The implementation phase is made up of a set of logically interconnected activities enabling the implementation of the considered strategy (more in Fotr et al., 2020; Hečková et al., 2018). Successful implementation depends on the necessary coordination and cooperation of competent management and executive elements of management and other stakeholders and includes a whole range of activities as a result of the negotiation starting from the publication of the preliminary agreement on the commercial parameters of the transaction, memoranda of understanding, exclusivity, protection of confidential information, the due diligence phase, ending by signing a complex contractual documentation and assessing the concentration by the competition authorities (Gavurova et al. 2018, 2020).

The integration phase deals with the integration of the merger or acquisition project itself and is crucial from the point of view of realizing and fulfilling the set goals and utilizing the potential of the synergistic effects of the entire integration project (more in Davis, 2012; Finkelstein and Cooper, 2012; Masood et al. 2017). The identification of value generators and potentially possible synergies is a creative process that differs depending on the strategy and structure of the company and its surroundings (Qin et al., 2022). Thus, the quality of business environment is also crucial factor that determines the obstacles in operations of businesses (Ključnikov et al., 2022; Civelek & Krajčík, 2022), their development (Stefko et al., 2021; Dvorsky et al. 2021) and innovative processes of companies including the usage of innovative tools (Civelek et al., 2020; Ključnikov et al., 2020), systems and processes (Civelek et al., 2021; Popova, 2021) in value generation activities. These innovative processes positively affect the performance of companies (Ključnikov et al., 2021; Belas et al. 2019), their development (Kolková & Ključnikov, 2021; Gavurova et al. 2021), and their competitive advantages that they have against their rivals (Cortes et al., 2021). One can encounter a diverse classification of value generators and their combinations (more in Mackenzie, 2016).

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Change management, responsible for project management and control, setting metrics, etc., plays an important role in the integration management. According to several authors (Vuori et al., 2018; Angwin, Meadows, 2015; Rouzies and Colman, 2012; Colman and Lunnan, 2011; Koudri, 2010; Appelbaum et al., 2007; Slangen , 2006; Chatterjee et al., 1992), critical quality factors for post-transaction integration include integration of the corporate cultures of the participating entities, in which an important role is played by effective communication, clearly formulated goals, an adequate time frame, the commitment and support of top management, the competence of project managers and the project team (Wu et al., 2022; Wang et al., 2022), a flexible and comprehensive integration plan , integration of management systems, organization of education and management skills (Pan et al., 2022; Škare et al., 2022).

According to Galpin and Herndon (2014), the successful implementation of a merger or acquisition project lies in the faster and smoother integration of the target company, which is conditioned by thorough preparation before concluding the transaction. However, it can also be agreed that the success of all previous stages of the transaction depends on dynamic integration and successful implementation (Moeller and Brady, 2014). DiGeorgio (2002; 2003) divides the success of mergers and acquisitions into two stages, namely "front-end" success and success in integration. The result of the front-end success (success in the first phase) is the selection of a suitable merger or acquisition target, which includes several factors such as leadership characteristics, creating a suitable environment for the team involved, adequate time, resources and tools for analyzing mergers and acquisitions, learning mechanisms resulting from the analysis and understanding differences in culture and organizational structure. Success in the second phase results in the achievement of goals that require the selection of the right leadership, a structured integration team, and a detailed plan in terms of communication, integration, and personnel issues.

3. Methodology

Despite the fact that the process of implementing each merger or acquisition is unique and unrepeatable, most authors (Davis, 2012; Finkelstein and Cooper, 2012; Galpin and Herndon, 2014 and others) classify it within at least three basic successive phases, namely: planning, implementation, and integration. Planning and preparation imply operational, managerial, and legal techniques and optimization with particular regard to the two following phases. In this phase, it is crucial to define the objectives of the merger or acquisitions and to clarify the ways of measuring inputs and outputs. The coordination of all resources to carry out the planned transaction and its management processes is to ensure the achievement of the set goals (more in Hlaváč, 2016; Mejstřík et al., 2011; Ntshangase and Msosa, 2022). Implementation and integration are the phases in which the formulated strategy and plans are implemented. The implementation phase is made up of a set of logically interconnected activities enabling the implementation of the considered strategy (more in Fotr et al., 2020). Successful implementation depends on the necessary coordination and cooperation of competent management and executive elements of management and other stakeholders and includes a whole range of activities as a result of the negotiation starting from the publication of the preliminary agreement on the commercial parameters of the transaction, memoranda of understanding, exclusivity, protection of confidential information, the due diligence phase, ending by signing a complex contractual documentation and assessing the concentration by the competition authorities.

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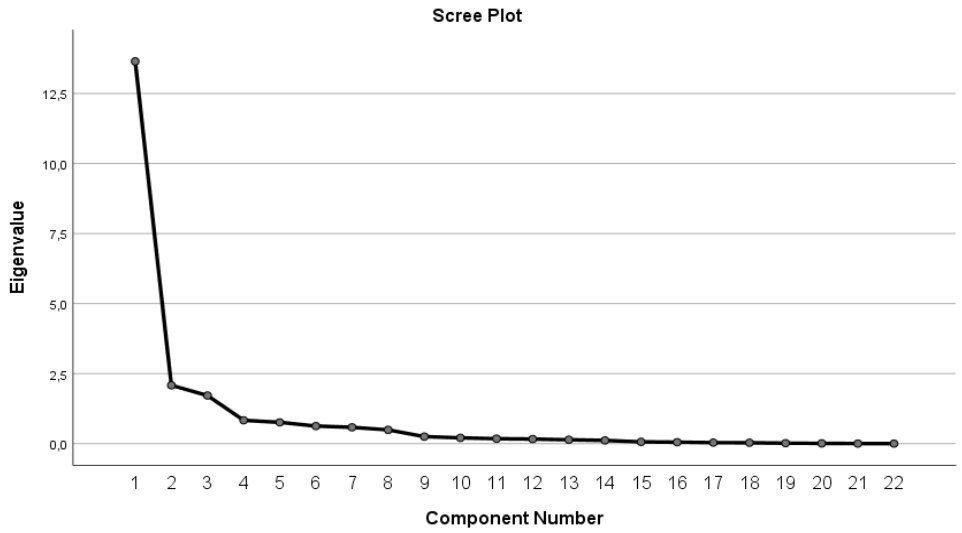
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4. Results

By means of a factor analysis (Principal Component Analysis and Varimax Rotation method), three implementation factors affecting the successfulness of an M&A project implementation were extracted and labeled as (Figure 1, Tables 1 and 2):

- F1: Prerequisites for project implementation
- F2: Elimination of project implementation risks
- F3: Cooperation of partners within project implementation



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Figure 1. Scree plot of the M&APIF methodology factor extraction
Source: own processing

Cattel's scree plot shows the number of factors found, with three sufficiently saturated factors (Table 1), for which the Eigenvalues were higher than 1 (Table 2).

Table 1. Factor structure of the M&APIF methodology

	FACTORS		
	Prerequisites for project implementation	**Elimination of project implementation risks**	**Cooperation of partners within project implementation**
Complexity of the project elaboration.		**.797**	
Particular elaboration of the project.			**.697**
Clearly formulated goals of the project.		**.893**	
Exact economic analyses of the project implementation.		**.667**	
Competence of the project manager.	**.826**		
Competence of the project team members.	**.671**		
Analysis of risks of the project implementation.		**.731**	
Political-social conditions of operation of the project partners.	**.743**		
Economic-social conditions of operation of the project partners.	**.684**		
Cultural-social conditions of operation of the project partners.			**.697**
Safety conditions of operation of the project partners.	**.792**		
Consultations with the project partners.	**.747**		
Trust among the project partners.		**.662**	
Independent information about the project partners.			**.660**
Longer knowledge of the project partners.			**.728**
Friendly relations with the project partners.			**.770**
Experience from cooperation with the project partners.			**.733**
Belief in a successful implementation of the project.	**.783**		
The need to implement the project.	**.790**		
Subjective confidence in a successful implementation of the project.			**.605**
Willingness to take risks in the implementation of the project.			**.663**
Motivation to cooperation among the project partners.		**.865**	

Source: own processing

Table 2. Percentage of explained variance for the extracted implementation factors

Factors	Eigenvalues	% of Variance	Cumulative %
F1 – Prerequisites for project implementation	13.647	62.032	62.032
F2 – Elimination of project implementation risks	2.082	9.462	71.494
F3 – Cooperation of partners within project implementation	1.717	7.806	**79.300**

Source: own processing

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The extracted factors relating to the implementation factors influencing the successfulness an of M&A project implementation explain 79.300% of the variance and can be specified as follows:

F1 – Prerequisites for project implementation: Managers who score higher in this factor attribute greater importance, in terms of the successful implementation of cross-border mergers and acquisitions projects, to the competences of the project manager and project team members, to the political and social working conditions of the project partners, to the economic and social conditions of the project partners' activities , the safety conditions of the work of project partners, consultation with the project partners, faith in the successful implementation of the project and the needs of project implementation.

F2 – Elimination of project implementation risks: Managers who score higher in this factor attribute greater importance, in terms of the successful implementation of cross-border mergers and acquisitions projects, to the complexity of project processing, a clearly formulated project objective, a high-quality economic analysis of the project, analysis of project implementation risks, trust between partners and motivation during project implementation.

F3 – Cooperation of partners within project implementation: Managers who score higher in this factor attribute more importance, in terms of successful implementation of cross-border mergers and acquisitions projects, to detailed project processing, cultural and social conditions of project partners, independent information about project partners, long-term knowledge of project partners, a friendly relationship with the project partners, experience of cooperation with the project partners, subjective confidence in the successful implementation of the project, willingness to take risks during the project implementation.

The appropriateness of using factor analysis is confirmed by the Kaiser-Mayer-Olkin measure of Sampling Adequacy (.940), Bartlett's sphericity test (sig. .000) and the KMO assessment measure calculated as mutual correlations of variables through Anti-Image Matrices. We determined the reliability of the questionnaire by assessing the values of Cronbach's Alpha (Tables 3, 4 and 5).

Table 3. Prerequisites for project implementation – **Cronbach's α = .954; N of Items = 8**

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item -Total Correlation	Cronbach's Alpha if Item Deleted
Competence of the project manager.	19.88	37.458	.813	.948
Competence of the project team members.	20.00	37.893	.840	.947
Political-social conditions of operation of the project partners.	20.36	38.396	.846	.947
Economic-social conditions of operation of the project partners.	19.95	37.566	.773	.951
Safety conditions of operation of the project partners.	20.15	35.970	.866	.945
Consultations with the project partners.	20.12	36.681	.827	.947
Belief in a successful implementation of the project.	20.16	36.958	.830	.947
The need to implement the project.	20.27	36.953	.831	.947

Source: own processing

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Table 4. Elimination of project implementation risks **– Cronbach's α = .945; N of Items = 6**

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Complexity of the project elaboration.	13.60	24.183	.827	.935
Clearly formulated goals of the project.	13.34	22.350	.934	.922
Exact economic analyses of the project implementation.	13.21	25.631	.824	.937
Analysis of risks of the project implementation.	13.20	24.271	.839	.934
Trust among the project partners.	13.35	24.681	.781	.941
Motivation to cooperation among the project partners.	13.58	24.072	.805	.938

Source: own processing

Table 5. Cooperation of partners within project implementation – Cronbach's α = .938; N of Items = 8

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Particular elaboration of the project.	17.55	28.676	.815	.927
Cultural-social conditions of operation of the project partners.	17.61	29.317	.820	.927
Independent information about the project partners.	17.55	28.989	.763	.930
Longer knowledge of the project partners.	17.66	28.201	.786	.929
Friendly relations with the project partners.	17.45	29.730	.673	.937
Experience from cooperation with the project partners.	17.61	28.797	.828	.926
Subjective confidence in a successful implementation of the project.	17.44	28.758	.731	.933
Willingness to take risks in the implementation of the project.	17.58	27.397	.836	.925

Source: own processing

The values shown in Tables 3, 4 and 5 describe the calculation of Cronbach's alpha for the individual considered factors as an indicator of internal consistency. They describe the effects of the individual items on the overall result if the question were to be deleted. The mean, variance, adjusted inter-item correlation, and Cronbach's alpha for the entire set are given if we were to delete a particular question. The internal reliability of the individual factors of the M&APIF questionnaire measured by Cronbach's alpha reaches high values (Prerequisites for project implementation: Cronbach's α = .954; Elimination of project implementation risks: Cronbach's α = .945; Cooperation of partners within the project implementation: Cronbach's α = .938).

A closer assessment of the individual factors provided us with information that confirms that the implementation factors proposed by us can be defined in terms of content. By assessing the Skewness and Kurtosis results (Table 6), we concluded that the data had a perfect normal distribution shape. The values of kurtosis and skewness indicate the normality of the data distribution

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Table 6. Descriptive statistics

		Prerequisites for project implementation	Elimination of project implementation risks	Cooperation of partners within project implementation
N	Valid	244	244	244
Mean		2.8730	2.6762	2.5082
Std. Deviation		.86884	.97846	.76237
Skewness		-.821	-.501	-.739
Std. Error of Skewness		.156	.156	.156
Kurtosis		.208	-.770	-.445
Std. Error of Kurtosis		.310	.310	.310
Minimum		1.00	1.00	1.00
Maximum		3.88	4.00	3.63

Source: own processing

Tomšik (2017) states that if the values of curtosis and skewness range from -1 to 1, we consider the distribution of values in the data set to be symmetrical. The extracted factor structure of the M&APIF methodology is also supported by the values of the inter-correlation coefficients between the individual extracted implementation factors (Table 7).

Table 7. Inter-correlations between individual extracted implementation factors of M&APIF methodology

	Elimination of project implementation risks	Cooperation of partners within project implementation
Prerequisites for project implementation	.706	.752
	.000	.000
Elimination of project implementation risks		.756
		.000

Source: own processing

The results of the correlation analyses (Pearson's correlation coefficient) testify to the fact that all factors of the M&APIF methodology are statistically significantly positively related. It means that the higher the managers score in the factor Prerequisites for project implementation, the higher they score in the factors Elimination of project implementation risks and Cooperation of partners within project implementation. At the same time, the higher the managers score in the factor Elimination of project implementation risks, the higher they also score in the factor Cooperation of partners within project implementation. The values of the correlation coefficients point to the fact that the extracted factors form a homogeneous whole. At the same time, the values of the correlation coefficients indicate that they identify and specify different areas relating to the successful implementation of cross-border mergers and acquisitions projects.

3. Discussion and Conclusion

Mergers and acquisitions processes are not only highly complex but must also take into account several contextual factors related primarily to the environment in which they are implemented. This is because cross-border mergers and acquisitions provide benefits for globalisation that positively affect competitiveness countries (Stefko et al., 2022). Their success is influenced by a set of factors that can be divided into a group of factors associated with planning and preparation, implementation and post-transactional integration and a group of factors of a rather objective nature given by the participating entities (more in Fotr et al., 2020, p. 271 et seq.). The absence of a quality design of the future form of the new organization – its structure, processes, control, and metrics – can have a negative impact on the configuration and the entire integration. Unclear roles, conflicting goals, inefficient decision-making can cause the potential failure of the entire financially and time-consuming integration project. Thus, financial managers should consider crucial factors when making decisions (Stefko et al., 2020). Correct identification of those factors increase competitiveness of companies (Stefko et al., 2020).

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Moreover, financial analysts should apply various ways to correctly predict and assess financial conditions of companies (Stefko et al., 2019). Assessing the implementation factors of the successful implementation of cross-border mergers and acquisitions projects is multifactorial and requires an interdisciplinary approach to research. Therefore, several authors, as already mentioned, include various factors among the attributes of the successful implementation of mergers and acquisitions projects (Vuori et al., 2018; Angwin, Meadows, 2015; Colman, Lunnan, 2011; Appelbaum et al., 2007; Appelbaum et al., 2000a; Appelbaum et al., 2000b; Chatterjee et al., 1992 and others). In this context, it is possible to discuss which factors are reasonably included in this set, how many there are, what weight they have, which apply only in certain contexts, which are universal, etc. One of the possible approaches to clarify the factors of successful implementation of mergers and acquisitions projects is their generalization on a meaningful level in the form of more general factors influencing the course of mergers and acquisitions. From this point of view, three factors were extracted in the presented research project and subsequently specified in terms of content: Prerequisites for project implementation, Elimination of project implementation risks and Cooperation of partners within project implementation.

At the level of prerequisites, the competences of the project manager and team members, political-social, economic-social and safety conditions of work of project partners, consultations with the project partners, belief in the successful implementation of the project and the needs of project implementation are emphasized. In the context of risk elimination, processing complexity, a clearly formulated goal, high-quality economic analysis, implementation risk analysis, trust between partners and their motivation come to the fore. In terms of the cooperation of the partners, it is necessary to pay attention to the detailed processing of the project, cultural and social conditions, independent information about the partners, long-term knowledge of the partners, friendly relations, experience of cooperation, subjective trust, and willingness to take risks. It should be noted that both the individual factors and the characteristics that fulfill them create one coherent whole that affects the successful implementation of cross-border mergers and acquisitions projects. At the same time, it is necessary to state that the presented knowledge represents one of the possible perspectives on the investigated issue of cross-border mergers and acquisitions with an emphasis on the subjective perception of factors relating to these processes.

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PECULIARITIES OF BULGARIAN UNIVERSITIES DIGITALIZATION DURING THE COVID-19 PANDEMIC*

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Abstract. The COVID-19 pandemic forced the education system to transform quickly from a straightforward traditional process to an online one. Both schools and universities, including their management and administration) were challenged to maintain the quality of the educational service they provided, but this time under completely different conditions and in a new and unfamiliar online environment. In Bulgaria, due to the rules of the systems and the academic autonomy, each university had the opportunity to decide how to deal with these force major circumstances. Along with the technical challenges, professors have to overcome the difficulties related to the motivation and engagement of the students in such a mediated environment. The main objective of the current article is to evaluate the results of the online learning process during the COVID-19 pandemic in Bulgaria. The results from empirical research (N = 140) clearly show that most Bulgarian lecturers prefer face-to-face learning. At the same time, they admit the necessity of specific training for technical skills improvement and different approaches for students' attention and engagement in online learning. According to the professors, the overall assessment for the level of satisfaction from online learning during the COVID-19 pandemic is in the golden mean - 3 on a scale of 1 - "not at all effective" to 5 - "it is effective".

Keywords: online learning; students' engagement; social isolation, universities

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1. Introduction

The COVID-19 pandemic drastically changed our life as individuals and as a part of society. Social isolation as a part of restriction measures imposed different professional systems to adjust quickly to adapt to new challenges. Universities in Bulgaria also faced this new reality – they had to transform from the traditional face-to-face learning process to online to continue obtaining the same quality of learning. This challenge had different dimensions – from different levels of technical skills of lecturers to diverse online platforms used for online classes. At the same time good level of motivation both for students and their professors in an online regime was hard to be achieved – in terms of engagement online learning process still is a great challenge to overcome.

The main objective of the current article is to evaluate the results of the online learning process during the COVID-19 pandemic in Bulgaria. For this purpose, we conducted a specific empirical survey covering representatives of all Bulgaria universities (professors and management staff). Our findings could be helpful for the national academic system to improve the quality of online learning in the future.

2. Literature Review

Online learning, distance learning, and e-education could be considered synonyms. Still, all these different terms have been of great subject of interest both for practitioners and scholars, primarily due to the social restrictions of the COVID-19 pandemic. For a short time, universities, schools and training centres have been forced by circumstances caused by this disease to transform all educational processes. That is the major reason for many different aspects that are already explored in the scientific literature for this type of learning.

For instance, Zhang et al. (2022) focus on the role of visualization in this online learning process. After a comprehensive review, they outline several fundamental challenges for online education: learner isolation, the possibility of predicting learning efficiency, further analysis of the instructor's behaviour and Enhanced Interpretability.

Guo and Wan (2022) explore the quality of online learning in High Schools in China during COVID-19 regarding the digital divide. They found that the digital divide in schools has different dimensions: "It was primarily presented as differences in equipment quantity and network quality, students' adaptability to online teaching, and their offline learning outcomes". They also conclude: "the development of online learning alone cannot eliminate achievement gaps" (Guo & Wan, 2022). The scholars recommend that the promotion of equal access to quality learning processes has to be a result of combined efforts for governmental entities, NGO sectors, different institutions and stakeholders, with particular attention to disadvantaged students. Parallel to such research outlining differences and gaps between students in online learning, there is also research proving that students and professors are satisfied by the level of quality in the online learning process. For instance, Elzainy, El Sadik and Al Abdulmonem (2020) outline the level of satisfaction in terms of achievement and improvement of technological educational skills.

Some scholars explore innovative strategies to build self-awareness in students during the COVID-19 pandemic (Yao et al., 2022). Others focus on students' engagement level in online learning during the pandemic (Zhang et al., 2022). The considerable work of students always accompanies the learning process (both in a traditional and online environment). That is why a research team explores the impact of information-seeking and online learning self-efficacy on students' performance proficiency (Tang, Tseng & Tang, 2022). The authors conclude that information-seeking self-efficacy is a partial mediator and plays a buffering role between online learning self-efficacy and performance proficiency (ibid). From some different points of view, but also in this line of

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exploration, Chaker, Bouchet and Bachelet (2022) consider the relationship between learning intentions and learning outcomes. After comprehensive research, the authors admit that socially driven intention could be a significant factor in the online learning process. The level of engagement during online learning seems to be among the leading subjects.

In this line, Wang et al. (2022) present research considering the mediating roles of online learning self-efficacy and academic emotions. Scholars reached exciting findings, such as the role of interaction between learner-content, as well as between learner-other learner, but not learner-trainer could be considered as a prerequisite for engagement; online learning self-efficacy from one side and academic emotion from the other are the links between interactions; according to scholars, both learner-content interaction, as well as learner-learner interaction, could influence the learning engagement. Some authors also outline, based on empirical research, the critical factors for a successful online learning process: the ability to communicate, self-motivation, self-discipline, the ability to set a schedule, and vivid engagement with the trainer (Penrod et al., 2022). On the other hand, Theobald and Bellhäuser (2022) consider that online feedback plays an essential role in students' performance in self-regulated learning.

Another way to attract students' attention and improve their performance at universities is proposed by Dietrich et al. (2021). Scholars prove through empirical research that individualized learning design enhances the process of online learning (ibid). A group of scholars came to a similar conclusion regarding the personalized learning methods in online environments claiming that the student's perceptions about the usefulness of learning suggestions, ease of use, goal setting, learning environmental structuring, task strategies, time management, self-evaluation, impact on learning, and attitude toward the learning environment are important predictors of behavioural intention to learn with the self-regulated online learning that integrated with the personalized learning approach (Ingkavara et al., 2022).

On the other hand, Warshawski (2022) proves that resilience and social support could improve students' academic self-efficacy in online environments. Shirish, Chandra and Srivastava (2021) argue that IT mindfulness has significant positive relationships with both productivity- and creativity-in-learning. Research conducted by Malysheva, Tokareva, Orchakova and Smirnova (2022) also proves that online courses improve creativity, critical thinking, strategic thinking and practical skills according to the student's assessment.

When we consider the level of engagement of students in the online learning process, Binali, Tsai and Chang (2021) revealed five types of learners: Highly engaged, self-driven online contributors (with a share of approximately 34% of their recipients), Moderately engaged, self-driven online viewers (12.3% of the sample), Less engaged, self-driven online learners (15.17%); Highly engaged, course-driven online learners (23.39%) and Less involved, course-driven online learners (15,43%). Specific research for the transformation from classical to online learning shows the following exciting finding, which is in total coherence with the already presented results: the changed conditions of the learning environment influenced social interaction in negative ways, but also that team reflection seemed to enable the students to reverse some of the adverse effects and develop practices that supported both the cognitive and socio-emotional dimensions of social interaction (Sjølie, Espenes & Buø, 2022).

Al-Kahtani (2022) conducted similar research to assess students` perception of online learning during COVID-19, this time in Saudi Higher Education Institutions. The author proposes an engaging online learning assessment survey to assess students` perceptions. Specific research dedicated to online learning in Nigerian Universities during COVID-19 is offered by Ogolodom et al. (2022). The scholar team explores the online learning process of Nursing and Radiography Undergraduate Students and finds that most students assess online learning as beneficial to their educational development. On the other hand, some of the challenges the scholars pointed out are financial constraints, internet access, unstable/slow internet access, lack of mobile data, poor communication

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with lecturers and peers, and no access to a computer device (Ogolodom et al., 2022). An exciting finding after a discriminant analysis made by Al-Nasa'h, Al-Tarawneh, Awwad and Ahmad (2021) revealed the following: High online learning satisfaction levels occurred with high online self-efficacy, moderate general anxiety, and low fear of COVID-19 (ibid).

Ulla and Perales (2021) researched the relationship between the level of Facebook usage as a supporting tool for students during a pandemic. They found that Facebook is not only perceived as a social network by the students but also as a learning platform where they can easily retrieve academic sources and share them with their classmates for intellectual discussion (ibid). Mulyono, Suryoputro and Jamil (2021) explore the supporting role of WhatsApp in the online learning process, and their findings are similar to those for the use of Facebook. They admit that most students in their research accept social media as a support for online learning. Scholars identified important drivers for learning: students' perceived usefulness, availability of learning support, motivation, and connectedness with their friends (ibid).

Some interesting consequences of the global COVID-19 pandemic in universities are also explored. For instance, in South Korea, some students (Generation Z) from universities "have actioned lawsuits to pursue tuition refunds and have raised the issue of the low quality of university courses through social media" (Kang & Park, 2022). Therefore, as a result of the research, the authors conclude that the university and academics must improve online courses to gain confidence and attract new students. Having the same idea of improving the quality of online learning, Barile, Elliott and McCann (2022) found that the use of open-ended questions along with lecture recordings and slides had a significantly positive impact on academic attainment in the online learning environment. At the same time, online learning develops specific skills for academic professors and their students. Thorough research on this subject is proposed by Gu and Huang (2022). Some of their findings are that students enrich multimodal digital literacies in online learning and communications and expand habitus and capital by utilizing the affordances of digital technologies (ibid).

After the COVID-19 pandemic, many authors introduce the term "new normal", meaning that the world will never be the same as before. Therefore this new standard and new reality require and impose new learning methods. Al-Kahtani et al. (2022) explore the sustainability methods for such an environment. Staddon (2022) presents the unique role of the supported flipped model over the traditional model for blended and online learning. Other authors propose gamified online learning applications as a valuable tool for improving students` engagement in online courses (Tan & Cheah, 2021).

On the other hand, we could consider the possibilities of Artificial Intelligence. Different algorithms could be used (Ilieva, Anguelov & Nikolov, 2019). Other scholars admit that the future development of university courses will be a good combination of the online and traditional environment (Chang et al., 2021). The variety of online and traditional techniques is also considered to satisfy social needs (Turk, Heddy & Danielson, 2022).

Whenever the future development of online courses in higher education is, it could also be taken into consideration that some of the majors at universities are not so applicable to online courses, such as medicine, sports, arts (partly), national security and others. For instance, the specifics of education in National Security are given by Stoykov (2019).

3. Methodology of the study

The main aim of the research is to evaluate the results of the online learning process during the COVID-19 pandemic in Bulgaria.

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The study was conducted as part of a scientific research project funded by the National Science Fund (the Bulgarian National Science Fund within the Ministry of Education and Science supports scientific research) with the number OF-39/2021. The study is based on the collection and analysis of quantitative and qualitative data obtained from the interviews of managers and professors (academic staff) in all Bulgarian universities. The following persons were interviewed: the Rector, Vice Rector responsible for educational activities, Head of the department/directorate for academic activities, and academic staff (including assistants, associated professors and professors).

The first part of the research started on 01.01.2022 with the definition of the research objectives, the research questionnaire, the research methodology and other organizational and methodological issues. Apart from the questions related to and collecting statistical information for the respondents, the questionnaire comprises 20 questions. Most questions - 18 are closed, but an opportunity is provided to make a comment, clarify and/or for the recipient to justify his choice, and 2 of the questions are open. The questionnaire allows not answering all questions, which gives freedom of choice and increases the percentage of reliability of the results. In parallel with the survey preparation, preliminary discussions were held with representatives of most of the Higher Education Institutions (HEIs) in Bulgaria, to whom we explained the idea and purpose of the survey.

With the achievement of the results of the first stage, the questionnaire was sent by email (respondents were invited to participate in a survey). After a particular time, the survey covered all HEIs in Bulgaria. It was conducted in the period from 07 February to 25 March 2022. One month after the start of the study, an interim count of the responses received was made, and reminder emails were sent to all who had not responded. Telephone calls were also made to many of them to detail the project's purpose and check whether the email survey had reached the addressee. The survey was also distributed via social media. One hundred forty responses were received.

Following the deadline mentioned above, a quantitative and qualitative analysis of the results obtained was carried out as a structured analysis of the main trends and indicators outlined within the survey. The work on the study was completed on 01.04. 2022.

The study is conducted where various restrictions related to attending training are associated with national and global COVID containment measures for two years. During these two years, national-level conditions have varied continuously, from no restrictions to attend training to a complete ban on attendance training and its online transformation.

Although Bulgarian universities took every opportunity to conduct in-person training, most of the last four semesters were undertaken in a non-in-person format. Considering this described situation, the research team in the research, as mentioned earlier, seeks with this inquiry to answer the questions related to the quality of the training conducted and the potential challenges that need to be overcome to obtain quality university training. Another important topic related to the survey is identifying possible ways to improve online learning to be more prepared for future restrictive traditional learning measures. Responses to the survey were received from all Bulgarian universities, which indicates that the results obtained indicate Bulgarian university education.

In this respect, the questionnaire is designed to identify the following:
1. The perception of university management and academic staff about the resulting quality of the online learning process;
2. The main challenges to quality online learning;
3. Potential opportunities to increase the quality of online learning.
In this connection, the following two research hypotheses are developed:

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Hypothesis 1 (H1): Online learning creates specific challenges that are successfully overcome in Bulgarian conditions

Hypothesis 2 (H2): There are both generally valid prerequisites and those that apply in varying degrees to the different fields of higher education: Pedagogical Sciences, Humanities, Social Sciences, Business and Law, Natural Sciences, Mathematics and Informatics, Engineering, Agricultural Sciences, Veterinary Medicine, Arts, Security and Defense, Sport, Medicine. For some university programmes, the challenges are easily overcome; for others, considerable effort is required; for the third part – the challenges cannot be satisfactorily overcome parallel with the same quality characteristic as the traditional training.

The questionnaire has been made in three major parts:
1. Respondent statistical information related to what role/ capacity the respondent filled in the questionnaire and from which Bulgarian university the respondent is.
2. Closed questions with a predefined, most often placed in-answer scale:
2.1. Do you think online learning is more effective than traditional face-to-face learning?
2.2. Do you think the lecturer requires more specific skills in an online environment?
2.3. Do you think online learning is more accessible in time and space than traditional face-to-face learning?
2.4. Do you admit that online learning can attract international students?
2.5 Do you believe that reduced financial costs characterize online learning compared to traditional face-to-face learning?
2.6 Do you believe online learning is characterized by increased attendance compared to traditional face-to-face learning?
2.7. Do you believe more diverse learning styles characterize online learning than traditional face-to-face learning?
2.8 Do you think focusing on the screen is a severe challenge in online learning?
2.9. Do you believe additional training is needed for lecturers delivering online training focusing on their ability to hold student attention in an online environment?
2.10. Do you consider internet connectivity a severe challenge in online learning?
2.11. Do you think there is an increased sense of isolation in online learning?
2.12. Do you think it is necessary to work with professors to increase their motivation to teach online?
2.13. Do you think there are specific tools you could use to get students actively involved in the online environment?
2.14. Do you think there is a greater need for time management in online learning?
2.15. Do you think there is a greater need to train the lecturer to use new technologies in online learning?
2.16. How do you think the lecture material is better understood?
2.17. Do you feel satisfied with your work teaching online?
2.18. How would you rate online learning in Bulgaria?
3. Open questions to identify missing factors of influence:
3.1. What are the biggest challenges for a lecturer conducting online training?
3.2. What are your recommendations for improving online learning?

4. Summarized survey results and comments

Statistical data and distribution of respondents

The completed questionnaires included respondents from each of the Bulgarian universities representatives of the two major groups: the university management, the teaching and learning process, and the teaching staff. There were more respondents from prominent universities. The respondents are also divided into several other groups according to the fields of higher education in which the specialities of their universities fall: Pedagogical Sciences, Humanities, Law, Economic and Social Sciences, Natural Sciences, Mathematics and Informatics,

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Engineering Sciences, Agricultural Sciences, Veterinary Medicine, Arts, Security and Defense, Sports, Medicine. In Bulgaria, specialized and classical universities are grouped according to the present methodology. This fact is taken into account by the methodology when processing the survey results.

Closed questions with predefined answers

The first question is related to the direct answer to the question of whether, according to the respondents, online learning is more effective than traditional face-to-face training.

81.4% indicated that they did not think online training was more effective (Fig. 1). This high percentage presents, on the one hand, the willingness of lecturers to continue their work in a normal learning environment and, on the other hand, that lecturer-student interaction is more fruitful in face-to-face teaching.

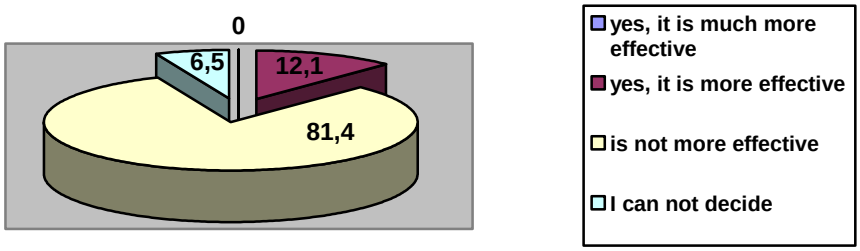


Figure 1. Effectiveness of online training compared to traditional face-to-face training (in %)

The second question concerns the need for a lecturer's specific skills when delivering online training. Respondents gave a clear answer: 84.3% of them think that particular skills in the process of providing online training are necessary (Fig. 2). We can assume that in a digital environment, lecturers should not only adapt the teaching material to be in an accessible format, but also change their attitude in terms of teaching as well in terms of their listeners' students. Learners' interest in lecture material in a digital environment should be constantly maintained; lecturers should improve or refine specific technical competencies, be able to help learners when they need assistance with technical malfunctions, etc.

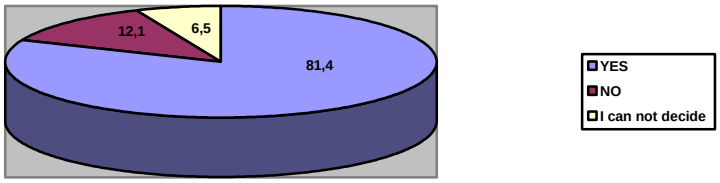


Figure 2. The need for specific skills from the teacher when delivering online training (in %)

The third question relates to respondents' perceptions of the potential better accessibility of online learning in terms of time and space compared to traditional face-to-face learning. Regarding accessibility, 58.6% of respondents felt that e-learning was more accessible. The rest of the respondents are in both poles 20.7% think it is much more accessible, while 18.6% think it is not more accessible. A substantial minority of respondents could not decide (Fig 3).

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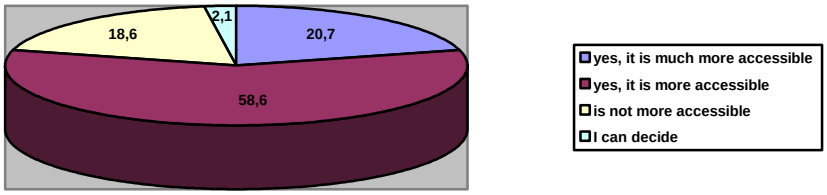


Figure 3. Comparison of the accessibility of online training versus traditional face-to-face training in terms of time and space accessibility (in %)

The fourth redefined question relates to the possibility of attracting international students when offering online university education. Most respondents (67.6%) believed that more international students could be attracted through online learning. It is important to note that 20.1% of respondents strongly disagreed with the majority (Fig. 4). The comments used to explain the responses are also of interest: In general terms, perhaps, yes, but if we are referring to Masters courses, online learning is a compromise there, not a solution. I don't see a viable option where distance learning is taught entirely in medicine, dentistry or pharmacy. This is possible for some courses or parts of the practices in the different specialities, but not completely. In this line of consideration, for many specialities, online learning should not be accepted as an attractive tool for the involvement of international students.

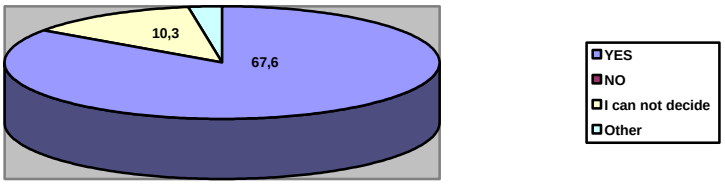


Figure 4. Online learning as a tool to attract more international students (in %)

The fifth question compares online training with traditional face-to-face training regarding the costs needed for the process. 15.1% of the respondents believe that much fewer costs characterize e-training; 48.2% believe that it has lower financial costs, and 26.6% are of the opposite opinion (Fig. 5). The main finding here is again related to the type of training in different groups: training that can be easily transformed from traditional into electronic format, and those for which this transformation is difficult or even impossible (e.g. medicine).

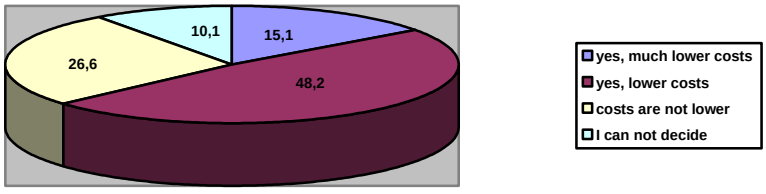


Figure 5. Comparison of online versus traditional face-to-face training in terms of costs (in %)

The sixth question compares student attendance at e-classes to traditional face-to-face lectures. 62.6% did not find attendance to be higher in the online environment compared to face-to-face (Fig. 6). This high percentage of responses reinforces the overall belief from the first survey question, namely that online learning is not more effective than traditional face-to-face learning for the majority of professors. On the other hand, it shows that

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students who want to attend lectures and seminars do so regardless of how the learning process is carried out - face-to-face or online.



Figure 6. Comparison of online versus traditional face-to-face training in terms of class attendance (in %)

The seventh question concerns comparing learning styles in online and traditional face-to-face learning. It is noteworthy that almost half of the respondents consider that more diverse styles characterize online learning. Here the answers provided by respondents from university majors that are difficult or nearly impossible to deliver online significantly influence the final results. 35.3% indicated that more diverse styles are possible. Still, these responses were primarily from representatives of specialities that could easily be transformed from traditional to online learning (Fig. 7). There was very little coverage of educational and social sciences, indicating many untapped opportunities in this area. At the same time, business and computer science majors perform very well.

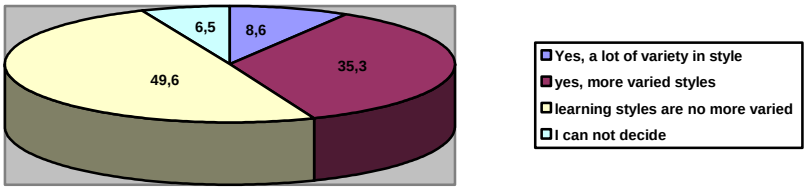


Figure 7. Comparison of online versus traditional face-to-face training in terms of learning styles (in %)

The eighth question concerns concentration on the screen in online learning. The vast majority of respondents consider that the environment through which the training is conducted is inevitably linked to concentrating on the monitor screen and therefore is a serious challenge; respectively, it is an inevitable feature of online training. 27.3% of respondents find it a severe challenge, and 44.6% find it a serious challenge (Fig. 8). Almost a quarter of respondents, 23.7%, do not find it a hindering factor. Such responses came mainly from IT and engineering-related majors and respondents with good technical and pedagogical knowledge. It is evident from the survey that the difficulties are different in the case of technical sciences.

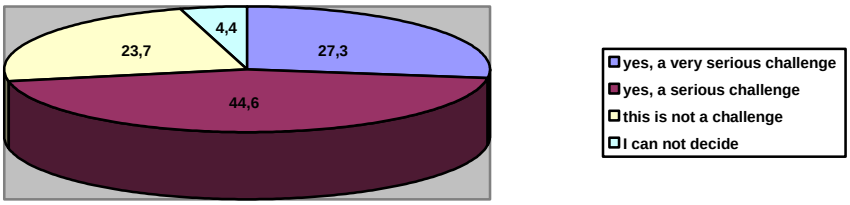


Figure 8. Impact of on-screen concentration in online learning (in %)

The ninth question relates to the need for further qualification of lecturers to work in an online environment, mainly focusing on student attention retention skills. As expected, a majority of 71% found a need for such

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qualifications (Fig. 9). Largely, the respondents are not those who, in response to the previous question, do not find concentrating on a screen a severe challenge, i.e. these are representatives mainly of IT and technical majors.

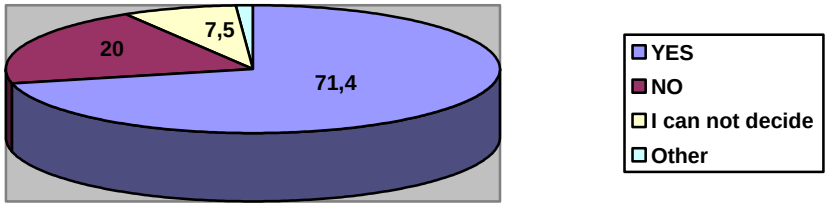


Figure 9. Need for additional training of lecturers to work in online environments, especially related to student attention retention skills (in %)

The tenth question assesses the need for a secure internet connection for online learning and its provision in a Bulgarian environment. Bulgaria is one of the countries with excellent internet connectivity. This applies to both universities' and students' home internet. However, respondents appreciate the need for secure and fast internet connectivity. The answers are mainly distributed between "Yes, a severe challenge" (48,9%) and " Yes, serious challenge ... " (29,5%) (Fig. 10).

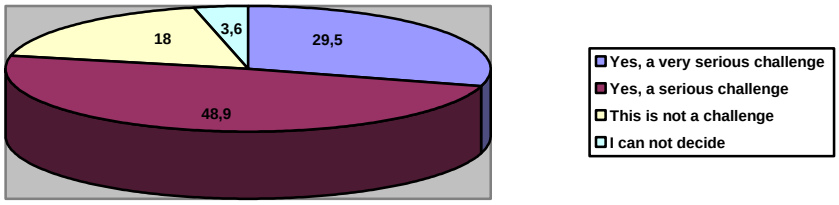


Figure 10. The need for a secure and fast internet connection for online learning (in %)

The eleventh question seeks to establish the extent to which the computer creates a sense of increased isolation in online learning. As expected, most identified communication through a mediator (computer)/ indirect communication as a serious challenge to overcome in online learning. Responses were, for the most part, split between "Yes, a strong sense of isolation" (41%) and "Yes, much stronger ..." (26.6%). Only 15.1% felt that there was no increased sense of isolation (Fig. 11). These responses were mainly from technical and information science majors.

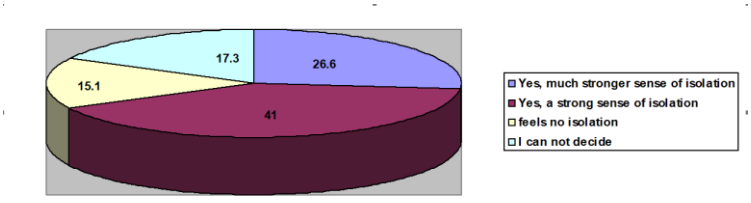


Figure 11. Self-assessment on the creating a sense of isolation in online learning (in %)

The twelfth question assesses the extent to which additional efforts are needed to enhance lecturers' motivation in an online environment. Almost half of the respondents gave a high priority to extra motivation (47.9%), while one-third (33.6%) did not (Figure 12). According to the surveys, the need for additional motivation was widely felt in the humanities, education, social sciences, law and natural science. Conversely, majors are related to the exact sciences, engineering, security, and defence. Respondents from medicine and sports refrained from answering the question en masse, another sign that these majors do not generally embrace online learning.

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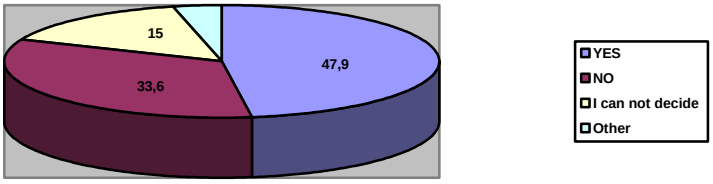


Figure 12. Assessing the extent to which additional efforts are needed to increase lecturers` motivation to teach online (in %)

The thirteenth question refers to the respondents' perception of the need for specific tools, including those that will have features through which student activity in the online environment can be enhanced. This question relates directly to the different educational platforms used in online learning. Since the topic of the specific characteristics, strengths and weaknesses of the other educational platforms used in Bulgaria goes beyond the study's objectives, we will not comment on this issue.

Lecturers are overwhelmingly in favour of specific tools - 67.8%. Those who answered "no" (9.6%) in the survey are both from majors where they generally deny the online form of learning, and one can foresee such majors that are more "static" when communicating with students in the online environment. A large number of respondents (22.6%) responded "not sure" - among these responses should be looked for opportunities to increase student-lecturer interaction in the online environment (Fig. 13).

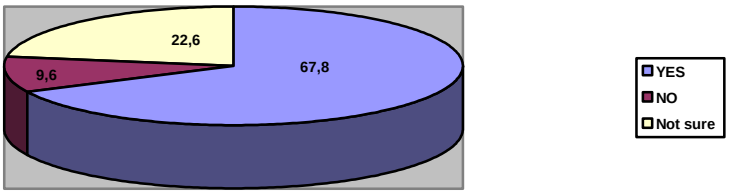


Figure 13. Respondents' perceived need for specific online learning tools (in %)

The fourteenth question attempts to establish the extent to which there is a greater need for time management in online learning. The technological solutions that are applied and the specific methodologies of online training require much more concentration on time management: 16.4% of respondents believe that there is a much greater need for time management in online training compared to traditional face-to-face training, and 41.4% believe that the last one is important. Nearly a third (32.9%) did not find a greater need for time management in the online environment compared to the face-to-face learning process (Fig. 14). Again, respondents from engineering and science majors predominantly answered this way.

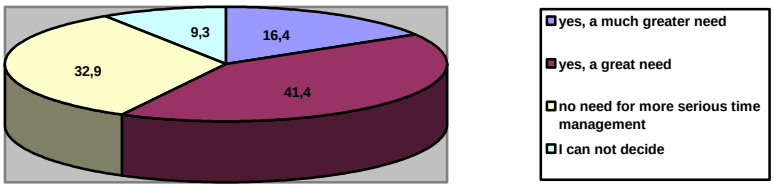


Figure 14. Respondents' perceived need for time management in online versus traditional face-to-face training (in %)

The fifteenth question relates to respondents' views on whether there is a greater need for lecturer training to use new technologies in online learning. The majority of respondents answered that such a necessity exists to a "much

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greater extent" (30%) or a great extent (50.7%). Only 15% believe that no such need exists (Fig. 15). When comparing the profiles of those who responded in this way, it can be assumed that these are mainly from degree courses where the lecturer staff are generally familiar with the possibilities of information and communication technologies and, by their professional profile, quickly and painlessly find their way around them.

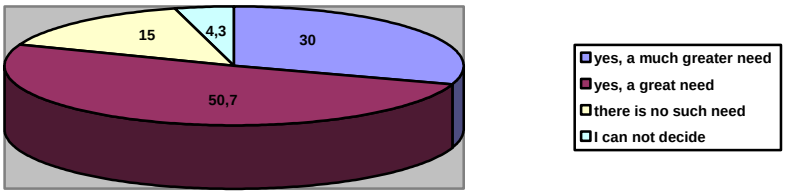


Figure 15. Respondents' perceptions of the need for lecturer training in the use of new technologies for online learning (in %)

A direct question concerning the quality of training is the sixteenth. In this question, respondents give their opinion when the learning material is better understood: in an online environment or face-to-face training. A unanimous percentage of respondents consider that the face-to-face environment facilitates a better way of learning (71.7%). Only 5.1% indicated online learning as a better option for learning the lecture material (mainly informatics-related majors), and 16.7% considered the two forms equivalent to this indicator (Fig. 16).

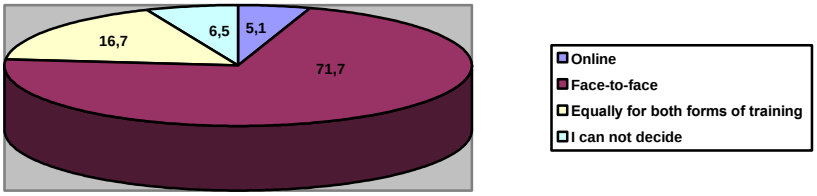


Figure 16. Comparison for better understanding of learning material between face-to-face and online learning (in %)

The seventeenth question identified satisfaction with teaching online. Most lecturers felt dissatisfied, with 46% answering NO and 36.5% answering YES. Some of the YES respondents explained, "Satisfaction is only for a few per cent of the learners …" or "Yes, but the passive resistance of some students affects their final results because, through online learning, they cannot actively engage in the process" (Fig. 17). Unfortunately, the answers to this question do not support the thesis of being able to obtain the same quality of learning online as with traditional face-to-face learning.

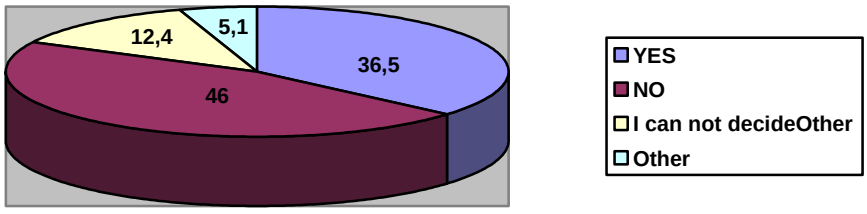


Figure 17. Satisfaction with the online training process (in %)

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The last eighteenth predefined question is related to the final evaluation of the online learning conducted during the COVID-19 restrictions in Bulgaria. Here the majority of responses are in the golden mean - 3 on a scale of 1 - "not at all effective" to 5 - "it is effective" (Fig. 18).

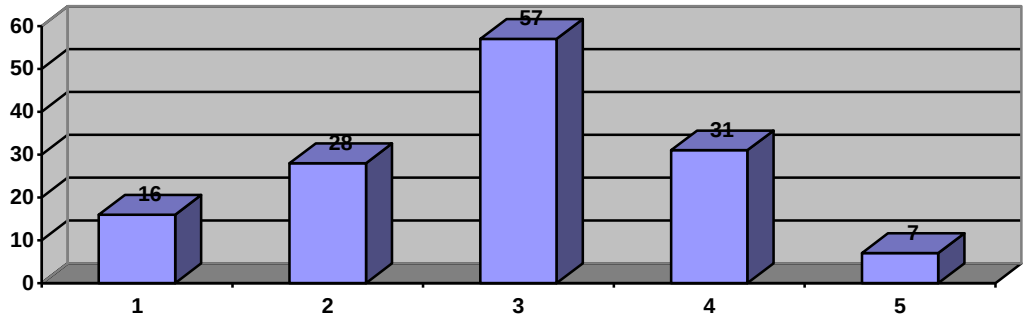


Figure 18. Satisfaction with the online training process (in number)

4.3. Comment on the results of open questions to identify missing influential factors

The following two questions are open, allowing the respondents to answer freely in their own words.
The first question is, "What are the biggest challenges for a teacher when delivering training in an online environment?"
The answers to this question allow us to reflect on the difficulties and draw conclusions about the factors that would improve online learning. We could group the responses into two main lines: technical (equipment, internet connection, online tools, etc.) and pedagogical (preparation of interactive content, lack of live contact, motivation, feedback, attention, passivity).

The last question collects recommendations directly connected to the online learning process at Higher education institutions in Bulgaria. The central part of the recommendations is related to the idea that face-to-face interaction between lecturers and students could be considered social significance. Therefore online learning could be integrated only as a tiny part of overall education. At the same time, there are recommendations related to the training for technical skills and training for more students' engagement in online learning.

Conclusions

The COVID-19 pandemic and the challenges associated with the restriction of social isolation have met Bulgarian universities with varying degrees of readiness to cope with a rapidly evolving reality. During the pandemic, online learning became the only possible form of continuing education at universities, with lecturers, students and university management facing many emerging difficulties: from the most fundamental problems of availability of appropriate equipment and high-speed internet to issues of student attention retention and lecturer motivation.

The results of our empirical study highlight that, according to educators, online learning satisfaction scores lie in the golden mean - 3 on a scale of 1 - "not at all effective" to 5 - "it is effective". At the same time, the central part of lecturers admits that interaction between students and lecturers has social significance. Therefore, online learning could only be a tiny part of overall education. In terms of improving the online learning process, most recommendations are in the line of training for technical skills and activities for more effective student engagement in online learning.

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AN ANALYSIS OF THE IMPACT OF SELECTED PREDICTORS FOR CROSS-BORDER M&A ACTIVITY WITHIN THE EUROPEAN AREA*

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Abstract. This paper provides a comprehensive overview of European M&A activity from 1998-2021. It examines trends and drivers of cross-border mergers and acquisitions, examining how European integration has affected M&A activity and the critical characteristics of M&As in the European Area. The ambition is to contribute to the existing literature on M&A activity in Europe. The paper aims to analyze the impact of advancing integration processes in Europe through our selected predictors on capital reallocation through cross-border M&As as a whole and also separately in the manufacturing sector and the service sector in the examined period in the countries of the European area through a generalized regression model and identify peculiarities in both industries. To achieve this goal, we investigated a new dataset of all completed M&A between 1998 and 2021 in 19 sources and 28 target countries of the European Area.

Keywords: European Union; European Monetary Union; cross-border mergers; cross-border acquisitions; manufacturing sector, service sector

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1. Introduction

Since their explosion in the mid-1990s, mergers and acquisitions (M&As) have become a global phenomenon with growing prevalence and now account for more than 76% of foreign direct investment (OECD, 2022). Essentially, cross-border M&As are tools of trade for companies looking to expand their operations overseas (abroad). They are an essential source of value creation and provide the means to access new jurisdictions and take advantage of different economic, market and consumer dynamics. Thus, they provide social and economic benefits (Stefko et al., 2022). They are also critical for the sustainable and profitable growth of corporations, even today, for their core business activities and future value-generating activities. According to Zhao (2021), the worldwide trend has become the growth of cross-border cooperation aimed at sustainability, both in terms of traditional mergers and acquisitions, as well as non-traditional ones such as partnerships, alliances and new ecosystems. The pursuit of sustainability and the fight against climate change, using alternative energy sources and raw materials, transforming the global supply chain, etc., are becoming highly topical, especially in the manufacturing and energy sectors (Kelemen et al. 2019; Simionescu et al. 2021). In their strategies, international organizations appeal to sustainability as a critical element for the future success of industries through various initiatives and support programs (Gavurova et al. 2019).

This naturally subsequently leads global players to a growing interest in mergers, acquisitions, alliances and initiatives that support the initiative of a sustainable world, new technologies and products and increase the attractiveness of individual industries for investors. Consumers also play an equally important role. Their demands for ESG-friendly products force industries to change raw materials and production processes. ESG factors will continue to integrate increasingly into the overall M&A deal sourcing. The transaction execution process, as well as the post-deal management and M&A itself, is an essential tool to create sustainable value for corporates and overall economic recovery through a green path (Zhao, 2021; Hasheminasab et al., 2022; Wang et al., 2022a).

The vast majority of attention is on cross-border deal research from several perspectives, such as motives, strategic issues, performance, etc. This paper examines trends and drivers of cross-border mergers and acquisitions, how European integration has affected M&A activity and the key characteristics of M&A in the European Area. The ambition is to contribute to the extant literature on M&A activity in Europe. The current wave of mergers and acquisitions in Europe, starting at the beginning of the 21st century, has some unique characteristics. The development of M&A deals is particularly noteworthy in terms of the deepening of the single integrated market, a more homogeneous regulatory framework, the expansion of the European Union, the creation of the European Monetary Union, changes in the European business environment, size and geographical dispersion. The introduction of the shared euro currency, liberalization of trade and investment regimes, the deregulation of the services sector, technological innovations, privatization, industry consolidation, globalization of industry and changing the worldwide industrial structure as well as the rapid development of financial markets and an increase in liquidity reflected in a higher proportion of cross-border deals in the European area in the last two decades.

The paper aims to analyze the impact of advancing integration processes in Europe through our selected predictors on capital reallocation through cross-border M&As as a whole and also separately in the manufacturing sector and the service sector in the examined period in the countries of the European area through a generalized regression model and identify peculiarities in both industries. To achieve this goal, we investigated a new dataset of all completed M&A between 1998 and 2021.

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2. Theoretical framework and hypothesis development

This paper is connected to the literature on the determinants of cross-border M&As. Among the most cited early empirical studies of aggregate cross-border M&As are Rossi and Volpin (2004), who focused on differences in laws and regulations across countries, Di Giovani (2005), who used the gravity model framework to uncover the determinants of the size and direction of international M&A flows, Bris and Cabolis (2008), who constructed measures of the change in investor protection. Head and Ries (2008) developed a control-based model of FDI. Changes in the quality of institutional environments were the subject of research by Bekaert et al. (2007) and Papaioannou (2009). Moreover, depending on the countries, the determinants of the quality of environments, including legal, economic and political environments (Dvorsky et al., 2021a; Gavurova et al. 2021) differ (Civelek et al., 2020) since governments can impose various regulations (Civelek & Krajčík, 2022). Innovative solutions applied by governments can provide some solutions for the problems that stem from those institutional environments. Those positive environmental changes also contribute positively to businesses (Dvorsky et al., 2021b), such as increasing their competitiveness which cause better financial performance and communities (Stefko et al., 2019; Gavurova et al. 2018, 2020). On the other hand, in case of unstable conditions in legal conditions, businesses face more impediments to development (Stefko et al., 2021). The aim of the research of the authors Coeurdacier, De Santis and Aviat (2009) was to assess the impact of the European Union and the European Monetary Union on capital reallocation through cross-border mergers and acquisitions within the member countries of these integration groups (Wang et al., 2022b). Their effort was to confirm or refute the theoretical arguments of Neary (2007), namely that trade liberalization and deeper integration of the European market correlate with an increase in the number of realized cross-border mergers and acquisitions. Moschieri et al. (2014) looked at how the harmonization of European regulations has affected M&A activity and the main characteristics of M&As in Europe. Barattieri, Borchert and Mattoo (2014) presented evidence on the determinants of cross-border mergers and acquisitions in services sectors; Skare and Riberio Soriano (2022), Chen et al. (2022) continued similar studies. McCarthy and Dolfsma (2015) examined the impact of the Euro on the number, size, performance and regional spread of European mergers and acquisitions. This paper is a continuous extension of the research presented in our previous studies Hečková, et al. (2016), Hečková, et al. (2018), and Štefko et al. (2022).

3. Methodology

The presented The data preparation process started with the extraction of 117 561 data on the number and volume of realized cross-border mergers and acquisitions with a minimum value of one transaction for 1 million euros in 19 source and 28 target countries of the European area and the values of the other predictors selected by us. We use a comprehensive dataset on global mergers and acquisitions from Bureau van Dijk Zephyr and Orbis database (Bureau van Dijk, 2022), spanning 1998-2021. The dataset consists of individual cross-border equity deals between the home country of the acquirer and the host country where the target firm is domiciled. The source of other statistical data used is Eurostat (European Commission, 2022). The basis for the modelling was the scientific studies of Head and Ries (2008), Coeurdacier, De Santis and Aviat (2009), McFadden's discrete choice (McFadden, 1974) and the study of Hečkova, et al. (Hečková et al., 2016). The extreme value of the capitalization volume of 204.73 million Euro was excluded from the research set between the United Kingdom as a source country and Germany as a target country implemented in 2000.

$M\&A_{ij,s,t}$ represents the total value of assets acquired through cross-border mergers and acquisitions by source country i in target country j in sector s and at time t. An important predictor that affects the volume of cross-border mergers and acquisitions can be considered the value of the gross domestic product of the source (i) and target country (j) in sectors s and at time t ($GDP_{j,s,t}$, $GDP_{i,s,t}$). Using the logarithm of their values eliminates their elasticity and does not affect the overall result. The following variables were further included in the model: the

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proximity of the countries, the specificity of their culture and the relatedness of the language. Proximity of the source and target countries is quantified by the distance of their capitals denoted as $distance_{ij}$, the sharing of a common border is quantified by the binary variable $border_{ij}$, which takes the value 1 in the positive case and the value 0 in the negative case. The binary variable $common\ language_{ij}$ assumes the value 1 in the case of the same official language and the value 0 otherwise and was considered to quantify the influence of language relatedness on the volume of cross-border assets. The goal is to estimate the weights of the considered predictors on the total value of assets acquired through cross-border mergers and acquisitions $M\&A_{ij,s,t}$ by source country *i* in target country *j* in sector *s* and at time *t*. The other predictors in the considered model represent dummy variables that relate to the membership of the source and target countries in the European Union and in the European Monetary Union, namely $EU_{i,t}EU_{j,t}$ takes the value 1 if the source country *i* as well as the target country *j* was a member of the European Union at time *t*, otherwise it takes the value 0. The variable $EMU_{i,t}EMU_{j,t}$ take the value 1, if the source country i as well as the target country j was a member of the European Monetary Union at time t, otherwise it takes the value 0.

Analysis of the effect of selected predictors and estimation of their regression weights on the total value of assets acquired through cross-border mergers and acquisitions $M\&A_{ij,st}$ by source country *i* in target country *j* in sector *s* and time *t* is carried out using a regression equation in the form:

$$\log(M\&A_{ij,s,t}) = \beta_0 + \beta_1 \cdot \log(HDP_{i,s,t}) + \beta_2 \cdot \log(HDP_{j,s,t}) + \beta_3 \cdot \log(Distance_{i,j}) + \\ + \beta_4 \cdot Border_{i,j} + \beta_5 \cdot ComLang_{i,j} + \beta_6 \cdot (EU_{i,t}EU_{j,t}) + \beta_7 \cdot (EMU_{i,t}EMU_{j,t}) \quad (1)$$

For the analysis itself, a generalized linear regression model with a gamma distribution and a logarithmic linking function was chosen. Generalized regression models, both linear and non-linear, cover a wide range of statistical methods with different types of variables that are widely used in economics and management fields. As part of the analysis, several regression models were tested, and their results were comparable regarding the significance of the regression coefficients.

The generalized linear regression model with normal distribution and linking function ident was identical to the selected model in terms of the significance of the predictors and their effect. A similar result was also achieved with the classical linear model by forward stepwise regression analysis with the achieved level of significance p = 0.000 for Fisher's F-test, and with a value of the adjusted index of determination at the level of 0.883. The simulation of the model by expanding the interactions of individual predictors no longer led to a better result in terms of quality.

3. Results

The A basic analysis of the created database on executed cross-border mergers and acquisitions transactions in the period 1998 to 2021 from the point of view of the source country *(i)* and the target country *(j)* shows that the largest number of cross-border transactions was directed from the United Kingdom with a total number of 1513 and a total financial volume €58,871 million. The largest financial volume came from France, namely €80,666 million, with a total of 917 cross-border mergers and acquisitions. France implemented cross-border mergers and acquisitions primarily in Spain (158; €18,241 million), the Netherlands (102; €11,881 million), Italy (118; €10,248 million), Great Britain (189; €9,609 million), Germany (92; €8,882 million) and Belgium (81; €7,628 million).

Great Britain directed its investments primarily to Germany (332; €12,806 million), France (369; €12,319 million), the Netherlands (212; €8,634 million), Spain (120; €5,876 million) and Italy (128 €5,748 million). Another essential source *(i)* countries of cross-border mergers and acquisitions are the Netherlands with a total of

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717 cross-border mergers and acquisitions and a total volume of €49,779 million, and Germany, with a total of 660 cross-border mergers and acquisitions and a total financial volume of €44,786 million. From the point of view of the target country *(j)*, the most important country for cross-border mergers and acquisitions is France, with a total financial volume of €56,250 million. In France, cross-border transactions were carried out primarily from Great Britain (369; €12,319 million), Spain (77; €7,570 million), Belgium (97; €6,902 million), Germany (89; €6,825 million) and the Netherlands (63; €6,052 million). The second most important country in terms of completed cross-border mergers and acquisitions is Germany, with a total financial volume of €54,951 million (905). In Germany as a target country, mergers and acquisitions were carried out primarily from Great Britain (322; €12,806 million), France (92; €8,882 million), Italy (80; €5,984 million), the Netherlands (82; €5,653 million) and Luxembourg (51; €5,140 million). The third most important country in realized cross-border transactions is Spain, with a total volume of funds of €48,091 million (616). In Spain, as a target country, mergers and acquisitions were carried out primarily from France (158; €18,241 million), Italy (91; €7,590 million), Great Britain (120; €5,876 million) and the Netherlands (50; €4,315 million). Other target countries *(j)* in terms of the total volume of cross-border mergers and acquisitions are the Netherlands (626; €46,966 million), Italy (568; €39,849 million), Great Britain (689; €34,133 million), Portugal (250; €22,342 million) and Belgium (322; €21,871 million).

Table 1. Estimation of regression model parameters for the entire data set (N=7455)

Effect	*y - Parameter estimates; Distribution : GAMMA Link function: LOG*						
	Level of Effect	***Estimate***	***Standard Error***	***Wald Stat.***	***Lower CL 95.0%***	***Upper CL 95.0%***	***p***
Intercept		1.28735	0.036211	1263.856	1.21637	1.35832	0.000000*
log ($GDP_{i,s,t}$)		0.04018	0.004300	87.344	0.03176	0.04861	0.000000*
log ($GDP_{j,s,t}$)		0.03114	0.003738	69.422	0.02382	0.03847	0.000000*
log ($Distance_{i,j}$)		-0.04106	0.011058	13.789	-0.06273	-0.01939	0.000205*
$Border_{i,j}$	0	0.00418	0.004129	1.027	-0.00391	0.01228	0.310927
$ComLang_{i,j}$	0	0.00859	0.006306	1.854	-0.00377	0.02095	0.173305
$EU_{i,t}\,EU_{j,t}$	0	0.03357	0.006145	29.852	0.02153	0.04562	0.000000*
$EMU_{i,t}\,EMU_{j,t}$	0	-0.04391	0.003623	146.886	-0.05102	-0.03681	0.000000*

y – log($M\&A_{ij,s,t}$), * - *significant at the significance level α = 0.05*
Source: own sourcing

Table 1 presents the basic analysis of the regression model (1) for the entire research set, which contains 7455 data on cross-border mergers and acquisitions in the evaluated period of 1998 to 2021. The above analysis shows that from the point of view of the interval variables of the model (1) for the conditional change in the value of assets acquired through cross-border mergers and acquisitions by the source country *i* in the target country *j* in sector *s* and at time *t* ($M\&A_{ij,s,t}$) has a significant effect at the selected level of significance α = 0.05 especially the GDP of the source country ($GDP_{i,s,t}$). Here it can be observed that an increase in GDP of the source country by 1% creates an increase in the conditional value of cross-border assets by 4.018%. The second most significant continuous predictor with a positive effect on the conditional change of the dependent variable *y* is GDP in the target country ($GDP_{j,s,t}$). Here it can be observed that for a 1% increase in the value of GDP in the destination country, the total value of assets acquired through cross-border transactions will increase by 3.114%. From the point of view of predictors in the interval scale, the distance between the main cities of the source and target countries ($Distance_{i,j}$), has a negative effect, where a 1% increase in this distance results in a decrease of the

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dependent variable $M\&A_{ij,s,t}$ by 4.106 %. It follows from Table 1 that the change in the value of assets acquired through cross-border mergers and acquisitions at the chosen significance level $\alpha = 0.05$ is not affected by the variable $Border_{i,j}$ a $ComLang_{i,j}$, the existence of a common border and the existence of a common communication language. From the point of view of the significance of the contribution to the model, the most significant variable is $EMU_{i,t}EMU_{j,t}$, which takes on the value of 1 if the source country *i* as well as the target country *j* was a member of the European Monetary Union at time *t*. In the case that both countries were members of the European Monetary Union at time *t* (*N = 3273*), when the other input variables are fixed at their mean values, the marginal value of the dependent variable is at the level of €39057.875 ± €3140.264, and vice versa if the variable $EMU_{i,t}EMU_{j,t}$ acquired at time *t* the value 0 (*N=4182*) is the marginal value of the dependent variable $M\&A_{ij,s,t}$ at the level of €15017.049 ± €1146.508.

The second significant dummy variable in the regression model (1) is the membership of the source *(i)* and target *(j)* countries in the European Union ($EU_{i,t}EU_{j,t}$). The marginal mean value of the volume of cross-border assets estimated by the model if both countries, source and target, are members of the European Union (*N = 6951*) is €23,186,709 ± €1,342,428, and for the opposite case

($EU_{i,t}EU_{j,t} = 0$) the marginal mean value of the volume is cross-border assets €18644.886 ± €4537.019. A graphic display of the influence of both significant dummy variables is presented in Figure 1.

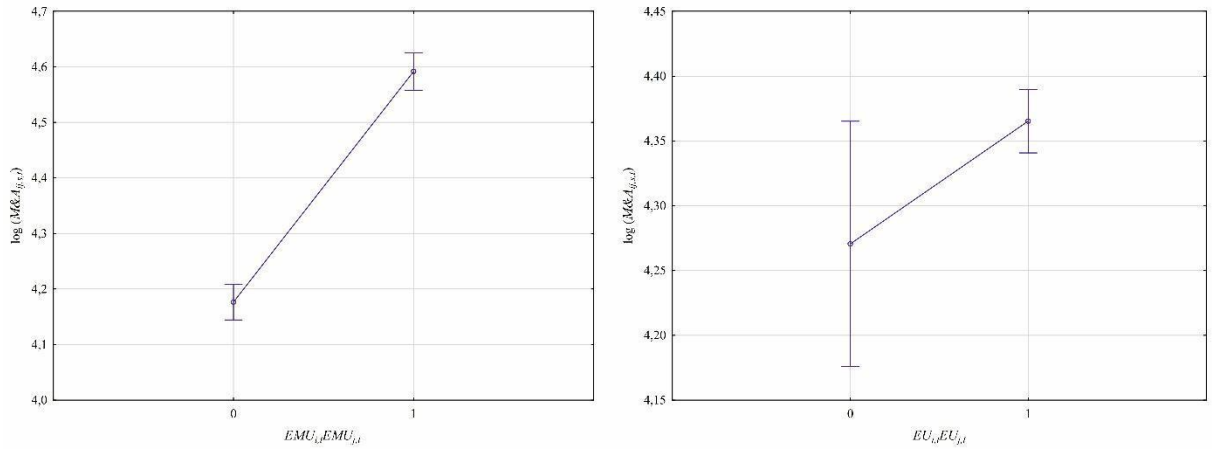


Figure 1. The effect of dummy variables on the change in the total value of assets purchased through mergers and acquisitions $M\&A_{ij,s,t}$ for the entire research set
Source: own sourcing

In the next step, separate regression models were implemented for the service sector and the manufacturing sector. These separate regression models are based on the original model (1). In terms of homogeneity and distribution of quantitative variables and obtained residuals, both investigated database subsets were a better input for regression analysis than the entire data set and showed better results of regression diagnostics.

The results of the regression analysis for the examined service sector, presented by the essential characteristics of the regression model, are shown in Table 2.

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Table 2. Estimation of regression model parameters for the service sector (N=4950)

Effect	*y - Parameter estimates Distribution : GAMMA Link function: LOG*						
	Level of Effect	***Estimate***	***Standard Error***	***Wald Stat.***	***Lower CL 95,0%***	***Upper CL 95,0%***	***p***
Intercept		1.26961	0.044370	818.7744	1.18265	1.35657	0.000000*
log ($GDP_{i,s,t}$)		0.05479	0.005302	106.7854	0.04440	0.06518	0.000000*
log ($GDP_{j,s,t}$)		0.03376	0.004449	57.5952	0.02504	0.04248	0.000000*
log ($Distance_{i,j}$)		-0.05640	0.013314	17.9430	-0.08249	-0.03030	0.000023*
$Border_{i,j}$	0	0.00349	0.005270	0.4390	-0.00684	0.01382	0.507621
$ComLang_{i,j}$	0	0.00372	0.007515	0.2453	-0.01101	0.01845	0.620433
$EU_{i,t}\,EU_{j,t}$	0	0.06406	0.008066	63.0747	0.04825	0.07987	0.000000*
$EMU_{i,t}\,EMU_{j,t}$	0	-0.05268	0.004578	132.4246	-0.06165	-0.04371	0.000000*

y – log($M\&A_{ij,s,t}$), * - *significant at the significance level α = 0.05*
Source: own sourcing

Similar results as for the entire research set (Table 1) are also observed for the service sector. From the above analysis, it follows that the point of view of the interval variables of the model (1) for the service sector on the conditional change in the value of assets acquired through cross-border mergers and acquisitions by source country *i* in target country *j* in sector *s* and at time *t* ($M\&A_{ij,s,t}$) has a significant impact at the selected level significance α = 0.05, primarily GDP of the source country ($GDP_{i,s,t}$). Here it can be observed that an increase in GDP of the source country by 1% creates an increase in the conditional value of cross-border assets by 5.479%. The second most significant continuous predictor with a positive effect on the conditional change of the dependent variable *y* is GDP in the target country ($GDP_{j,s,t}$). Here it can be observed that for a 1% increase in the value of GDP in the target country, the total value of assets acquired through cross-border mergers and acquisitions will increase by 3.376%. From the point of view of predictors in the interval scale, the distance between the main cities of the source and target countries ($Distance_{i,j}$), has a negative effect, where a 1% increase in this distance results in a decrease of the dependent variable $M\&A_{ij,st}$ by 5,640 %. It follows from Table 2 that the variable $Border_{i,j}$ and $ComLang_{i,j}$, the existence of a common border and the existence of a common communication language, do not affect the change in the value of assets acquired through cross-border mergers and acquisitions at the selected level of significance α = 0.05, as in the analysis of the entire research set . From the point of view of the significance of the contribution to the model, the most significant variable is $EMU_{i,t}EMU_{j,t}$, which takes on the value of 1 if the source country *i* as well as the target country *j* was a member of the European Monetary Union at time *t*. In the case that both countries were members of the European Monetary Union at time *t* (*N = 2077*), when fixing the other input variables at their mean values, the marginal value of the dependent variable is at the level of €37,414,990 ± €3,858,460, and vice versa if the variable $EMU_{i,t}EMU_{j,t}$ acquired at time *t* the value 0 (*N=2873*) is the marginal value of the dependent variable $M\&A_{ij,s,t}$ at the level of €12049.349 ± €1124.116. The second significant dummy variable in regression model (1) is the membership of the source *(i)* and target *(j)* countries in the European Union ($EU_{i,t}EU_{j,t}$). The marginal mean value of the volume of cross-border assets estimated by the model if both countries, source and target, are members of the European Union (*N = 4664*) is €19,142,826 ± €1,387,294, and for the opposite case ($EU_{i,t}EU_{j,t}$ = 0) the marginal mean value

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of the volume of cross-border assets is assets €23,770,690 ± €7,840,943. Here we observe the opposite trend compared to the entire research set as documented in Figure 2.

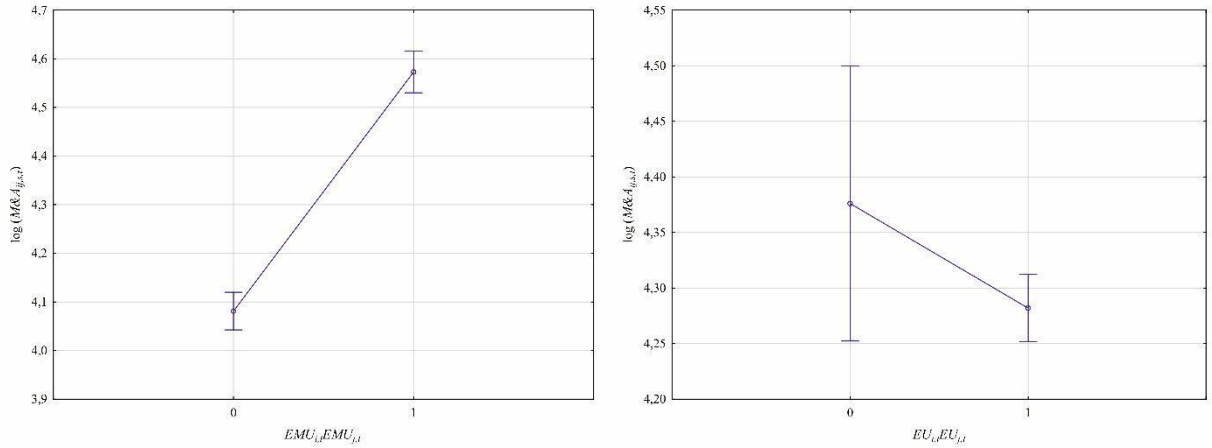


Figure 2. The effect of dummy variables on the change in the total value of assets purchased through mergers and acquisitions $M\&A_{ij,s,t}$ for the service sector
Source: own sourcing

The last analyzed subset is the manufacturing sector. The results of the regression analysis for the studied production sector, presented by the basic characteristics of the regression model, are shown in Table 3.

Table 3. Estimation of regression model parameters for the manufacturing sector (N=2505)

Effect	***y - Parameter estimates Distribution : GAMMA Link function: LOG***						
	Level of Effect	***Estimate***	***Standard Error***	***Wald Stat.***	***Lower CL 95,0%***	***Upper CL 95,0%***	***p***
Intercept		1.31471	0.061712	453.8526	1.19375	1.43566	0.000000*
log ($GDP_{i,s,t}$)		0.02641	0.007390	12.7739	0.01193	0.04090	0.000351*
log ($GDP_{j,s,t}$)		0.02049	0.006823	9.0174	0.00712	0.03386	0.002674*
log ($Distance_{i,j}$)		-0.01807	0.019350	0.8719	-0.05599	0.01986	0.350427
$Border_{i,j}$	0	0.01189	0.006499	3.3500	-0.00084	0.02463	0.067205
$ComLang_{i,j}$	0	0.00460	0.011419	0.1622	-0.01778	0.02698	0.687142
$EU_{i,t}\,EU_{j,t}$	0	-0.02213	0.009367	5.5796	-0.04049	-0.00377	0.018171*
$EMU_{i,t}\,EMU_{j,t}$	0	-0.02195	0.005793	14.3544	-0.03330	-0.01059	0.000151*

y – log($M\&A_{ij,s,t}$), * - *significant at the significance level α = 0.05*
Source: own sourcing

The results of the regression analysis for the manufacturing sector (Table 3) show a certain change in the influence of the examined dependent variables on the value of assets acquired through cross-border mergers and acquisitions by source country *i* in target country *j* in sector *s* and at time *t* ($M\&A_{ij,s,t}$). First of all, we observe the statistical insignificance of the influence of the distance between the main cities of the source and target countries ($Distance_{i,j}$) at the chosen level of significance α = 0.05, in contrast to the entire research set and the service sector. On the other hand, we observe almost a half smaller influence of the other significant interval variables on

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the conditional change in the value of the investigated parameter ($M\&A_{ij,s,t}$). For GDP of the source country ($GDP_{i,s,t}$). Here it can be observed that an increase in GDP of the source country by 1% creates growth in the conditional value of cross-border assets by 2.641% and for GDP in the target country ($GDP_{j,s,t}$) it can be observed that with a 1% increase in the value of GDP in the target country, the total value will increase assets acquired through cross-border mergers and acquisitions by 2.049%. Compared to the service sector, these values represent a decrease of 51.798% for the GDP of the source country and a decrease of 39.307% in the GDP of the target country. From the point of view of the significance of the contribution to the model, the most significant variable is $EMU_{i,t}EMU_{j,t,}$ which takes on the value of 1 if the source country *i* as well as the target country *j* was a member of the European Monetary Union at time *t*. In the case that both countries were members of the European Monetary Union at time *t* (*N = 1196*), when the other input variables are fixed at their mean values, the marginal value of the dependent variable is at the level of €42084.207 ± €5627.663, and vice versa if the variable $EMU_{i,t}EMU_{j,}$ acquired at time *t* the value 0 (*N=1309*) is the marginal value of the dependent variable $M\&A_{ij,s,t}$ at the level of €24347.487 ± €3279.772. The second significant dummy variable in the regression model (1) is the membership of the source *(i)* and destination *(j)* countries in the European Union ($EU_{i,t}EU_{j,t}$ The marginal mean value of the volume of cross-border assets estimated by the model if both countries, source and target, are members of the European Union (*N = 2287*) is €34,275,254 ± €3,317,317. For the opposite case ($EU_{i,t}EU_{j,t}$ = 0) the marginal mean value of the volume is cross-border assets €13557.357 ± €5395.301. A graphic representation of the influence of both significant dummy variables for the manufacturing sector is shown in Figure 3.

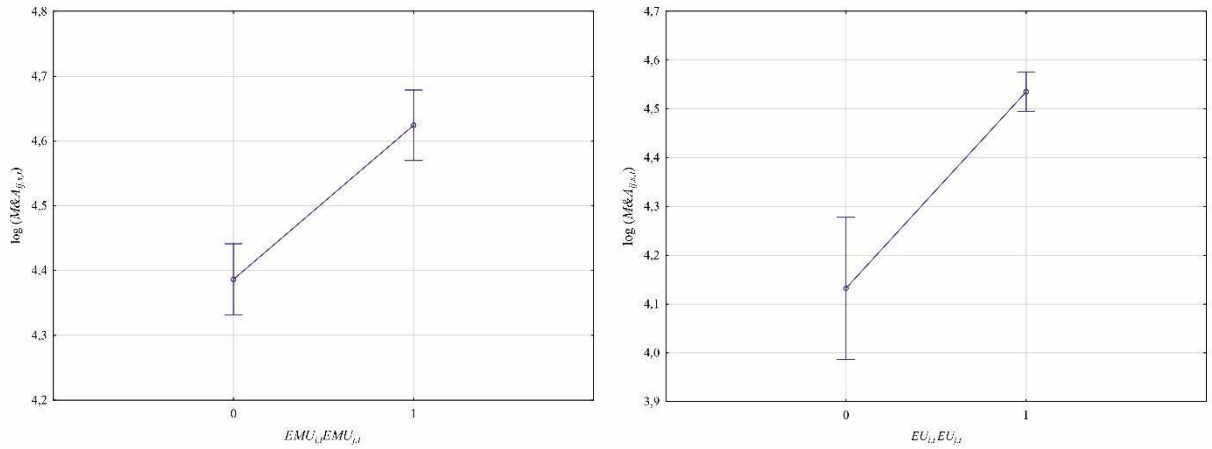


Figure 3. The effect of dummy variables on the change in the total value of assets purchased through mergers and acquisitions $M\&A_{ij,s,t}$ for the manufacturing sector
Source: own sourcing

3. Discussion and Conclusion

The context of the study is the integration of the European market that has sped up by the launch of the Economic and Monetary Union in 1992 and the introduction of the Euro in 2002. Many studies converge in finding that these steps, mainly through increasing market size and decreasing transaction costs and political uncertainty, have led to a rise in cross-border M&A activity and performance (Coeurdacier et al., 2009; McCarthy & Dolfsma, 2015; Moschieri et al., 2014). Even in the years following the financial crisis beginning in 2008, market integration continued despite cross-border M&A activity declining (Weitzel et al., 2014) but patterns in M&A activity during the financial crisis have not deviated significantly from those in periods of expansion. Globalization of financial markets also plays a crucial role because different economies have become closer to the existence of the globalization process (Přívara & Kiner, 2020). Government measures like investment

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liberalization, privatization, and regulatory change also contribute to accessing these cross border mergers and acquisitions opportunities.

Moreover, the creation of industrial zones by governments might also enable businesses to apply more cross-border activities, including increases in export (Navickas et al., 2021), merger and acquisition actions (Ključnikov et al., 2021, 2022) since those zones also enable foreign businesses to operate in such regions (Civelek et al., 2021). Firms can also closely follow other companies' technologies and use those technologies for their internationalization process (Stefko et al., 2022). The results of the research carried out by us presented in this contribution in the investigated period of 1998 to 2021 as well as in our previous studies Hečková, et al. (2016), Hečková et al. (2018) with a narrow view of the selected predictors confirm that European integration in general, and EMU, in particular, have stimulated intra-EU cross-border M&A activity and to have enhanced the attractiveness of European companies. Membership in the European Union has a significant impact, especially in the manufacturing sector. The conditional change in the value of assets obtained through cross-border mergers and acquisitions in our model has the strongest impact of the GDP source country. The second most important is the GDP in the target country. The simplicity of access, greater awareness or unity of standards and rules of the European market has contributed to increased tendencies of investment in the form of mergers and acquisitions between the Member States of the European Union. This phenomenon is further strengthened if both countries are also members of EMU, related to lower entry costs and profitability resulting from investment within the same currency. If only one of the countries is a member of EMU, the volume of mergers and acquisitions is lower, which results from the fluctuation of other currency pairs with a rigid euro taking into account the development of the situation within all EMU countries. The influence of the euro single currency is thus a strong, statistically significant determinant of the implementation of cross-border mergers and acquisitions. The existence of a common border and a common communication language do not significantly affect the change in the value of assets acquired through cross-border mergers and acquisitions, contrary to the results of the research of Barattieri, Borchert and Mattoo (2014). When comparing both partial models, namely for the manufacturing sector and the service sector, we observed in the manufacturing sector the statistical insignificance of the influence of geographical barriers, in contrast to the entire research set and the service sector, and almost a half smaller influence of the other significant interval variables on the conditional change in the value of the investigated parameter GDP. The presented results are also an input for further research on this issue, especially in individual sectors, where it is necessary to look for other significant predictors.

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THE COVID – 19 PANDEMIC AND ITS IMPACT ON THE LABOR MARKET IN THE SLOVAK REPUBLIC AND THE EUROPEAN COUNTRIES*

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Abstract. The outbreak of the worldwide pandemic COVID-19 at the beginning of 2020 prompted almost all governments around the world to implement restrictive measures with social distancing. The dealing with the negative effects of a pandemic on the labor market is different in individual countries. The policy measures can contribute to faster recovery of the labor market, that has been most affected by the pandemic. The main purpose of the article is to analyze changes in labor market of NUTS 3 regions in the Slovak Republic during the pandemic. The aim of the study is to assess the effects of pandemic particular phases on the changes in the labour market in the Slovak republic and the European Union countries. The key method used to analyse these changes is the beta and sigma convergence method, which offers the opportunity to monitor in detail how the labour market situation has changed over time. To fulfil the main purpose of the article, we will work with statistical databases related to pandemic progress and with statistical data of the labour market. The results show that the pandemic has caused labor market changes in the form of rising unemployment, which we attribute mainly to the national lockdown at the beginning of the pandemic.

Keywords: labour market; COVID-19 pandemic; region; regional disparities; unemployment

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Additional disciplines: Urban, Rural, Regional, Real Estate, and Transportation Economics, Particular Labor Markets, Labor and Demographic Economics

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1. Introduction

The outbreak of the worldwide pandemic COVID-19 (C-19) at the beginning of 2020 prompted almost all governments around the world to implement restrictive measures, with social distancing. he approaches to dealing with the negative effects of a pandemic on the labor market are diverse in individual countries. Many businesses were temporarily closed, and many employed people were confined and isolated to prevent the spread of the virus. For this reason, it is necessary to apply policy measures that will contribute to the faster recovery of those areas on the labor market, that have been most affected by the pandemic. Admission of effective decisions to elimination the impact of a pandemic on the national economy and the labour market requires a detailed analysis of progress and a comparison of epidemiological data as well as economic and labour market data.

In their research, many authors point to the negative impact of the C-19 pandemic. However, there are several camps where views on the pandemic and its impact on the economy and on the labour market are clearly different. One group of experts argues that the pandemic has negatively affected the economic situation and labour market performance since its inception, and that this situation still persists, which is why they recommend state intervention to offset the adverse effects. On the other side, the second group of experts is of the opinion that the pandemic has negatively impacted the economy as well as the overall labour market, but the situation has come under control over time and therefore state intervention is not fully needed, but only in areas that cannot be compensated other than financially way.

One of these contradictory opinions can only be accepted based on individual country-by-country examinations, as each country and region shows a different degree of pandemic intervention and a different degree of economic development. In this case, however, the situation is very difficult, as even the countries with the strongest economies have succumbed to the fight against the pandemic on several fronts. In addition to high numbers of infected populations and high mortality, experts point to an increase in the unemployment rate, a decline in production in industry or services, as well as an overall decline in gross domestic product, which are the most important factors for the assessing of economic development. Even the most economically advanced countries are struggling with economic and humanitarian problems in a pandemic. The question is how quickly stronger or weaker economies can recover.

The Slovak Republic is one of the most open economies in Europe. Due to its dominance in industrial production, trade is inevitably tied to other countries, which means that if a worsened epidemiological and economic situation in the countries with which the Slovak Republic trades, despite the favourable situation in our country, there would be a decline in revenues. However, the question remains whether the pandemic has really paralysed our economy and the labour market, and if so, when this turning point occurred, how serious this situation was and how it developed over time.

2. Literature Review

The failure to control the C-19 pandemic has had far reaching impacts on the global economy. C-19 is not only a global pandemic and public health crisis, it has also severely affected the global economy and labour market. Significant reductions in income, a rise in unemployment, and disruptions in the transportation, service, and manufacturing industries are among the consequences of the disease mitigation measures that have been implemented in many countries (Pak et. al, 2020; Periokaite, Dobrovolskiene, 2021).

While previous pandemics have typically emerged in poorer countries, C-19 emerged in an important economic hub and has affected countries central to the global economy (Baldwin, Di Mauro, 2020).

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The impacts of the disease itself, the policy measures being taken to control its spread (closing businesses and schools, and restricting travel) simultaneously affected supply and demand at multiple points in the economy (Lucas, 2020). According to the latest information from the International Labor Organization (ILO, 2020), more than 436 million companies worldwide face a high risk of serious disruption. These enterprises operate in the most affected economic sectors, of which approximately 232 million in wholesale and retail, 111 million in manufacturing, 51 million in accommodation and food services and 42 million in real estate and other business activities.

In the conditions of the European Union, Pouliakas and Branka (2020), and Fana et al. (2020a,b) that the segment of the workforce that will continue to be most affected by distance measures and practices as a result of the C-19 pandemic are the most vulnerable groups. Such as women, small entrepreneurs and workers working at the minimum wage level, or people with lower education. A range of studies have been conducted on how C-19 has affected different outcomes. A survey conducted by Euro-found (2020) shows that the proportion of people reporting that their working hours have decreased (very or slightly) during the COVID-19 pandemic is above the EU average in all Mediterranean countries.

Biddle et al. (2020), considered the relationship of C-19 to factors such as employment, labour supply, life satisfaction, income, financial distress, and mental health. On the other side, Botha et al. (2020) investigated the impact of C-19 pandemic on the changes on the labour market such as reduction of working hours, earnings, entering into unemployment or having to file for unemployment benefits during the pandemic. Beland et al. (2020) focused on the short-term effects of C-19 on employment and wages in the United States. Their results suggest that the unemployment rate has risen, working hours have decreased and labor force participation has fallen, but this has not had a significant impact on wages. The negative effects on labor market outcomes are greater for men, younger workers, Hispanics and less educated workers.

Other research in the USA was conducted by Kong and Prinz (2020), who looked at how outage policies affected unemployment itself during the C-19 pandemic. They focused on the effects of the so-called six principles of non-pharmaceutical intervention and analyzed how Google searches responded to each of them to obtain an unemployment claim. The authors thus provided estimates of the short-term impact of notifications on state-level anti-pandemic measures on unemployment expectations based on Internet search data.

Almeida and Santos (2020) focused on the impact of C-19 on the Portuguese labor market. In their research, the authors found that the impact of the pandemic and measures against it in Portugal was asymmetric in terms of regions, age groups, but also sectors of activity. They also identified the most affected areas, but also the individuals whose employment was most affected by the pandemic. At the end of the research, they also discuss measures to mitigate the effects of the pandemic on employment in Portugal (Mitra, Xu, 2020).

The effects of the pandemic on youth employment in Australia were examined in his Churchill study (2020). She worked with data from the Australian Bureau of Statistics where he compared young men and women with their older counterfactual data. And also examined the unemployment rates of men and women in different age categories. The author found that the negative impact of the pandemic on employment did not escape young people either, and their unemployment rate also increased significantly. C-19's economic impacts are broader and more severe than most past crises. The disease has been highly infectious in comparison with past major disease outbreaks, spreading rapidly to reach almost every country in the world (Lucas, 2020). However, it is important to note that the intensity of the economic impact depends to a greater extent on the specialization of the country. The countries most affected are those that rely on low-productivity, low-employment activities (Fana et al., 2020a,b).

The Slovak Republic was no exception and was also significantly affected by the C-19 pandemic and its consequences. This was mainly reflected in the economic downturn and employment, which disrupted the

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ongoing labor market developments. After a long-term declining employment rate, it began to grow rapidly from March 2020. Svabova et al. (2021) focused on the growth of unemployment in the context of the C-19 pandemic. Based on analyzes of the unemployment rate and the influx of newly registered jobseekers, they found that they have even completely stopped some sectors. In the context of the Slovak Republic, it was mainly the accommodation and catering sector, real estate activities, administrative and support services, arts, entertainment and recreation, but also other business activities. The Government of the Slovak Republic is trying to eliminate the effects of these anti-pandemic measures by introducing interventions that should help entrepreneurs survive and at the same time be able to retain their employees. However, according to this research, the number of unemployed in these sectors continues to grow and is an almost immediate response to the measures in place. This phenomenon was caused not only by the pandemic itself, but also by forced restrictions in the business sector and a reduction in consumer demand.

As a result of the above factors, employers have begun to compensate for cost reductions through collective redundancies in their companies (Baliak, Belin, 2020). Another manifestation was the transition to a home office "telework" which is characterized by two factors. On the one hand, we are talking about distance, as the teleworker works in a different place than the employer's premises, but also communication between the parties, for which IT-computer tools are needed today (Baruch, 2000).

In connection with this issue, a study by Karácsovy (2021) was created, which focuses on the impact of teleworking and the satisfaction of Slovak employees in the C-19 era. The results of this study show a 7 - fold increase in the number of people currently working remotely. At the same time, it pointed out the important relationship between teleworking and its implementation and job satisfaction. A significant number of respondents (workers) would continue to work remotely even after the end of the C-19 pandemic.

Based on these answers, he said, it is necessary to consider teleworking at the organizational level for higher productivity as well as a better work-life balance. In addition to the positive effects of teleworking, management must pay sufficient attention to the negative consequences, such as the development of a sense of isolation, barriers to the transfer of information and knowledge, but also the loss of individual career opportunities, etc. It is therefore important to find a balance between the positive and negative aspects of teleworking and to use new innovative technologies to create a work environment that can meet the psychological needs of individuals for autonomy, motivation and work atmosphere. But this was also reflected in the health care system, where even before the outbreak of the global C-19 pandemic in 2020, experts warned of a critical shortage of health workforce in the country. It was mainly a lack of supportive medical staff, such as nurses and nurses, but also a lack of doctors. In this case, the pandemic began to exacerbate these shortcomings, but also revealed the fragility of the entire health care system in Slovakia (European Commission, 2021).

3. Data and Methodology

The main purpose of the paper is to analyze changes on the labor market of NUTS 3 regions in the Slovak Republic during the Pandemic of C-19 and the European Union countries. We are focusing on finding out whether there is a convergence or divergence in the unemployment rate of the NUTS 3 regions in the Slovak Republic in the period before and during of pandemic.

The aim of the study is primarily to monitor changes in behaviour of the labour market during a pandemic, in order to find effective tools that will to help the labor market to better respond in crissis situations such as the pandemic is.

Before calculation of beta-convergence is necessary to perform a normality test of selected data, using the Shapir-Wilk data normality test and the Dixon´s Q test for outliers. For the calculation of Beta-convergence we must

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calculate the unemployed share out of the economic active population before and during the pandemic. Then, we must calculate the logarithm of the initial values and the average growth coefficients also. From the calculated average growth coefficients, we must calculate the logarithm of the average growth coefficients.

As the analyzed periods, we choosed:
I. Period (SR before the Pandemic of C-19): 08/2019 - 02/2020
II. Period (1st Wave of the Pandemic C-19 in the SR): 03/2020 - 09/2020
III. Period (2nd Wave of the Pandemic C-19 in the SR): 10/2020 - 04/2021
IV. Period (3rd Wave of the Pandemic C-19 in the SR): 05/2021 - 11/2021

Beta-convergence is one of the methods for measuring regional convergences, respectively regional divergences. It is based on the assumption that the observed data in the regions are converging in the given time horizon, we are talking about convergence. If, in a given time horizon, the data in the regions are dissipating, then we are talking about divergence. In our case, the regions are the individual areas NUTS 3 (self-governing regions) of the Slovak Republic. A similar method was applied to calculate beta-convergence for the European Union.

Shapiro-Wilk Test of Normality:

$$W = \frac{\left(\sum_{i=1}^{m} a_i^{(n)}\left(x_{n-i+1}^{*} - x_i^{*}\right)\right)^2}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \qquad (1)$$

Dixon´s Q Test for outliers:

$$Q_n = \frac{x_n - x_{n-1}}{x_n - x_1} \qquad (2)$$

β- convergence:

$$k = n\sqrt{\frac{yn}{y0}} \qquad (3)$$

When:
n – in our case is 7, because we compared the time (months in 3 periods)
yn – in our case, the share of unemployment of the population at the end of the reference period
y0 – in our case, the share of unemployment of the population at the beginning of the reference period

By the least squares method is determined the equation of a regression function with a dependent and independent variable. The dependent variable is a logarithm of the average growth coefficients and an independent variable is the logarithm of the initial values. If the regression function is declining, it is about convergence, on the other side if the linear regression function is rising, it is about divergence. An important step is the calculation of the value of the coefficient of determination in percentage.

The coefficient of determination explains how many percent of total variability is explained by the used model. If the value of the determination coefficient is closer to 100, it is considered significant, if approach 0 is considered insignificant. If the results of convergence are insignificant, a correlation diagram is used.

The correlation diagram is divided by two lines into a four quadrants. In the first quadrant are located the regions with above-average of initial value and an above-average growth coefficient. In the second quadrant are located the regions with below-average of initial value and an above- average growth coefficient. The third quadrant includes the regions with below-average of initial value and a below-average growth coefficient. The fourth,

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quadrant includes the regions with above-average of initial value and a below-average growth coefficient (Minařík, Borůvková, Vystrčil, 2013).

The σ-convergence method is a supplement to the calculation of β-convergence calculation, it is a calculation of the standard deviation of the logarithmized values of the observed time period.
σ-convergence:

$$\log \bar{k} = a + \beta \log y_0 \qquad (4)$$

The sigma convergence method is used in case of non-demonstration of convergence resp. divergence by using of β-convergence (Minařík, Borůvková, Vystrčil, 2013). Regression and correlation analysis is a very suitable method to identify hidden relationships between the indicators examined (Markechová, 2011).
Regression Analysis:

$$y_i = \beta_0 + \beta_1 x_i + \varepsilon_i \qquad (5)$$

The purpose of applying the method of regression and correlation analysis is to point out the fact that the increase in the number of C-19 cases affects the increase in the number of unemployed. In our conditions, it is an application of linear regression analysis.

3. Results and Discussion

The Pandemic of C-19 has seriously threatened not only society but also the health systems of individual countries. The crisis caused by the pandemic has affected the whole world, but Europe as the oldest continent in particular. As can be seen in the figure 1 the Czech Republic, Slovenia and Luxembourg are the most affected countries in terms of mortality from the C-19 disease so far, with a morbidity rate of more than 11%.

By contrast, the least affected countries in Europe so far are Norway and Iceland. The highest mortality rates during the three waves of the pandemic were identified in Bulgaria, Hungary and Romania, at more than 3%. However, the Slovak Republic also has a relatively high mortality rate for this disease, the mortality rate reaching almost 2% at the end of the observed period in 2021. Norway and Iceland are again among the countries with the lowest mortality rates on the European continent.

At the sight of vaccination rates of the population, we can see that the population of Portugal, Spain and Malta is among the most vaccinated, where we record more than 85% of those vaccinated. By contrast, the least vaccinated countries are Bulgaria, Romania and Slovakia, where the number of vaccinated is below 50%.

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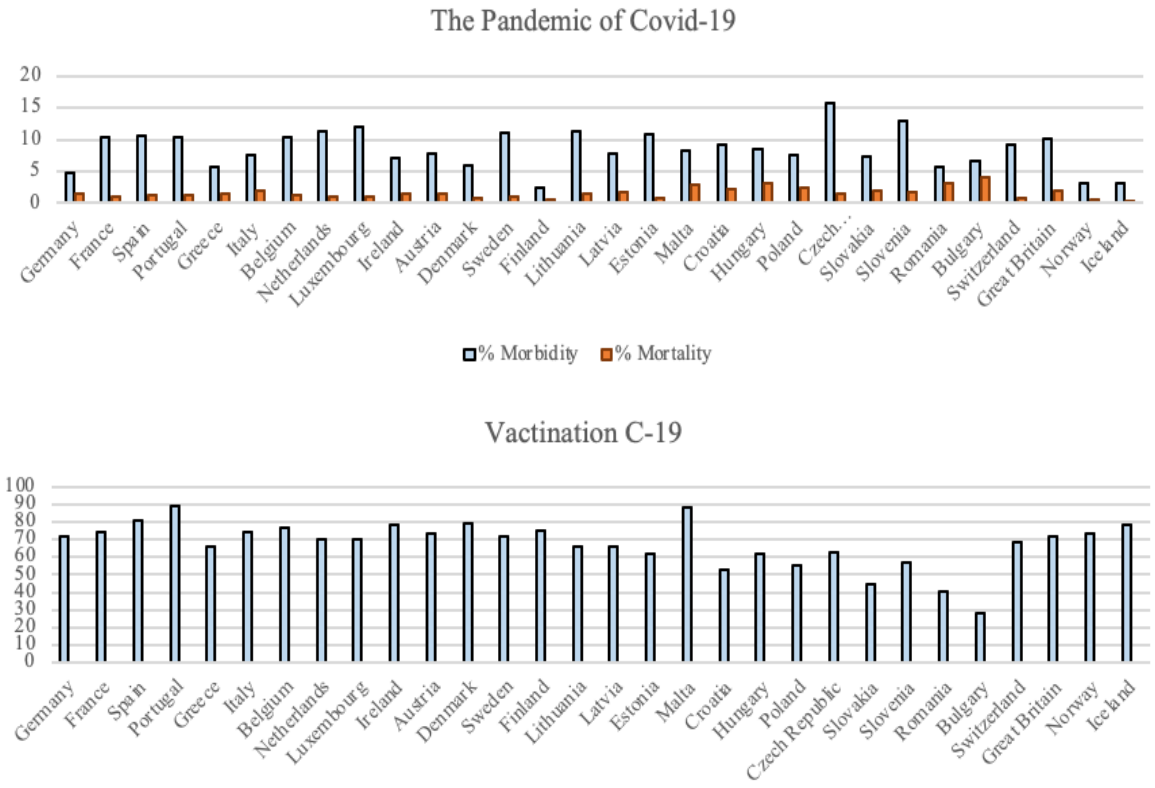


Figure 1. The Pandemic of C-19 disease in European Countries 2019-2021
Source: www.ourworldindata.org

The C-19 pandemic endangered Slovakia not only in terms of the overall health of the population, but also significantly disrupted the economy and the functioning of the labour market.

In Slovakia, the C-19 pandemic has begun in March 2020. While the first wave of the pandemic (March - September 2020) was handled very well by the Slovak Republic, the following waves of the pandemic moved Slovakia among the most affected countries in the world in terms of the number of deaths. We can see (Figure 2) that the highest number of recorded cases of new disease was identified in the third wave (May - November 2021) of the pandemic, in the month of November 2021, when the number of cases exceeded 200,000 cases per month. The highest number of deaths was recorded in Slovakia in the second wave of the pandemic, in January 2021, when the number of confirmed deaths from this new disease exceeded 3400. In addition to the high rate of reported cases and high mortality rates, the Slovak Republic continues to struggle with high number of hospital admisions, which puts enormous pressure on the healthcare system. In the third wave of the pandemic, the number of hospitalizations exceeded 2,400 (www.korona.gov.sk, 2021 online report). The constant expansion of covid departments adversely affects the implementation of white medicine interventions and, ultimately, the quality of the provision of routine health care.

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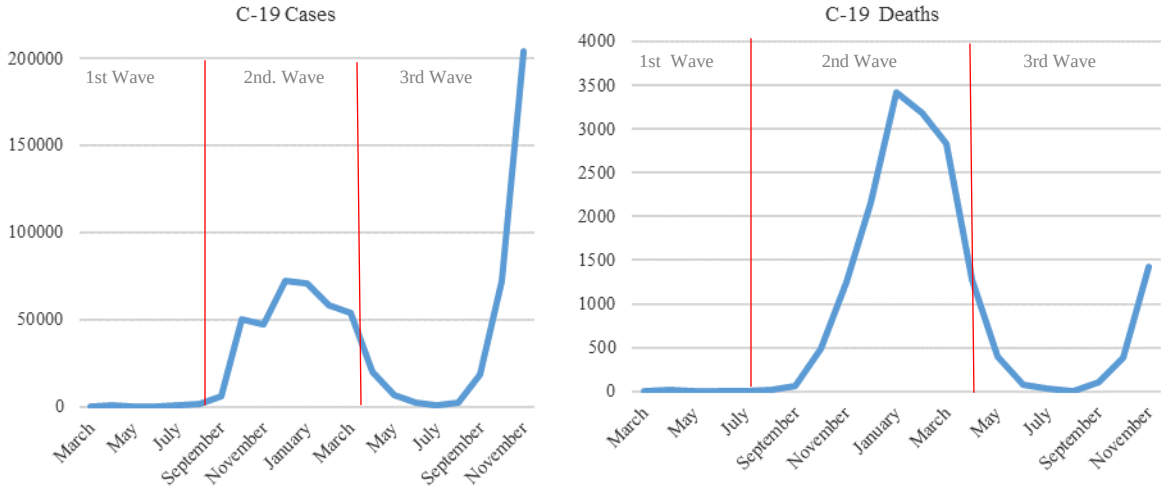


Figure 2. The Pandemic of C-19 disease in the SR during the three periods 2019-2021
Source: www.korona.gov.sk

GDP, as one of the most important indicators of economic performance, initially experienced a significant decline in the vast majority of European countries due to the pandemic. In most countries, a decline in GDP was identified during the period 2019 - 2020. Exception were countries such as Luxembourg, Denmark and Sweden. This is probably due to the shortest duration of restrictions compared to other European countries (Figure 3).

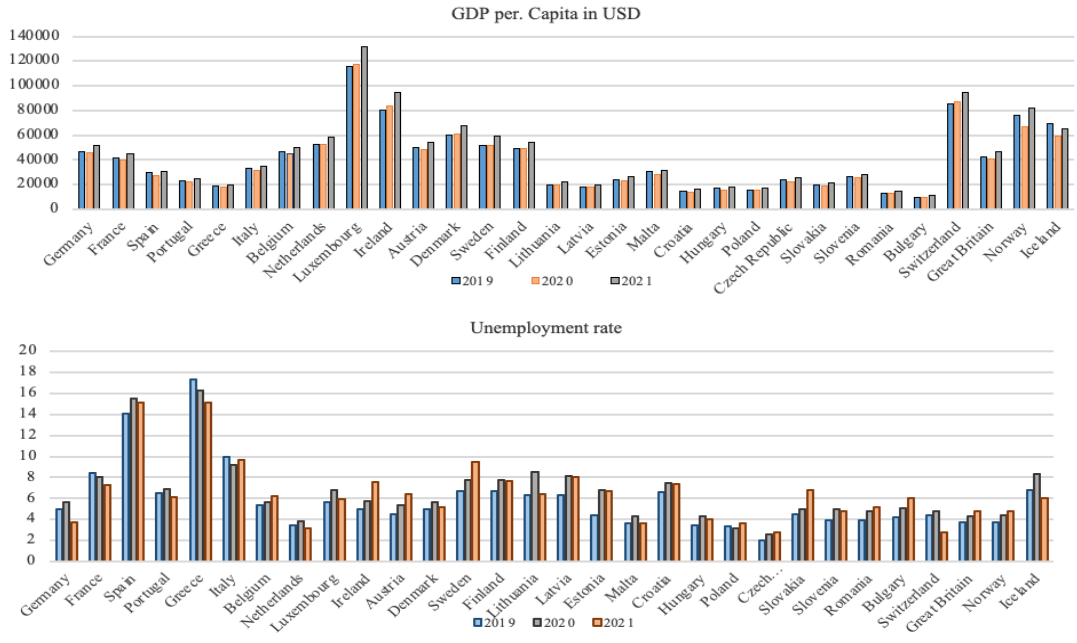


Figure 3. Economics and Labour market of European Countries
Source: www.ourworldindata.org

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Until November 2021, the Slovak Republic found itself in a nationwide "lockdown" twice, which is a result of a slight economic decline. The most significant decline in GDP since the beginning of the pandemic has been identified in countries such as Germany, France, Spain and Italy.

The economic declesion was inevitably caused by limited movement and work activity. These restrictions have also largely affected changes in the unemployment rate. From a global perspective, we can see that the unemployment rate is on the rise (Figure 3).

The most significant increase in the unemployment rate was recorded in the first stage of the pandemic (2019-2020) within the European area in Lithuania and Estonia + 2%. On the contrary, despite the unfavorable socio-economic situation, Italy, France and Greece recorded a decline in the unemployment rate -1%. In the second stage of the pandemic (2020-2021), the situation improved slightly in the vast majority of countries. However, even in the second stage of the pandemic, the Slovak Republic ranks among the countries with an ever-increasing tendency of the unemployment rate. Regarding the progress of the economic situation in the conditions of the Slovak Republic, we can see that before the pandemic, the level of GDP per capita was 4,5 thousand EUR. With the advent of the pandemic, the level of GDP dropped significantly to approximately 3.95 thousand. EUR per capita. In the second and third waves of the pandemic, GDP recorded growing trends, despite the unfavorable epidemiological situation. At the end of the period under review, the level of GDP per capita reached 4.7 thousand EUR.

Looking at the trends progress of the unemployment rate as a key indicator of the labor market, we can see (Figure 4), similarly to the growth of GDP, that with the advent of the pandemic there was the most significant increase in the unemployment rate. In the period before the pandemic, the unemployment rate was around 4.92%. In the first wave, of the pandemic increased to around 6.84%. In the second and third waves, the level of the unemployment rate gradually decreased, reaching 6.64% at the end of the period under review.

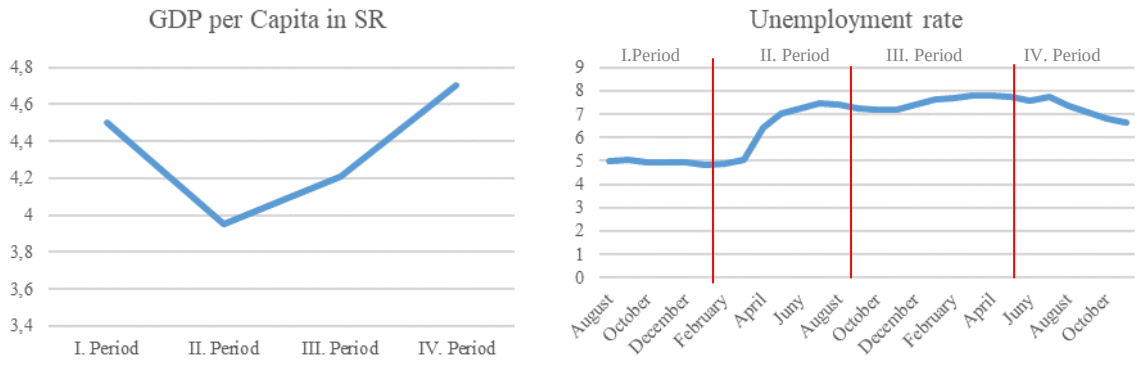


Figure 4. Economics and Labour market in Slovak Republic
Source: www.upsvr.gov.sk, www.datacube.statistics.sk

The outbreak of the Covid-19 pandemic has led to significant economic changes that countries will continue to face. Due to significant limitations, the number of inhabitants lost their jobs, which was also considerably reflected in the quality of their life. Effective tools and measures will be needed to eliminate the degrading effects of a pandemic in individual countries. This is the reason that it is necessary to pay attention to monitoring of the changes that take place in the labor market during a pandemic.

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One of the intensively used methods for examining changes in the labor market is the β-convergence method. Baddeley, Martin, and Tyler (2000) used this method in their survey to identify the nature of unemployment disparities between regions in Europe and USA. The main purpose of using the β-convergence method is to identify the of disparities between NUTS 3 regions of SR in terms of the unemployment rates over four defined periods.

Before proceeding to perform the calculations themselves, we test the normality of the data using the Shapir - Wilk test. The value of the normality test reached 0.8> α 0.05 for the groups at the beginning of the reference period and 0.8> α 0.05 at the end of the reference period, ie both sets come from a normal distribution (Table 1).

Table 1. Shapiro-Wilk Test of Normality

Shapiro-Wilk Test of normality			
The beginning of the reference period		*The end of the reference period*	
I. Period	*0,805*	I. Period	*0,805*
II. Period	*0,815*	II. Period	*0,831*
III. Period	*0,823*	III. Period	*0,822*
IV. Period	*0,817*	IV. Period	*0,792*

Source: own calculation of authors based on UPSVR data, StatGraphics

In the case of performing the Dixon´s test to identify outliers in the set of data, we identified no significant outliers (Table 2).

Table 2. Grubbs Test for outliers

Dixon´s Q Test for outliers			
The beginning of the reference period		*The end of the reference period*	
I. Period	*Not sig.*	I. Period	*Not sig.*
II. Period	*Not sig.*	II. Period	*Not sig.*
III. Period	*Not sig.*	III. Period	*Not sig.*
IV. Period	*Not sig.*	IV. Period	*Not sig.*

Source: own calculation of authors based on UPSVR data, StatGraphics

We expressed the results of β - convergence by means of a linear regression function obtained from data on the unemployment rate, in individual NUTS 3 regions of the Slovak Republic. The logarithm of the initial values of the unemployment rate was determined as an independent variable and the logarithm of the average growth (decrease) coefficient was determined as the dependent variable. The average growth (decrease) coefficient of the analyzed regions reached 0.98 ‰ for the first period, 0.66 ‰ for the second period, 0.92 ‰ for the third period and 1.21 ‰ for the fourth period. In this case, the coefficient of determination reached 0.07 for the first period, 0.95 for the second period, 0.20 for the third period and 0.31 for the fourth period. For relatively low values of the coefficient of determination (with the exception of Period II), the result of the analyzes cannot be considered conclusive. In this case, a correlation diagram is given (Figure 5), which divides the examined regions into four quadrants, based on the logarithm of the initial value and the logarithm of the average growth (decrease) coefficient.

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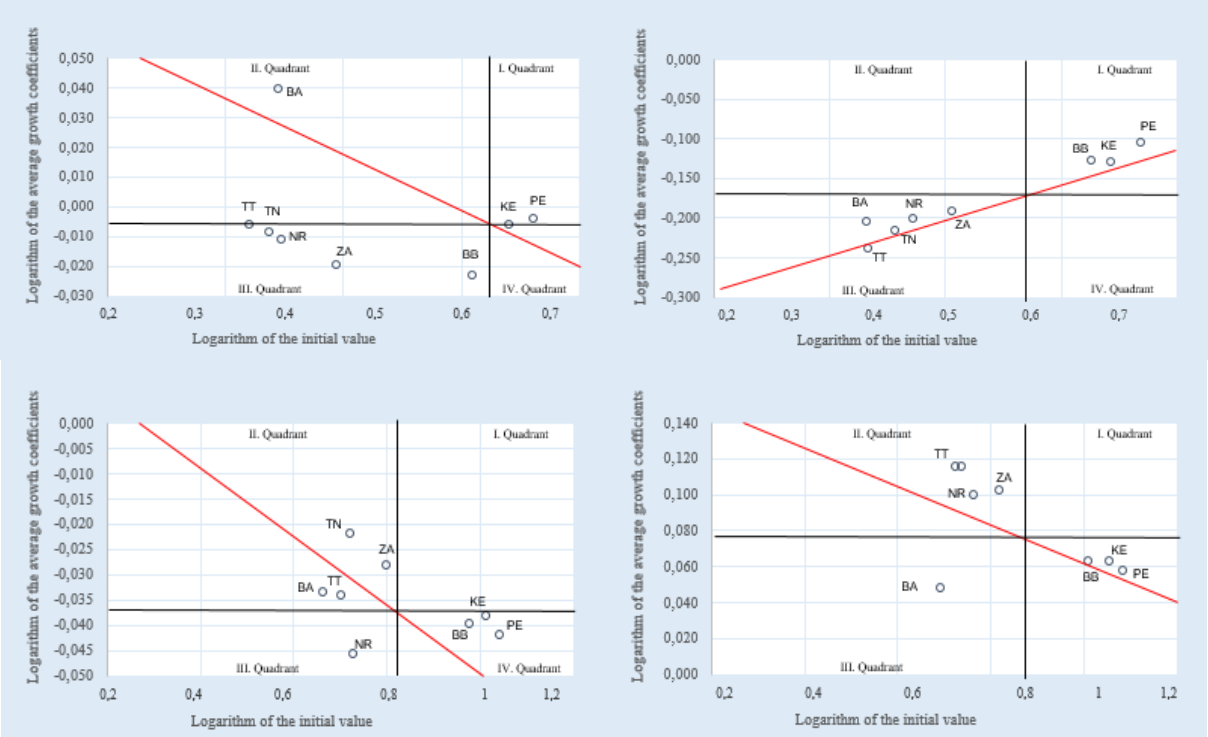


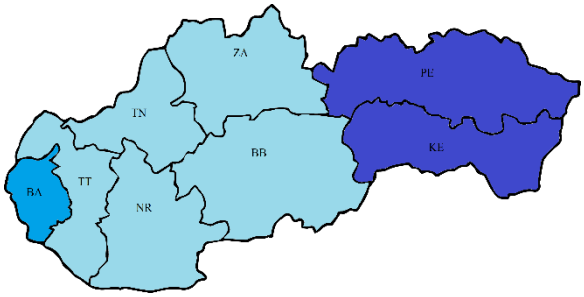
Figure 5. β-convergence and correlation diagram
Source: own calculation of authors based on UPSVR data, MS Excel

The regions located in the first quadrant tend to move away from the others, as they show an above-average value of the logarithm of the initial values, but also an above-average logarithm of the average growth (decrease) coefficient. In the second quadrant, there are regions that tend to approach the regions in the first quadrant. They show an below-average logarithm of the initial values, but on the contrary an above-average logarithm of the average growth (decrease) coefficient in the unemployment rate. In the third quadrant there are regions that tend to lag behind and thus none of them shows a below-average logarithm of the initial value and a below-average logarithm of the average growth coefficient. In the fourth quadrant, there are regions that showed an above-average logarithm of the initial values, but on the other hand show a below-average logarithm of the growth rate in the unemployment rate.

Figure 6 provides a graphical overview of the distribution of regions in the four quadrants. The aim of the β-convergence was to monitor changes in the behavior of the unemployment rate in the regions over four periods. The main goal was to find out whether the pandemic caused more fundamental changes on the labor market, while the monitored indicator on the regional labor markets was the unemployment rate. From the results of β-convergence it can be stated that during the observed period there was mostly convergence between the regions in terms of the unemployment rate progress, with the exception of II. period when divergence occurred (the curve in the correlation diagram is increasing).

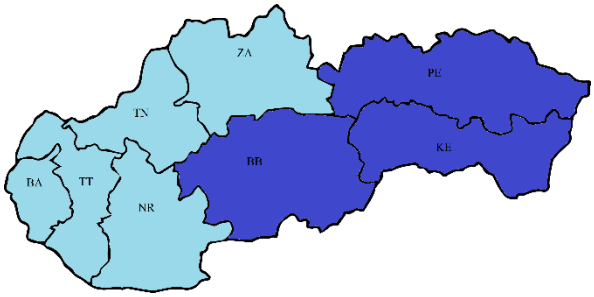
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Before the Pandemic C-19 (August 2019 – February 2020)



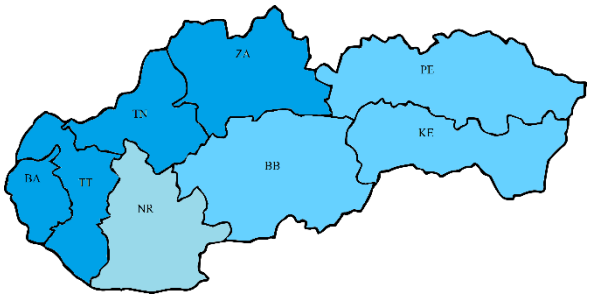
- 1st Quadrant: *Prešov Region (PE), Košice Region (KE)*
- 2nd Quadrant: *Bratislava Region (BA)*
- 3rd Quadrant: *Trnava Region (TT), Trenčín Region (TN), Nitra Region (NR), Žilina Region (ZA), Banská Bystrica Region (BB)*
- 4th Quadrant: *No Region*

1st Wave of the Pandemic C-19 (March 2020 – September 2020)



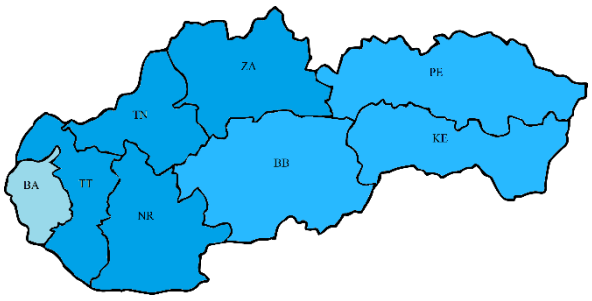
- 1st Quadrant: *Prešov Region (PE), Košice Region (KE), Banská Bystrica Region (BB)*
- 2nd Quadrant: *No Region*
- 3rd Quadrant: Bratislava Region (BA), *Trnava Region (TT), Trenčín Region (TN), Nitra Region (NR), Žilina Region (ZA)*
- 4th Quadrant: *No Region*

2nd Wave of the Pandemic C-19 (October 2020 – April 2021)



- 1st Quadrant: *No Region*
- 2nd Quadrant: *Trenčín Region (TN), Žilina Region (ZA), Trnava Region (TT), Bratislava Region (BA)*
- 3rd Quadrant: Nitra Region (NR)
- 4th Quadrant: *Banská Bystrica Region (BB), Prešov Region (PE), Košice Region (KE)*

3rd Wave of the Pandemic C-19 (May 2021 – November 2021)



- 1st Quadrant: *No Region*
- 2nd Quadrant: *Trenčín Region (TN), Žilina Region (ZA), Trnava Region (TT), Nitra Region (NR)*
- 3rd Quadrant: Bratislava Region (BA)
- 4th Quadrant: *Banská Bystrica Region (BB), Prešov Region (PE), Košice Region (KE)*

Figure 6. Regional results of the β-convergence calculation
Source: own calculation of authors based on β-convergence data

We can see that during the observed period there was mostly divergence between NUTS 3 regions, with the exception of period II. periods when convergence occurred (the curve is decreasing).

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As the coefficients of determination reach relatively low values, we supplement the σ-convergence analysis with a σ-convergence analysis, which confirms the previous results. In the observed period, there was mostly convergence in the unemployment rate progress between the regions of the Slovak Republic, with the exception of II. periods when divergence occurred (Figure 7).

Given the results of beta-convergence, which showed the onset of changes in the labor market with the advent of the pandemic, we supplement the issue with the results of regression and correlation analysis, which points to the relationship between the variables examined (independent variable is C-19 and independent variable is unemployment rate). A linear regression model was used to calculate the regression and correlation analysis, which shows low values of the correlation index and the determination index in all monitored regions. The values of the Durbin-Watson characteristic index (0.325) indicate a positive autocorrelation of the data, which confirms the unsuitability of the model to describe the investigated dependence.

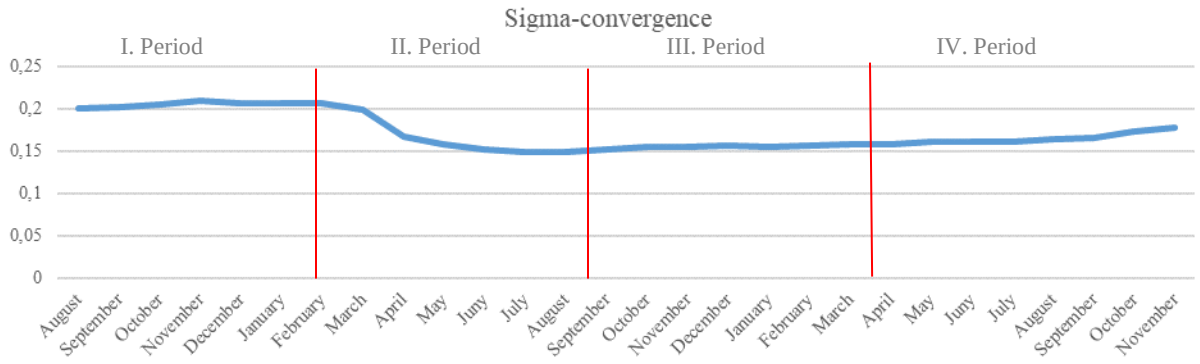


Figure 7. σ-convergence – unemployment rate August 2019 – November 2021
Source: own calculation of authors based on UPSVaR SR data, MS Excel

From the results of the regression analysis we can see that the highest value of the correlation index (Multiple R) is reached by the Košice region, the Banská Bystrica region and the Prešov region (Table 3). On the contrary, the lowest value is reached by the Nitra region. The determination index (R Square) reaches a very low value in all cases, which means that the used regression model does not explain more than 16% of the variability of the examined data (Košice region).

Table 3. Regression Statistics

REGION	Bratislava	Trnava	Trenčín	Nitra	Žilina	Banská Bystrica	Prešov	Košice
Multiple R	0,34	0,36	0,24	0,12	0,39	0,39	0,32	0,40
R Square	0,11	0,13	0,06	0,01	0,14	0,15	0,10	0,16
Adjusted R Square	0,053	0,071	-0,008	-0,056	0,088	0,089	0,037	0,101
Standard. Err.	0,054	0,588	0,588	0,633	0,633	0,748	0,845	0,898

Source: own calculation of authors based on UPSVaR SR data, MS Excel

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It cannot be said that this is due to an increase in new cases, but due to the introduction of a nationwide lockdown at the beginning of the pandemic.

The C-19 pandemic did not cause changes in the labor market, only in the conditions of the Slovak Republic. Many people around the world have lost their jobs as a result of its spread. To show the changes in the labor market due to the C-19 pandemic, we decided to monitor the development of the unemployment rate in the European area as well (Figure 8). In this case, we monitored changes over the time horizon, 2019 (before the pandemic outbreak) after the end of 2021. We can conclude that, as in the case of the Slovak Republic, in individual countries, the most significant increase in the unemployment rate occurred precisely at the time of the toughest lockdown, later the situation on the labor market stabilized, but not to the state we recorded before the C-19 pandemic.



Figure 8. β-convergence – unemployment rate August 2019 – November 2021
Source: own calculation of authors based on Eurostat data, MS Excel

The countries located in the first quadrant tend to move away from the others, as they show an above-average value of the logarithm of the initial values, but also an above-average logarithm of the average growth (decrease) coefficient. In the second quadrant, there are countries that tend to approach the countries in the first quadrant. They show an below-average logarithm of the initial values, but on the contrary an above-average logarithm of the average growth (decrease) coefficient in the unemployment rate. In the third quadrant there are countries that tend to lag behind and thus none of them shows a below-average logarithm of the initial value and a below-average logarithm of the average growth coefficient. In the fourth quadrant, there are countries that showed an above-average logarithm of the initial values, but on the other hand show a below-average logarithm of the growth rate in the unemployment rate. The conclusion is that although the advent of the pandemic has caused

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significant changes in the labor market in the form of rising unemployment, it cannot be said that this is due to an increase in new cases, but due to the introduction of a nationwide lockdown at the beginning of the pandemic.

Conclusions

In this paper, we set the main goal to analyze changes in the labor market of NUTS 3 regions in the Slovak Republic during the C-19 pandemic and the European Union countries. We wanted to find out whether there is convergence or divergences in the unemployment rate of these NUTS 3 regions in the conditions of the Slovak Republic, in the period before and during the pandemic. Using the Shapir-Wilk test, we tested the normality of the data, as the value we found reached 0.8> α 0.05 for the groups at the beginning of the reference period and 0.8> α 0.05 at the end of the reference period. We could find that both of these files came from a normal distribution. Subsequently, based on the B-convergence examination, we identified disparities between NUTS 3 regions of the Slovak Republic in terms of the unemployment rate over four defined periods. In the article, we also worked with important data such as the unemployment rate and GDP. Here we wanted to find out what condition the Slovak Republic was in before and during the COVID-19 pandemic. From the economic situation progress in the Slovak Republic, we could see that before the pandemic, the level of GDP per capita was 4.5 thousand. EUR. Subsequently, with the advent of the pandemic, the level of GDP dropped significantly to about 3.95 thousand. EUR per capita. In the second and third waves of this pandemic, GDP had a growing trend, despite the unfavorable epidemiological situation. At the end of the period under review, the level of GDP per capita reached 4.7 thousand. EUR.

The sharp decline in GDP levels and the economic slowdown can clearly be attributed to the radical measures related to the C-19 pandemic, and especially during its first wave. Immediate losses occurred due to the closure of shops and operations as well as manufacturing companies. The production of goods and services was quite limited. By easing measures, especially in industrial sectors, it is possible to register a gradual growth of GDP, especially demand and needs of foreign countries.

Based on the B-convergence survey, we identified disparities between NUTS 3 SR regions in terms of the unemployment rate over four defined periods. We found that the characteristics of works. cities and business structure remain key and play an important role. Therefore, even within our results, we can state that the Košice, Prešov and Banská Bystrica regions were worse off than the regions of western Slovakia, where key industry and trade are concentrated. The stronger industrial regions started faster. On the contrary, regions built mainly on services and trade, such as catering facilities, retail, accommodation services, etc., were in a worse situation. Measures against C-19 significantly reduced their activities and attractiveness. While before the pandemic there was a shortage of staff in those sectors, during the pandemic they became the most critical in the system.

In order to eliminate the damage to the unfavorable progress of the economy and unemployment, it is necessary to approach the issue sensitively and responsibly. It is important for the economy to build a favorable environment that will be ready to respond even in times of pandemics and other crises and to minimize adverse events. Here it is particularly important to think of small and medium-sized enterprises, which are the pillars of the economy, but also the most vulnerable category of the whole system and employees. It is important for these entities that the state is able to support and retain them. There is a need to set clear and legible rules that will be communicated to the professional community and the private sector well in advance. Related to this is the responsible development of crisis and strategic scenarios, models and procedures that mobilize funds and resources in times of adverse economic and other conditions, as well as the setting up of support mechanisms such as compensation, subsidies, etc., which will help overcome these particularly challenging periods. In addition, in connection with health crises, there is a need for a significant involvement of the state in the protection of its citizens, ie its socio-economic status. Uniform rules, procedures and common solutions to such situations and situations should be established for crisis situations caused by a pandemic, not only within the

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country but also within the EU community. This would promote the idea of unity, solidarity or social responsibility of all Member States, which would also have a positive impact on the socio-economic development of the EU.

During the implementation of the research, we encountered several limitations such as. problem in the processing of data related to mortality from C-19 disease in the Slovak Republic, while from the first available data it is not clear whether the deceased died directly from C-19 disease, or this disease was only an accompanying and the cause of death was caused by another disease. Another limitation in the research is the absence of the possibility of a clear quantification of the impact of the pandemic, i.e. an increase in the number of identified cases on changes in the labour market, i.e. on growth, respectively a decrease in the number of jobs or the employment rate itself, respectively unemployment rate. If the direct impact of the spread of the pandemic and thus its quantification could be more clearly described using statistical methods, the survey could be extended to examine specific changes not only in the labour market as such but also in its specific sectors.

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THE IMPACT OF GDP ON M&A VOLUME IN THE EUROPEAN AREA IN THE CONTEXT OF THE CONSOLIDATION OF THE BANKING MARKET*

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Abstract. The banking sector of any nation is its key driver because the performance of the financial sector plays a vital role in the development of any economy. The European banking sector has gone through a process of rapid changes during the past three decades. The established trend of liberalization and deregulation resulted in a wave of massive consolidation, which fundamentally changed the environment in which banks did business. The main purpose of this paper is to evaluate relationships and, above all, quantify the impact of GDP on the volume of cross-border mergers and acquisitions in the banking sector for the period 2004 – 2021 in selected countries of the European Area by applying three panel regression methods. From the values shown, it follows that the percentage growth of GDP has a significant effect on the percentage growth of the volume of cross-border mergers and acquisitions in the banking sector and thus was the established hypothesis confirmed. The results confirmed that 1% growth in the economy will cause a 32% increase in the volume of cross-border mergers and acquisitions in the European Area.

Keywords: cross-border merger; cross-border acquisition; gross domestic product; consolidation; banking sector; European Union

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1. Introduction and theoretical framework

The performance of the financial sector plays a vital role in the development of any economy. The banking sector is the prime mover of the economy as no economic activity will sail smoothly without adequate funds, the bulk of which is provided by the banking sector. Banks therefore occupy a significant place in the economy of every nation and should be given more attention than any other type of economic unit in an economy (Agarwal et al., 2020). The reorientation of global development provokes transformations in all policies of the country's development (Pimonenko et al., 2021; Masood et al. 2017). Companies are constrained by external forces that hinder their sustainability (Amoah et al., 2021). Foreign direct investments (FDI) are a crucial element for development of modern economies. FDI's role in globalization is unquestionable; the countries, which receive the most FDI, develop faster, and also the growth of their GDP. Two basic FDI forms are: green-field investments and brown-field investment, which include mergers and acquisitions (M&A). In Europe, financial markets deregulation, technological development and the creation of the European monetary Union (European single currency) created the common platform for bank competition which led to expansion (Wang et al., 2022; Oliinyk et al., 2022). The expansions took mainly the form of mergers and acquisitions (Babic-Hodovic and Mehic, 2007; Naba and Chen, 2014).

Similarly, Teplý et al. (2010) says that the M&A wave contributed to a consolidation process, which has transformed the once fragmented European banking industry into a system of national oligopolies with even a few pan-European players. The rise of M&A activity was forerunned by fundamental changes in external environments, such as deregulation, introduction of euro, technological progress and changing customer demand. Over recent years the European banking sector has experienced a rapid process of mergers and acquisitions. Mergers and acquisitions have become the driving force of the world's economy and have played a significant role in the strategy of many banks in the last decade. Since the 1990s, the European banking industry has experienced an unprecedented level of merger activity that has considerably influenced the sector's structure (Badík 2007). Also according to Smirnova (2014), in recent years, mergers and acquisitions have become very common not only between business entities but also between financial institutions. Such factors as globalization, liberalization, internationalization of competition and technological developments have just intensified this tendency (Belas et al. 2019). A deeper understanding of motives for mergers and acquisitions allows us to recognize what forces (economic, financial, technological, etc.) drive companies and other establishments towards the creation of such alliances. In addition, the global financial crisis of 2007-2008 undermined the economies of many countries, their volume of gross domestic product (GDP) and economic growth and thus expedited consolidation of financial institutions. Subhashree and Kannappan (2018) also argue that banks are currently forced to rethink their business and devise new ways because of changes within the expectation of the company customer.

Theoretical concept of mergers and acquisitions in the banking sector is also discussed by Novickyte and Pedroja (2015). According to them, the concentration of banks on the market is growing thanks to consolidation processes that are taking place in the banking sector. Consolidation typically occurs as a result of mergers or acquisitions between market players. Such mergers and acquisitions are usually driven by an ambition to gain as much weight as possible in the international banking space, to eliminate competition from profitable areas of business, to procure added financial benefits for the shareholders, to expand the range of services, and to effectively manage the resources available. Such consolidation processes inevitably affect the financial system of a country or a region and can also have an impact on the GDP. The concern with the constitution of the banking system and its stability stems from the exclusive role that banks play in the financial system and economy. The importance of the banking sector in the economy supports the relevance of the issue at hand and allows probing into the consolidation processes within the banking sector, as well as impacting the performance of the economy on volume of M&A. Broader view of the issue of mergers and acquisitions was also devoted to studies from Hečková et al. (2018) and Štefko et al. (2022).

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Mergers and acquisitions are the important process in the banking sector to make enormous financial gains. The main aim of merger and acquisition in the banking sector is to improve the economies of scale. A merger means the combination of two companies into one company. During the merging process, one company survives and the other company loses their corporate existence. On the other hand, acquisition means a complete takeover. Mergers and acquisitions are these days common choices for business survival and development. That integration is achieved through strategic actions in processes and structures, in addition, through the management of the subjective conditions that support human performance, while strategic planning as an important factor of competitiveness (Štefko et al. 2021). Mergers and acquisition helps the bank not only to get new brand name, new structures, product offerings but additionally give opportunities to cross sell the new accounts acquired (Subhashree and Kannappan, 2018; Gavurova et al. 2017a,b). Specifically, several authors devoted to research in the framework of M&A in the banking sector, such as Teplý et al. (2010); Ayadi and Arnaboldi (2008); Aljadani and Toumi (2019); Micu and Micu (2016), etc.

The banking and financial sector is a dynamic sector that regularly goes through a series of structural changes. Innovation is one of the most crucial factors that make its representatives to differentiate themselves against their competitors to generate more income and profit (Civelek et al., 2021; Dvorsky et al. 2021). Innovative financial products have been used as a stimulating tool to increase trading activities and social interactions (Ključnikov et. al, 2020). Global bank consolidation and concentration processes have prompted a lively discussion on the part of scholars and practitioners regarding the influence of concentration on the efficiency and competition levels in the banking system, the financial and macroeconomic stability of countries and the growth of economies and their GDP (Wang et al., 2022; Škare and Porada-Rochoń, 2021, 2022). It has been noted that the banking sector tolerates high levels of concentration rather well compared to other business sectors, thanks to the apparent benefits of concentration on the increasing stability of the financial system (Novickyte and Pedroja 2015). The M&A transactions represent a wide range of unique business optimization opportunities in the corporate transformation deals, which are usually characterized by the high level of total risk. The M&A transactions can be successfully implemented by taking into account the size of investments, purchase price, direction of transaction, type of transaction, and using the modern comparable transactions analysis and the business valuation techniques (Ledenyov and Ledenyov, 2014). Modern methods of evaluating decision-making units are quite often used as a necessary tool for assessing the financial stability and performance of decision-making units (Štefko et al., 2017). The rest of the paper is organized as follows: in the next section we will describe the methods and the methodology. The section Results will be entirely dedicated to the empirical investigation, where we will briefly review the most significant findings, while in the Discussion and Conclusion sections, we will discuss the outcomes of previous empirical research and conclusions.

2. Methodology

The main purpose of this paper is to evaluate relationships and, above all, quantify the impact of GDP on the volume of cross-border mergers and acquisitions in the banking sector for the period 2004-2021 in selected countries of the European Area.

Based on the aim of the work, we set the following hypothesis:

H1: GDP affects the growth of the volume of cross-border mergers and acquisitions in the banking sector.

The analysis is focused on 19 countries of the European Area, whereas the examined development covers 18 periods. The panel data were used, while applying regression models primarily intended for the analysis of such structured data, i.e., the pooled regression model (PRM), the random effects model (REM), and the fixed effects model (FEM). These methods are constructed as follows:

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PRM: $M\&Ait = \alpha + \beta1*GDP\ it1 + \varepsilon it$ (1)
REM: $M\&Ait = \beta1*GDP\ it1 + (\alpha + ui) + \varepsilon it$ (2)
FEM: $M\&Ait = \alpha + \beta1*GDP\ it1 + \varepsilon it;\ \alpha t=\alpha t1+\alpha t2+...+\alpha te$ (3)

M&A presents a volume of realized cross-border mergers and acquisitions in the banking sector in the countries of the European Area (in mil. eur). This variable is expressed by a natural logarithm (dependent variable). GDP (gross domestic product from Eurostat in mil. EUR at regular prices) presents an independent variable. This variable is also expressed by a natural logarithm.

The dataset containing records of implemented cross-border mergers and acquisitions in the European Area was based on data from the Zephyr and Orbis database (Bureau van Dijk, 2022). The dataset consists of individual cross border equity deals between the home country of the acquirer and the host country where the target firm is domiciled. The source of other used statistical data is Eurostat (European Commission, 2022).

Before each separate regression analysis, we assessed the stationarity of the dependent and independent variables using the ADF or KPSS test for the presence of unit roots. Before constructing the regression models, we carried out correlation analysis. To determine the appropriateness of one of the three regression models mentioned above, we used the joint significance test of the averages of different groups, the Breusch-Pagan test, or Hausman test statistic. All three methods were only used for the analysis of the complete dataset for the purpose of visualization and comparison.

3. Results

After determining the existence of unit roots by the ADF test and KPSS test, we can confirm the stationarity of the indicators, so it was not necessary to perform any correction (difference) of the indicators. Subsequently, we proceeded to the correlation analysis, the results of which are shown in Table 1.

Table 1. Correlation analysis

Correlation	Pearson correlation coefficient	Coefficient of determination	p-value
M&A - GDP	0.4506	0.2030	0.0000***

Source: own processing
*. **. *** represent the statistical importance of 1%. 5%. or 10%

As part of this analysis, assumptions about a positive correlation between gross domestic product and volume of cross-border mergers and acquisitions in the banking sector were confirmed. Although, there is a weak but directly proportional relationship between the mentioned indicators. The growth of the economy thus affects the percentage growth of the volume of cross-border mergers and acquisitions in the banking sector.

The results of the subsequent regression analysis by applying three panel regression methods are shown in Table 2. From the values shown, it follows that the percentage growth of GDP has a significant effect on the percentage growth of the volume of cross-border mergers and acquisitions in the banking sector. The obtained model is statistically significant and thus we can confirm the established hypothesis. However, it is clear from the values of the coefficient of determination that the resulting model explains only a fifth of the variability of the variables.

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Table 2. Comparison of regression models

	PRM	REM	FEM
constant	8.5378 [0.0000] ***	9.9603 [0.0000] ***	10.6007 [0.0000] ***
GDP	0.4779 [0.0000] ***	0.3199 [0.0000] ***	0.2880 [0.0000] ***
Adjusted R^2	0.1997		0.4579
S.E. of regression	2.1080	2.1530	1.8059
Schwarz criterion	1082.7080	1094.1820	1086.3640
rho	0.5181	0.3331	0.3332
Akaike criterion	1075.6810	1087.1550	1016.0960
Hannan-Quinn	1078.5100	1089.9840	1044.3830
Durbin-Watson	0.8611	1.1684	1.1684

Source: own processing

On the basis of the test of joint significance of the means of different groups and of the Breuch-Pagan test statistics and Hausman test statistics (Table 3), we prefer the model of random effects. 1% growth in the economy will cause a 32% increase in the volume of cross-border mergers and acquisitions.

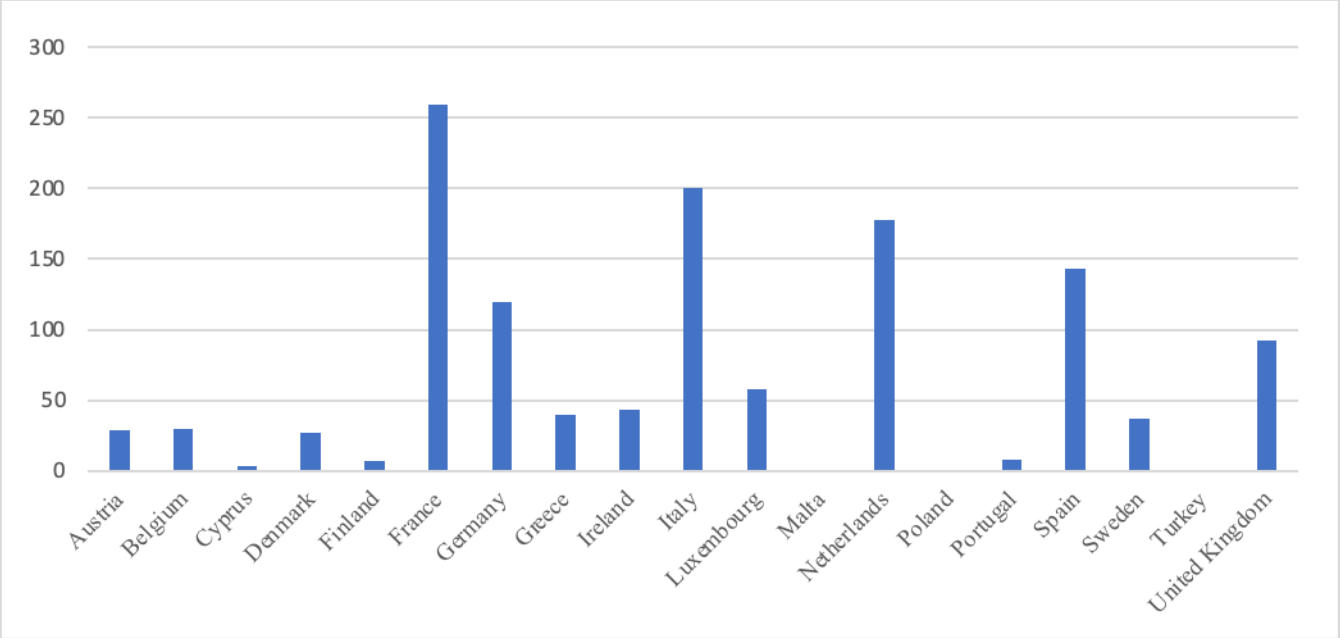
Table 3. Panel test statistic for regression model selection

Panel test	F/LM/H	p-value
Test of joint significance of differing group means	5.9563	0.0000
Breuch-Pagan test statistics	52.7289	0.0000
Hausman test statistics	1.8649	0.1721

Source: own processing

Figure 1 and 2 shows the volume and the number of cross-border mergers and acquisitions in the banking sector for the period 2004-2021. For the sake of clarity, the data is available in summary for the monitored period.

Figure 1. Volume of cross-border mergers and acquisitions in banking sector for the period 2004-2021, (v mil. Eur)



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Source: own processing

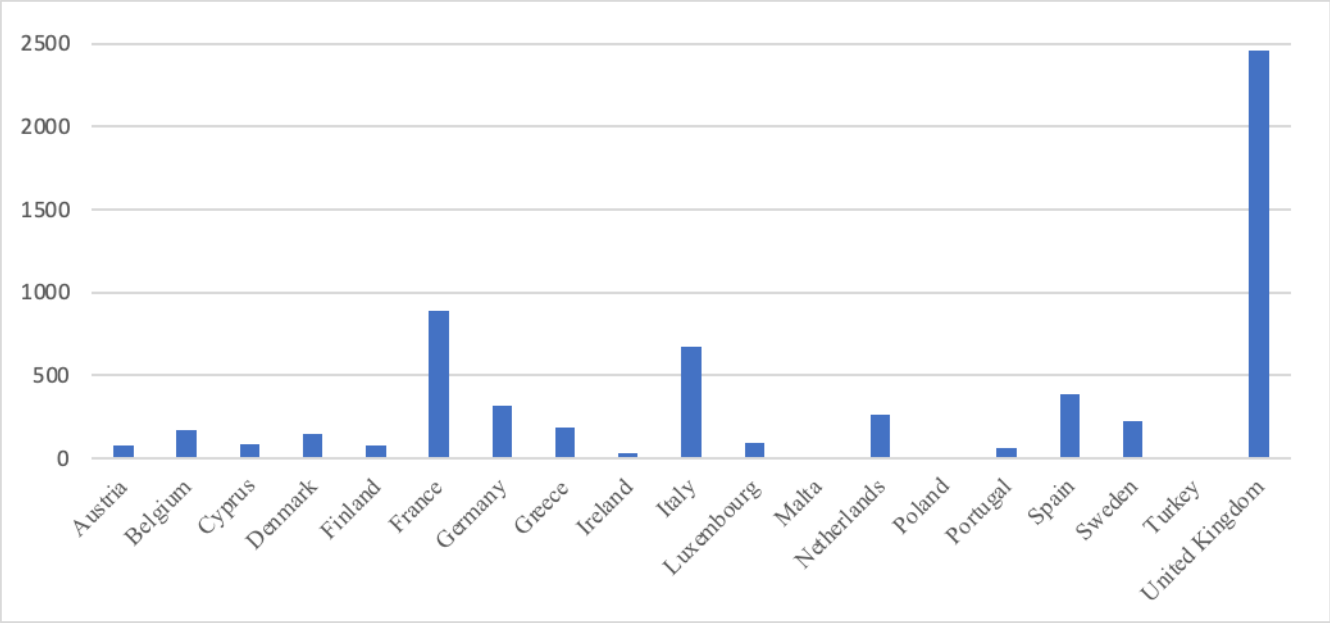


Figure 2. Number of cross-border mergers and acquisitions in banking sector for the period 2004-2021
Source: own processing

The countries with the largest volume of cross-border mergers and acquisitions in the banking sector for the period 2004-2021 include France, Italy, the Netherlands, Spain, Germany and the United Kingdom. The largest number of cross-border mergers and acquisitions in the banking sector for the period 2004-2021 was in the United Kingdom, France, Italy, Spain, Germany and Netherlands. During the monitored years, there are changes in the given volume or number of cross-border mergers and acquisitions in the banking sector. Therefore, for a better idea, we present in table 4, the average ranking of countries in individual years according to volume and number of cross-border mergers and acquisitions in the banking sector for the period 2004-2021.

Table 4. Ranking of countries

Country	Average Rank of volume M&A	Rank of volume M&A	Average Rank of number M&A	Rank of number M&A
Austria	9,0	9	10,9	11
Belgium	8,2	7	8,6	8
Cyprus	13,8	15	12,8	15
Denmark	8,5	8	7,4	7
Finland	12,1	13	11,1	12
France	3,3	1	3,3	2
Germany	4,6	4	6,3	4
Greece	10,2	10	10,4	9
Ireland	14,5	16	14,8	16
Italy	3,8	2	2,3	1
Luxembourg	10,8	11	10,9	10
Malta	16,5	18	16,4	18
Netherlands	6,2	5	7,4	6
Poland	16,8	19	16,7	19
Portugal	11,2	12	11,3	13
Spain	4,2	3	4,3	3
Sweden	12,9	14	11,9	14
Turkey	15,7	17	16,0	17
United Kingdom	7,9	6	7,2	5

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Source: own processing

3. Discussion and Conclusion

The globalization results in a strong necessity to originate and implement the new corporate strategies towards the businesses restructurizations through the various types of the M&A transactions in order to optimize the organizational structures, management capabilities, financial indicators, aiming to establish a fully optimized profitable corporations at the various business operation scales and scopes within the different product and services lines in various markets (Ledenyov and Ledenyov, 2014). Mergers and acquisitions in banking take place to enhance the wellbeing of shareholders and to attain an economic effect; the aspect of stability in mergers and acquisitions is short-lived and is usually inspired by the government. Modern banking market of the EU countries has evolved through mergers and acquisitions; strategic investors have helped countries with transitional economies ensure the stability of their banking systems, capitalize on economies of scale, and thus support their GDP growth. Several large banks operating in small open economies (and transitional economies in particular) provide the backbone for the stability of their financial sector (Novickyte and Pedroja, 2015).

Kurmanalina et al. (2017) also argue that active development of the international and national banking markets in the conditions of economic globalization is accompanied by expansion of mergers and acquisitions transactions. The expansion is dependent on the interests and positions of participants in mergers and acquisitions aimed at expanding and diversifying their activities, development of new technologies, market segments and territories, strengthening competitive position, minimizing risks, reducing costs, fulfillment of obligations, and the involvement of highly qualified specialists. Therefore, in the banking sector M&A deals are one of the main forms of manifestation of the process of centralization of bank capital.

According to Long (2015) one of the primary objectives for M&A is to reach growth at the strategic level in terms of size and customer base. With the power of M&A in the banking sector, the banks can achieve strategic benefits, growth in operations and minimize their expenses to a sizable extent. Therefore, more and more international and domestic banks all over the world are engaged in M&A activities. In recent years, a number of academic studies in economics and corporate finance have measured the profitability of companies (banks) before and after M&A. The value of this approach is that it can be used to diagnose strengths and weaknesses of the company's performance, whether it is profitable or not. However, whether M&A lead to improved performance is a debatable issue. Some results indicated that M&A have synergistic effects; others have concluded negative effects; others showing mixed or insignificant results. No definite conclusion can be drawn thus there is a need to explore this area further.

Decisions aimed at implementing a merger or acquisition as one of the alternatives for achieving the company's strategic goals are primarily based on a general effort to increase efficiency, financial and capital motives, and market motives. Entrepreneurs can very easily find themselves in a bad financial situation (Bič, 2022). In the current economic environment, among the motives for mergers and acquisitions, the necessity of restructuring or the effort to prevent the bankruptcy of companies, often due to unexpected and disruptive changes that in a short period of time will cause a serious liquidity crisis and a rapid decrease in value for the owners of the company. These transactions are time-consuming and sensitive (Hečková et al., 2018). Therefore, the question arises here as well, whether the size of the economy, measured through the volume of GDP, has an impact on the volume of M&A implemented in the given countries. This research study confirmed this assumption about a positive correlation. The result of partial analyses was the fact, that growth of the economy affects the percentage growth of the volume of cross-border mergers and acquisitions in the banking sector of the European Area. The countries with the largest volume of cross-border mergers and acquisitions in the banking sector for the period 2004-2021 include France, Italy, the Netherlands, Spain, Germany and the United Kingdom.

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Ayadi and Arnaboldi (2008) argue that M&A allows the resulting company to obtain efficiency gains through cost reductions (or cost synergies), revenue increases (or revenue synergies), the exchange of best practices and/ or risk diversification. Cost synergies result from an improved organization of banking production, a better scale and/or a better combination of production factors. The core objective is to extract the benefits from cost complementarities and economies of scale and scope. Revenue synergies also derive from a better combination of production factors which is mainly typical for economics with higher economic growth and volume of GDP. Finally, Aljadani and Toumi (2019) confirmed that the deregulation process in the banking industry, which has occurred mainly in most developed countries in the European Union, with the subsequent increase in the level of competition, forced banking entities to react to a new competitive scenario. Mergers and acquisitions were a frequent response in many developed European countries with higher volumes of GDP, and good management of the integration process and the consolidating banks clearly contributed to the success of mergers and acquisitions.

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IMPACTS OF MODERN TECHNOLOGIES WHILE IDENTIFYING AND UNLEASHING INTRAPRENEURS' POTENTIAL

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Abstract. The scientific literature on intrapreneurship still has many areas for deeper investigation. In recent years, there has been an increasingly growing interest in intrapreneurship: companies came to an understanding of the importance of innovativeness and found new business models triggering innovative growth, along with the possibilities for the creation of new products or services. Intrapreneurs were described by Pinchot (1985) as people who focus on innovation and creativity, turning creative ideas into profitable businesses within an organisational environment, while modern technologies are a great medium to identify and unleash intrapreneurs' potential. The purpose of the present paper is to examine how modern technologies can help promote the intrapreneurial culture in companies which could lead to sustainable competitive advantages. To answer the research question 'How to unleash the potential of modern technologies while enhancing intrapreneurial activities', the literature review and case studies were conducted based on qualitative semi-structured expert interviews.

Keywords: intrapreneurship; modern technologies; effects, corporate performance; efficiency; effectiveness; international and domestic companies; technological intensity

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1. Introduction

Although various aspects of competitive advantages across different economies, industries and companies (via technology) have been receiving growing attention among scholars over the last few decades (for instance, Dodgson (1993) emphasised the role of technological collaboration in the industry; Brynjolfsson and McAfee (2014) focused on the automation of cognitive tasks; Yamakage and Maruyama (2018) scrutinised the role of AI and other cutting-edge technologies; Aithal & Aithal (2019) addressed the industry competitiveness via technology; Robertson et al. (2000) introduced the typology of industries, based on the technology application),

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the impacts of modern technologies on intrapreneurship are tackled by a relatively smaller number of researchers (Okun et al., 2020; Pergelova et al., 2019; Elia et al., 2020), Kungu et al., 2020; or Kwilinski et al., 2019, etc.). Moreover, many scholars address the effects of technologies, liaising them to different conditions for intrapreneurship enhancement, such as effective/ efficient business model (Rachinger et al., 2019; Clinton and Whisnant, 2019; Ibarra et al., 2018; Loon and Chik, 2019), digitalisation (Radosavljec et al., 2020), sustainability agenda (Haseeb et al., 2019), creativity and innovation (Wijngaarden et al., 2016), education (Handoyo and Anas, 2019) or a necessary ecosystem for entrepreneurship (Estrin, 2018).

The recent evidence by Bianchi and Mathews (2016) suggests that adopting digital technologies is crucial for internationalisation. Furthermore, the effects of modern technology on firms' competitive advantages should be tackled while focusing on productivity and strategy effectiveness (enabling firms to automate their processes and increase digital business security). Moreover, modern technology might lead to improved communication and consumer base, increased marketing capabilities and internationalisation. Von Briel et al. (2018) suggested that technologies not only contribute to the firms' productivity or the ability to expand but also enable the creation of new businesses and digital start-ups while enhancing entrepreneurial activities in the areas of digital products or services, digital platforms, digital tools and infrastructure, digital artefacts, and Internet-enabled service innovations (Aldrich, 2014).

This paper examines how modern technologies can help promote the intrapreneurial culture in companies, which could lead to sustainable competitive advantages. Intrapreneurship mainly focuses on employees' activities that lead to increased productivity/ effectiveness/ efficiency or volume/ profitability through innovation (Bosma et al., 2010). The main challenges for unleashing the intrapreneurial spirit within organisations are that the companies might still have stagnant business models while not being ready to delegate sufficient control of innovation processes to employees (Duncan et al., 1988). Moreover, the implementation process of modern technology might be imprisoned by the lack of resources and insufficient knowledge. Thus the governmental support for SMEs and the benefits of technology adaptation should be further emphasised. The present paper elaborates on the research question of how to unleash the potential of modern technologies while enhancing intrapreneurial activities. The literature review and case studies were conducted using qualitative semi-structured expert interviews, and a comparison of international and domestic companies was performed. This led to pertinent performance improvement recommendations and could be served as a conceptual pillar for further research in the same series. Comparing two industries (Automotive and Creative) revealed the critical suggestions related to the practical/ efficient combination of high- and low-tech business practices to be sustainable and stimulate the higher value-added-value for an organisation.

As claimed by (Kungu et al., 2020), innovation and intrapreneurship have become crucial for companies to survive in the technology-driven business world. In the less developed countries, the level of intrapreneurship is correspondingly lower, which is related to somewhat lower competition compared to the developed countries (Kaleem et al., 2019); however, severe competition makes it more difficult for companies to differentiate from other peers, while the demand for talented people is growing: the companies need to promote intrapreneurship inside its environment via creating an intrapreneurial climate and encouraging innovation processes. This is directly connected to the research question of the present study: digital solutions help companies stay innovative by attracting intrapreneurs and implementing modern technologies (Ali et al., 2020) and supporting e-learning and game simulations (Vakaliuk et al., 2020).

To understand how technologies are reshaping the business world, it is crucial to know the classification and differences/ similarities of the technologies in various fields of business. Industries have been facing many transformations in the last decade, which changed how companies connect business with their customers and how products are developed, manufactured, and delivered.

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Driven by the growing importance of hybrid technologies, a set of modern technologies (such as Artificial Intelligence & Robotics, Big Data & Intelligence Technology, Blockchain, Cloud Computing Technology, Cyber Security Technology, 3D Printing Technology, Digital Marketing Technology, Internet & Internet of Things (IoT), Information Storage Technology, Optical Computing Technology, Online Education Technology, and Virtual and Augmented Reality, etc.) might be used to develop the technology which helps analyse, plan, and compare information better than employees could do. At the same time, those technologies help eliminate fraud and corruption by keeping track of financial transactions using blockchain technology. This phenomenon is called the Fourth Industrial Revolution, and it is predicted that it will be the most powerful force for innovation in technologies over the next few decades (Frank et al., 2019).

Thanks to the connectivity offered by the Internet, different industries are now facing a transformation towards the digitalised era, where machines, devices and products can relate to each other and be flexible to react to market changes quickly. The application of Information Technology is changing across various industries (including Car Manufacturing) while responding to the increasing needs of human societies in the 21st century and following new opportunities (Fournier, 2017). However, information technology projects have a high rate of failure, and the main reasons for these failures or unwillingness to invest in these stocks are the lack of transparent and integrated information technology, along with the lack of support of senior management of information technology projects and unfavourable short-term changes in teams of executive managers.

According to Abbasi et al. (2017), Communication and Computation Technology (ICCT) also heavily influences the creative industry. Technologies in this industry are often used as a means to directly enhance creativity and increase the interaction of technologies with other departments, leading to new genres of art, such as media art, digital art, and video art, as well as the reshaped understandings of creativity (for example museum, theatre, and gallery apps). It also contributes with new materials, processes and tools for creative practices, new business models, digital marketplaces, consumer groups and distribution channels, along with new ways of marketing and selling innovative products, tools, apps and services, new forms of user-producer interaction, new virtual communities of creators and innovators, along with the new forms of creativity, such as human-free and computational creativity (Abbasi et al., 2017). According to World Bank data, there are over 190 million registered businesses in the world; one of the ways how a company can stay competitive in the market is by aligning its innovativeness policy with the intrapreneurship enhancement initiatives.

Creativity, corporative entrepreneurship, and technological innovation orientation are critical factors for technological innovation. The main driver of technological innovation within an enterprise is the executives of a firm, which is in line with Hambrick's (2007) theory of Upper Echelons, according to which a manager's creativity is positively influential to various fields within the organisational innovation development. It helps achieve the technological innovation orientation and increase business performance. This idea that technological innovation depends on creative mindsets is furthermore analysed with the introduction of the technology-mindset matrix (Figure 1), which consists of four types of factors for technological innovation improvement: incremental innovation, radical technological innovation, radical mindset innovation and revolutionary innovation; showing how each type leads to the unique, innovative outcomes within the companies (Ringberg et al., 2019).

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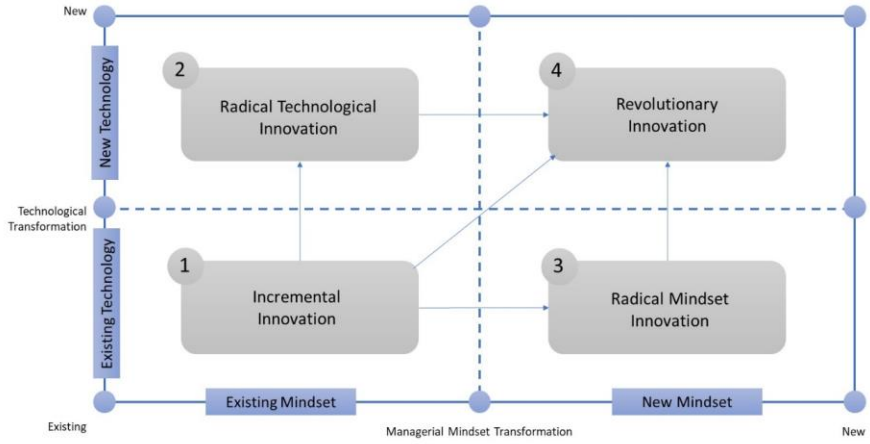


Figure 1. Technology-mindset matrix
Source: Ringberg et al., 2019

The first type (incremental innovation) represents a low-risk reward type of innovation and is the most popular across various industries. It is mainly driven by the need to identify new and exciting processes, services, or products to stay competitive. Therefore, the activities related to these types of innovation are typically reactive to the competitors' moves and involve the gradual development of the technology and managerial mindsets, also defined as 'muddling through technology' by Lindbloom (1959). However, the problems related to this type of technological innovation are the lack of resources, the complexity of internal cultures, legal requirements, and the situation when managers often being resistant to the change, have stagnant mindsets and prevent the acquisition of new ideas, so it is hard for big companies to make the necessary adjustments to new technological practices.

Radical technological innovation is based on a technological breakthrough. It represents the implementation of new products, processes and services which create fundamental change in business productivity and interaction with the market (Ringberg et al., 2019): the exploration of the potential of those revolutionary new technologies is only possible via innovative managerial mindsets as they carry huge risks, while the decisions to implement those technologies heavily influence firms' production, logistics and the ability to become more competitive in the market.

The firms' managerial innovation is critical to strive for businesses to stay competitive in the market. At the same time, Seung Hoon and Ahn Yeon (2016) further analysed the technological investment propensity factors: how they influence the technological competitive advantage and management performance (the study of 181 firms using technological innovation and information technology). The first group consisted of technology investment factors – market-oriented investments in the technology linked with customer needs, competitor responsiveness, market environment, and stakeholder strategies towards modern technologies. This factor relates to the technology, enabling innovative product and process creation and business model enhancement. Having analysed the first two factors, Seung Hoon and Ahn Yeon (2016) tackled the strategy oriented to investments in technology to dominate the market sustainably and consistently. The analysis identified the competitive advantage factors, such as technological excellence in new product commercialisation, market growth, internationalisation, and business profitability.

The importance of firms' efforts in organisational engineering, team operations and flexibility of innovativeness process should be further examined. At the same time, management performance should consist of financial and non-financial dimensions in the open and rapidly changing environment (marking the importance of mindsets and the correlation between technological advancement and business performance). Thus, a more ingenious

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collaborative, relational diagnosis is necessary (Campos Vidal et al., 2017). Technology adoption is challenging for Small and Medium-sized Enterprises (SMEs) due to the lack of resources and marketing issues. SMEs face limitations when adopting the latest technology; thus, external factors, such as governmental incentives, covering part of their R&D costs, and minimising their financial risks are of significant help (Yigitcanlar et al., 2019). Many investors seek to obtain quick and safe returns on their investments, as investing in modern technologies is often risky; thus, governmental incentives are critical. To continue, adequate support for innovation in competencies, skills, knowledge, and experience should complement the financial support Yigitcanlar et al., 2019).

While using various technologies, small businesses can focus more on the cost-efficiency strategy via optimisation of OPEX, COGS and CAPEX, as well as using modern communication tools or enhancing the employees' competencies and productivity. Moreover, business technologies help outsource business functions to diverse markets, which leads to the reduction of costs and a more vital strategic direction. Therefore, many small businesses use the technology to outsource operations for which they lack resources, and the technology enables outsourcing in an effective and cost-reducing way, including foreign enterprises: digital technologies help diminish the number of barriers to market entry and increase the number of stakeholders engaged in the international market exchange (Aldrich, 2014).

Furthermore, digital technologies help SMEs in their internationalisation by increasing the efficiency of market intelligence and allowing firms better communicate with various stakeholders internationally (Bianchi and Mathews, 2016), while the adoption of Internet-based technologies are the most important aspect of internationalisation. The Internet also provides access to secondary data sources, individual country data (data about cultural differences), industry and legislation reports, and lists of potential suppliers, distributors, customers, and governmental agencies.

Modern technology tools and systems, such as data analytics or enterprise resource planning systems, help store information about customers, suppliers, and competitors and intensify market knowledge sharing within an organisation, liaising with local and international partners (Zhu and Kraemer, 2018). Modern digital technologies help develop market intelligence by making it easier to access high-quality market information in parallel with communication among customers and international partners. In line with its positive characteristics, modern technology not only increases the productivity of companies or their abilities to expand internationally but also enables the creation of new businesses and digital start-ups that use modern technologies as the main component of their business models and operations. It can be concluded that digital technologies are enablers of entrepreneurial activity (von Briel et al., 2018), and they manifest in various forms, such as digital products or services, digital platforms, digital tools, or infrastructure (Aldrich, 2014), digital artefacts, or Internet-enabled service innovations. Modern technologies change the entrepreneurial process thanks to combining those technologies and the reshaped entrepreneurial minds.

2. The Role of Intrapreneurship

The interpretation of intrapreneurship differs from one source to another. For instance, Shefiu (2019) describes it as a new and more hazardous activity of the organisation whose goal is to raise sales and productivity within a company. Several scholars, such as Bosma et al. (2010), associate the term 'Intrapreneurship' with employees who take the initiative to make new business activities within an organisation. Activities related to this term are perceived as an opportunity within the firm while planning, organising, and gathering resources.

The outcomes of intrapreneurship could be launching a new product or establishing a new subsidiary (Bosma et al., 2010). An intrapreneur could also be called an innovation executive, product developer, business developer or another type of employee. After analysing 106 articles, Neesen et al. (2019) found out that the term

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'intrapreneurship' usually revolves around the creation of new products or businesses. According to their research, the Intrapreneurship definition entails six themes (see Figure 2).

First, intrapreneurship is directly coherent with the word 'Innovativeness'. When someone is called an intrapreneur, he is considered a creator of innovation (a product, service or process). Sometimes an intrapreneur could be a creator of a business venture. This term could also apply to an employee responsible for renewing his organisation. An intrapreneur needs to recognise an opportunity, and if given the required resources, that person can fulfil it. Innovation executives must not be afraid to initiate new projects with all the accompanying risks (Kokku, 2019).



Figure 2. The Roles of an Intrapreneur
Source: Neesen et al., 2019

To achieve the organisational competitive advantage, there should be a specific role of an intrapreneur specified and aligned within a company (Kokku, 2019): to take risks to increase productivity inside a firm and solve diverse challenges; initiate innovation via the technologies or applications (Seshadri and Tripathy, 2006); be focused on the creation of new products/services; new business venturing, self-renewal of an organisation, and opportunity recognition/ exploitation; have the specific skills to solve organisational problems, while focusing on the processes, learning and understanding market trends; inspire their team to be creative and support them (Seshadri and Tripathy, 2006).

Thus, intrapreneurship has a lot of similarities with entrepreneurship. Still, intrapreneurship is usually interpreted as specific activities inside a company by a lower hierarchy employee, whilst entrepreneurship is practised mainly by managers capable of mitigating risks throughout the innovation process. One of the main differences between entrepreneurship and intrapreneurship is that they do not have complete freedom to act as they depend on the company's financial strategy, organisational culture, and intellectual property rights. Intrapreneurship is also easier to sustain, manage and facilitate than entrepreneurship (Kaleem et al., 2019). Despite these differences, an entrepreneur and intrapreneurs are innovative while adding value to their products or services, facing risks, even though an intrapreneur doesn't risk his own money (Aina and Solikin, 2020).

Moreover, companies showed a growing interest in implementing intrapreneurship initiatives in practice (Duncan et al., 1988): intrapreneurship was considered a future phenomenon the companies, but the time was not right in 1988 because at that time, companies did not know what to do with intrapreneurs, often putting them into the management position while diminishing their potential to innovate; organisations were not ready to risk by delegating control over the product/service development to an employee.

Neesen et al. (2019), deriving from the analysis of 106 articles, witnessed the increasing attention to intrapreneurship after 2002, which indicates that companies have come to an understanding of the importance of

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innovativeness: they continuously try to find different ways to complete the task or solve their problems, while thinking out of the box or finding new ways to create new services or products. One of these transformational outcomes is related to the intrapreneurship culture within an organisation. Laužikas et al. (2015) agreed that nowadays, intrapreneurship is crucial to thriving and growth: a lot of employees don't want to work only for the financial remuneration; the opportunity to contribute to strategy implementation and future growth is an important motivational factor, along with the transforming work-life balance or new exciting collaboration opportunities.

It is recognised in developed countries that intrapreneurship culture should be encouraged inside the organisation: intrapreneurship and innovation are the key drivers of sustainable growth (Kungu et al. 2020); however, more traditional and bureaucratic organisations might find these processes rather difficult to implement (Kaleem et al. 2019). On the other hand, the competitive environment in developed countries encourages companies to find new ways to promote their products or create innovative solutions which could differentiate them from other peers. Finding talented people and promoting intrapreneurship or new technologies are significant in high-tech organisations (Kaleem et al., 2019). Therefore, a specific environment and rules must be implemented (Ali et al., 2020) via training programs for employees and the opportunity to experiment. In parallel with the innovative climate, companies must be ready to invest financial and physical resources, enabling employees to learn and innovate, see new opportunities and feel valuable. Thus, a company which promotes intrapreneurship (Ali et al., 2020) should possess an adequate reward system for the employees' accomplishments while tolerating learning from the mistakes approach and encouraging them to take risks. Codrinlescu and Bolcas (2019) underlined the five most important factors which can promote the development of the intrapreneurial environment within a company (see Figure 3).



Figure 3. 5 factors which can favour the development of the intrapreneurial environment within a company.
Source. Codrinlescu and Bolcas, 2019

Firstly, a company's objectives and missions must be clear for the employees. An intrapreneur must understand the path they need to take and which innovation they create. Without a clear goal, their creation may not be helpful for the company, and the time, money and other resources would have been spent on an unnecessary innovation or service for the organisation. An employee should also be provided with support by senior management (Ahmad et al., 2012). Besides the financial support, the superior management should accord their own time to assist the intrapreneur under challenging situations. Additionally, the administration should support entrepreneurial employees by creating social trust (Narayanan, 2019). A clear and smooth organisational structure is also significant to develop the intrapreneurial culture where employees are ready to enhance their competencies/ skills/ knowledge, be flexible and initiate their projects, accompanied by sufficient resources to commercialise innovations.

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The technologies make the process of implementing the intrapreneurial culture in the organisation easier by diversifying the intrapreneurial environment and conducting training or learning programs (Ali et al., 2020), such as e-learning (Gethe and Hulage, 2020): e-learning provides opportunity to learn remotely or in the office, personalise the learning experience for different employees as well as unleash the intrapreneurial potential in a cost-saving way. The freed-up financial resources could be further allocated to various intrapreneurial projects or innovation activities. Various gamification tools and simulators might teach people to behave in specific situations (Vakaliuk et al., 2020) and manage their projects, resources, and risks, leading to a more effective strategy implementation process.

3. Research methodology: measuring impacts of modern technologies within the entrepreneurship dynamics

To examine how modern technology usage could unleash intrapreneurs' potential while strengthening a firm's competitive advantages, the qualitative semi-structured experts' interviews method was chosen: to explore some areas that could not be investigated with quantitative research, such as human behaviour. The in-depth experts' (the chief executive officers') observations were the focus of this study (Roshan and Deeptee, 2009). This helped to better understand the knowledge and perception of the top-level management about intrapreneurship and the implementation of modern technology while encouraging the intrapreneurial culture. It was expected to provide recommendations for performance improvement and strengthening corporate competitive advantages.

Similar data was conducted by other researchers (Kenney and Mujtaba, 2007), who interviewed intrapreneurs and tackled their valuable experiences. They gained insights through the emotional intrapreneurs' perspectives, but their research could not show how intrapreneurship affected the company's results. The same researchers wrote about their anticipated study where they could interview more intrapreneurs and combine it with the quantitative method. Manimala et al. (2006) also interviewed intrapreneurs to gain insights into the organisational perception of intrapreneurship; Rekha et al. (2015) interviewed employees from India to tackle the intrapreneurial mindset inside organisations.

Two types of top-level managers were interviewed: three of the managers were from international companies, and the other three were from domestic organisations. Due to confidentiality, all the respondents were coded. The interview questionnaire consisted of 11 questions and evaluated the importance of six factors for employees' intrapreneurship. The first questions were formed to understand the managers' depth of knowledge and perception regarding intrapreneurship. The following questions were to identify whether they encourage activities related to creating the intrapreneurial environment.

Furthermore, it was essential to tackle whether the experts sufficiently understand the connection between intrapreneurship and modern technologies and whether they use innovative solutions to stimulate intrapreneurship. Some of the questions were constructed to realise what resources the companies accord to talent development (financing staff training, examining and implementing the ideas created by the employees, etc.). Interviewees were also asked whether they had seen examples of intrapreneurship or at least some of its features. Finally, it was focused on top-level managers' opinions regarding the most important factors for employees to become intrapreneurs.

The selected method also helped reveal new theories or factors of the research topic (Matveev, 2002). The qualitative research has contributed to a better understanding of the culture and environment of the selected organisations, along with some practical individual experience illustration (Wrigley et al., 2010). Although the sample size of the qualitative research is somewhat limited, it helped explore the topic deeper while gathering more significant amounts of diverse information (Queirós et al., 2017) through professional interviews of sufficient time and value added to the research question. In the future, it is intended to continue scrutinising this

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topic while using the quantitative method to gather the data from intrapreneurs and compare it with the qualitative data derived from the experts.

4. Research results: the comparative analysis of 6 cases

Company A

The first interrogated company is an international company with 12 employees specialising in online payment processing. It is an innovative company based in Lithuania but mostly orients operations to foreign customers. Internet-based technologies made it possible for intrapreneurial specialists like the CEO of this company to implement their business ideas: by using technologies, this company was able to use the outsourcing strategy in the fields such as accounting, human resource management, and IT maintenance. Therefore, reducing costs and focusing on its primary business activity was the main strategic priority of the analysed company. The research results revealed that this firm encourages creativity through various motivational systems, bonuses for productiveness, gifts during Christmas and birthdays and different creativity and learning sessions. This IT also combines diverse software to benefit their business processes: Microsoft teams and Jira (a program to track project progress and individual and group objectives) are the two leading technologies used to increase creativity. A horizontal business model supports the ideas generation session. Apart from daily meetings, managers discuss with employees about the technology preferences they are willing to use; employees can express their ideas and, in this way, not only contribute to the business benefits (for instance, increased productivity) but also to the harmonised relationships between management and employees. The importance of the horizontal business model was also expressed when the respondent evaluated how important the managers are for the intrapreneurship environment (on a scale of 1-10, the evaluation reads the maximal value).

Technologies within this company are used to increase creativity and encourage collaboration: this company outsources most of its activities. Some companies they are working with are domestic; some are international. Internet-based communication technologies make such collaboration among companies smoother and more efficient. One of the fields which are being outsourced within this company is human resource management (HRM). The company uses the services of a recruitment company, "people link", which is a domestic company; however, they do not communicate physically (face-to-face), as all the communication is happening online through Internet-based communication technologies. The second area, which is being outsourced for this company, is IT maintenance: the key strategic partners help provide services, such as fixing various malfunctions with hardware and software and providing computers for the company. Accounting is the third type of service being outsourced: currently, they are using foreign companies to perform on their behalf. Communication with all the companies is mostly happening through Microsoft teams. Even though it is a small business, it's challenging to communicate efficiently through physical face-to-face meetings. This is where communication technologies come to help, and this company uses a variety of them, such as Microsoft Teams; Confluence, which specialising in documents and constantly updates information relevant to employees; workplace, which is a web and mobile app aimed to keep team members connected, Facebook Work, Sharepoint (which stores information about employees and their status), CRM software called "Salesforce" (providing a single, shared view of every customer for all the departments).

When the expert evaluated the importance of employee training and its correlation with intrapreneurial mindset formation, the expert gave maximum importance to this subject. Various training methods are used in this company; some are not formal and constantly performed among employees and managers during lunch breaks and various workshops; however, the official training includes international business trips being organised several times a year. Moreover, cyber security simulation training is mandatory for everyone, as this firm is working with sensitive data, and data breaches would result in substantial financial and moral losses. Training enhances employees' skills and capabilities, correspondingly mitigating the risk of failure (creating a more robust intrapreneurial environment in the company).

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The last but not the minor factor for intrapreneurship, mentioned by the interviewee, are competent leaders. The co-founders of this company are an example of intrapreneurs who were originally managers in similar types of companies abroad. They identified the opportunity to create a start-up in Lithuania, and with the financial help of their previous company, they managed to succeed. The current management has kept the same strategy to improve the intrapreneurial environment, and employees were able to get financial help to implement their business ideas. This confirms the previous observation that the main driver for innovation is an intrapreneur of a firm.

Company B

The second investigated company (via the interview with its CEO) is a domestic company specialising in the retail and wholesale of building materials with a headcount of 50 employees in four branches in the four most prominent cities of Lithuania. This company has a traditional vertical business model, with all four branches having separate regional managers in charge of 10-15 employees teams. In line with their insights regarding the internal programs to encourage employee creativity, the specificity of work does not entail the necessity to be creative; thus, no software is used to increase creativity. It can be suggested that intrapreneurial activities are not equally relevant to all types of businesses, especially those not driven by innovation. This is also preconditioned by choice of a traditional vertical business model. However, the interviewee marked the importance of the technologies, as they help increase productivity and improve internal and external communication. Moreover, this company does not use any specialised software for communication, while focusing more on traditional online communication means, such as emails, phone calls and social media (those means became extremely helpful for this company during the quarantine). Furthermore, this company uses the outsourcing strategy (in the fields such as accounting and IT security) and implements the same type of communication technologies for internal communication.

In response to the question of whether there were cases of intrapreneurial activities and the employees who created their ventures in the past, the respondent confirmed the transformation from an intrapreneur to an entrepreneur. Some employees decided to leave the firm and create their ventures. For this reason, the interviewee accentuated the risks coming from intrapreneurial people inside a firm. Those risks consisted of financial and human capital losses; however, there is a possibility for an employee to gain support from a company to implement their business idea. Only a few criteria must be fulfilled to find an effective consensus: it must be mutually beneficial and have legal acts that regulate its relationship with the mother company. This way, the risk of financial losses is reduced, and the employee can unleash their intrapreneurial potential.

Moreover, the CEO does not deny the correlation between employee motivation, skill set, or corporate results. For this reason, a couple of employee training programs are conducted annually. In addition, the company offers motivational programs for employees, such as bonuses for sales and social guarantees. Surprisingly, when revealing his/ her insights regarding the importance of the wage policy and motivational systems to create the intrapreneurial environment, the expert's position was rather pragmatic: indicating the willingness to not largely increase the expenditure for entrepreneurs and intrapreneurs while focusing more on the psychological support, along with the favourable work environment well-established.

Company C

The following company selected for the research is a domestic windows & doors company specialising in retail and wholesale all over the country. Its CEO is also an owner of two other businesses operating in the bars & nightclubs industry (only the windows & doors company is scrutinised within the present research).

Within this domestic company, the communication system is established internally and externally; however, it is not technologically intensive, and technologies used for this communication are more traditional and accessible in global markets for businesses and customers. This company uses outsourcing for diverse activities, such as HR,

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accounting, and marketing – all three strategic partners are domestic; thus, the means of communication used to interact are phone calls, emails, and video calls. For instance, all the accounting information is kept in the cloud, so the CEO of this company can access this data anytime. Internal communication is also happening through phone calls, emails or in person.

The responses regarding the technologies used to enhance creativity were more of a negative character: this company does not use technologies for this purpose. However, the respondent had the knowledge and understanding of the term intrapreneurship as well as accentuated its importance. The motivational systems include rather simplistic and classical means (bonuses out of turnover and gifts during significant celebrations and birthdays) to increase the employees' motivation and ideas generation. Moreover, window installation teams have different ways to generate profit and unleash their intrapreneurial skills. One such method is related to the opportunity to provide additional services for clients, along with the corresponding other rewards for the employees.

Given that there are many unqualified workers in window installation teams, the firm provides them with a new income source and, in the same way, increases the employees' motivation. Another solution is getting financial support to implement their business ideas. While examining the performance of this firm over 15 years, it is found that two previous employees of the company have become significant suppliers thanks to the financial help of this company. It is a mutually beneficial relationship as it decreases the cost of the materials and helps employees create their own manufacturing business. However, according to the interviewee, this company does not require high technological intensiveness, as it is already a mature business, and the specialisation of this firm is relatively simple. Therefore, to maximise its profitability, this company is operating through the vertical business model, along with a friendly environment: most of the employees and managers are friends, and every week (during the Friday meetings), there are discussions among the leaders of the installation teams and managers, which leads to the increase of the firm's productivity and more excellent psychological climate.

Company D

Company D has been chosen because of its internationalisation strategy: founded in Lithuania, it also operates via offices in other countries, along with many employees working in this organisation. The general manager explained the meaning of intrapreneurship: ‘employees acting as entrepreneurs. The expert revealed his positive attitude towards intrapreneurship while explaining the motivational system as a critical driver for entrepreneurial employment. Although it depends on the departmental specificity, it is essential that the employees feel appreciated and their hard work can always be compensated. All the employees can always expect a raise or promotion in line with their work contributions to the firm's overall performance. In addition, there are different motivational systems across departments. For instance, the employees working in the marketing department can expect a monetary incentive if their marketing program is successful: the Lithuanian office runs the Friday's meeting of the whole office, where people can present their ideas, or they can reveal their challenges and vulnerabilities.

According to the CEO, this company is highly dependent on modern technology: it is necessary for communication with employees from other countries; it helps manage all the data, while all the financial results of the company can be tracked via technologies. Every department has its way of managing the workload, but all of them must rely on technology. Based on the observation of the general manager, the technologies also help to invoke the employees' creativity as they can see most of the company's results on their computers or even on the TV screens on the wall. Based on this data, they can figure out new ideas that could contribute to the company's results. In addition, if they have a good idea, which could contribute to the company's welfare, the firm might be eager to invest in these initiatives. When asked whether there were people who created their businesses after leaving their company, the CEO admitted that the company is still very young. There were no exceptional intrapreneurship cases yet. Although according to the general manager, the employees are encouraged to lead

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their projects if they are experts in the required field. However, they must be correctly taught. According to the needs of the employees, there can always be a training session (or a learning program arranged), particularly if the employees need to improve the usage of a program or complete a specific task on time. Lastly, the inefficient risk-taking and managing process is due to the fear of losing their jobs and reputation. They are constantly reminded that they shouldn't be afraid of that.

Company E

Company E is the opposite of company D: it is based in Lithuania, and its employees are only Lithuanians. Its activities are mostly related to manufacturing. The company's general manager reveals regrets regarding their limited knowledge of intrapreneurship. In contrast, the company's indicated types of motivational incentives were a raise or promotion for the employees' work. Given a big headcount, it is hard for all the employees to be engaged and supported. However, the technologies are crucial for this organisation: the technology helps communicate with each other and encourages the employees' creativity; the employees can receive the necessary training through the technology (for example, the digital program to teach safety, along with various safety videos). The CEO claimed that there are no significant cases where employees could be responsible for their projects. Still, their company would be ready to invest in the employee's ideas if they contribute to the company's welfare (only after quitting their job did one former employee create their own successful business).

Company F

Company F is an international company which has offices all around the world. Its activities are based on providing IT services. The company was established in Lithuania. One of its founders revealed that they are trying to motivate their employees in diverse and unique ways: a game room where the employees can play table football or video games in the Lithuanian office, happiness and optimism-oriented sessions, and various motivational incentives across different departments, etc. For instance, after each successful quarter, the best-performing departments can gain monetary incentives based on the results; the employees are heard and frequently interrogated about what might be different or what innovative solutions might be implemented. The employees develop a considerable number of products within this company. All the employees are stimulated to generate their ideas, and if they are relevant and beneficial, this company is eager to invest in these ideas. Moreover, the company's activities are very dependent on technologies; thus, to improve organisational communication, various technologies are implemented: this company seeks to make every process as easy as possible; all the newcomers must undergo training, although there is no additional training after that.

The comparison of the domestic companies

Drawing the conclusions, the three domestic companies have significant similarities: all of them are operating either in manufacturing or sales, both retail and wholesale; these sectors are less technologically intensive; moreover, these companies are based on a vertical business model. The chosen business model is effective for them but jeopardises innovation processes simultaneously. For example, none of those companies has specific creativity enhancement technologies. However, all interviewees of the domestic companies highlighted the importance of employees' intrapreneurship and creativity to increase the firm's productivity. Within companies C and E, considerable importance was accorded to the motivational systems (seen as the way to improve the intrapreneurial environment).

On the other hand, it has been found in company B that the motivation of employees does not correlate with the motivational systems (on a scale from 1 to 10, only a value of 4 was attributed). At the same time, firms C and E drew more importance to this factor (the value of 8). The low value accorded by the CEO of company B could be explained from the perspective of the efficiency of these systems: monetary bonuses for performance might only motivate unqualified employees. In contrast, employees in higher positions are more aware of their value added. In addition to this observation, bonuses do not often increase or decrease the employees' intrapreneurial potential. All three companies' motivation systems consist of bonuses when employees show results and behaviour above expectations, such as increased turnover or commitment.

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As there is no suitable environment for intrapreneurial activities inside the researched domestic companies, employee training is perceived to increase the firms' productivity. The training policies are not conducted via the technologies in the B and C companies. In contrast, the employees of company E can enhance their skills via the use of technology in their training program. There was a significant positive correlation among those companies regarding the importance of communication technologies to enhance the employees' intrapreneurial traits and productivity. Technologies are used for internal and external communication in all the interrogated domestic companies. The most critical communication for companies B and C is related to the suppliers or outsourcing partners. The list of the outsourced fields consists of HRM, Accounting and IT maintenance.

Communication is crucial to be constantly up to date with the latest information, while Internet-based communication technologies are being used to collect that information from outsourcing partners. This leads to the increased productivity of the companies, as they can focus on their core business activity and leave room for innovative ideas generation. Similarities are also found in internal communication: face-to-face communication (which does not include modern technologies) and online communication (which would be impossible without technologies, such as Internet-based software and online phone calls). Modern technology increases the speed and quality of internal communication, leading to better productivity and a more suitable intrapreneurial environment, as ideas can be shared at the speed of light. At the same time, different departments can work together to achieve common goals. Communication between executives and employees was also marked as one of the fundamental ways employees' intrapreneurial capabilities can be identified and unleashed (with the corresponding values on a scale of 10: 7 for company B and a value of 10 for company C and E). The efficient relationship between a leader and an employee builds mutual trust, which is crucial for intrapreneurship incentives inside the company as it often requires financial funding. If there's no trust, this increases the risk because an employee might leave the company and start their own independent business. The CEOs of companies B and C mentioned this aspect of risk management in the context of intrapreneurship, as there were cases in the past when employees left the firm and started their businesses. In the case of company C, this resulted in gaining a new supply partner; however, in company C, the former employees' new businesses became competitors and even conquered their clients.

The analysis of the domestic companies led to the conclusion that the importance of intrapreneurship is understood as a pillar for employees' motivation and business productivity; however, intrapreneurial activities are being improved not through advanced technologies (which enable the creation of new products or services), but mostly through the increased quality of communication and motivational systems inside the company. The results share similarities with the findings of Hambrick (2007) in his theory of Upper Echelons, according to which the manager's creativity positively influences various fields within organisations in terms of innovation development: it helps achieve the technological innovation orientation and improves the business performance.

The comparison of the international companies

The interrogated international firms are also marked by a lot of similarities in terms of the perception of intrapreneurship (Companies A, D, F): the technologies are a compulsory precondition for their activities; they use it for communication among the employees, encouraging creativity, as well as tracking the results of the company. All these companies found ways to use modern technologies to make their work processes more accessible and efficient. Company A created a business strategy where technologies made outsourcing possible with reduced organisational costs. According to the CEO of company D, they could barely survive without technology because every job is based on technology, and they always keep tracking their results. Company F has offices in several countries while their clients are from around the world (including countries such as China and the United States of America); thus, they use various communication channels via modern technology.

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One of the similarities between these international companies is that they all see the need to motivate their employees. Therefore, they created various motivational systems which stimulate the employees to work more efficiently: the increase in salary or promotion is the most common means to reward the best-performing employees. The research results also revealed that international companies are likelier to use a horizontal business model, where employees have engaged and everyone's opinion matters. Thus, these companies are notable examples of excellent communication. For instance, company D allows employees to express their insights and input every Friday; they also communicate via technology as they have offices in different countries.

The employees of company A have regular daily meetings where they can share their thoughts and ideas regarding the firm's business processes. In addition, they use various technologies to keep up with their colleagues' work. The company's F management repeatedly interrogates the employees regarding the strategies or operations they could improve or make more efficient. These communication methods can improve the intrapreneurial environment inside the company. Furthermore, as mentioned before, specific training programs should be introduced to create an intrapreneurial culture. It is well implemented within some of the international companies investigated in this research. For instance, company D allows employees to learn anything related to their job during the required training. It is in line with the experience of company A where employees are constantly trained, while modern technologies help implement successful training inside the organisation. On the other hand, the company F offers employees training only at the beginning of their career, and there is a limited number of training available later, which might be related to a relatively large number of employees with diverse and specific tasks (that are not often rotated and transferable from one department to another). Thus, to create an intrapreneurial environment, the employees need strong support from the management.

Some of the international companies within the present research were able to provide examples of intrapreneurship in their companies. The general manager of company F stated that some of their products were the results of their employees. They were responsible for fulfilling and creating these ideas from scratch. Without them, these products and ideas would probably not exist in these companies. The example of the intrapreneurial activity from company F is a bit different: the co-founders of this company were the founders of the start-up in a foreign country. However, the CEO of company D could not provide a specific example of an intrapreneurial activity because the company is still relatively young.

In conclusion, the international companies investigated in the present research use various modern technologies to make their processes more effective and to strengthen their communication among employees, management, and clients. In addition, they use technologies to boost their employees' creativity because modern technologies help improve the intrapreneurial business environment. By supporting and helping their employees, the technologies help create a culture where intrapreneurs can emerge.

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Table 1. The importance of factors in creating intrapreneurial culture, according to the investigated companies, out of 10

Factor	Employees Trainings	Employees Education	Strong Leaders	Salary and Bonuses	Work Environment	Technology
Company A	10	7	9	10	10	10
Company B	7	8	7	4	7	7
Company C	6	7	10	5	8	8
Company D	9	8	10	9	7	9
Company E	7	10	10	8	5	9
Company F	7	7	10	10	8	8
International Companies Average	8.67	7.33	9.67	9.67	8.33	9
Domestic Companies Average	6.67	8.33	9	5.67	6.67	8
All Companies Average	7.67	7.83	9.33	7.67	7.5	8.5

Source: prepared by the authors of the present paper, based on the research results

While interviewing the general managers of the selected companies, they were asked to evaluate the importance of six factors for creating the intrapreneurial environment in the organisation. Table 1 depicts the evaluation of each factor by the companies from 1 to 10 (the average of these factors is counted for the international companies, domestic companies and all the interrogated companies).

In line with all the investigated companies, strong leadership is a critical factor in boosting the intrapreneurial environment inside an organisation. It is essential for both domestic and international companies. The importance of strong management was also mentioned in the theoretical part of this research. Based on the average of all the researched companies, technology is the second most emphasised factor while building the intrapreneurial environment: based on the interviews with the CEOs, and it was clear that the technologies are fundamental in most of the interviewed companies. The third crucial factor for intrapreneurs to emerge is the employees' education; however, international companies consider education less important, which might be related to their well-established learning and knowledge-sharing systems when education is part of the knowledge-sharing process. Within the examined domestic companies, employees' education is the second most crucial factor in creating an intrapreneurial culture. According to international companies, salary and motivational incentives are essential for intrapreneurship. Still, domestic companies indicated that it is the least important factor for promoting the intrapreneurial culture, which might be related to the effectiveness/ efficiency of the motivation systems when a company is preparing for growth or expansion. Moreover, according to the average results of the research, the domestic and international companies disagree regarding the importance of employee training to boost the intrapreneurial culture. The global companies evaluated the training higher than the domestic companies by two points (according to the average of all companies, the work environment is the least important factor for intrapreneurship).

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The comparison of the international and domestic companies

Given that all the international companies were technologically intensive service businesses, this influenced their use of technologies to enhance intrapreneurship, whilst all the domestic companies were either from manufacturing or retail sectors. In contrast, the usage of modern technology in these firms is more limited. For instance, within the international companies A and B, the communication among employees and external partners is intensive; the means of the used communication technologies are rather diverse: communication in the company B is organised via phone calls or emails, which is still efficient for them, corresponding to the nature of their business (while communicating between different departments and outsourcing partners in the fields, such as HR, Accounting and IT maintenance). In the meantime, the company B (which focuses on international clients and all the business activities are carried out online) is using a huge variety of communication technologies (to transfer messages at different levels from the clients to the outsourcing partners, to track record of the employee's performance, and/ or maintain the systematic data on relationship with customers).

As expected, the intrapreneurship level also depends on the structure of the business and the mindsets inside a company. It was found that the horizontal business models are more prevalent in international organisations that are more open to innovation (each employee feels equally essential when creating value for the company, which motivates them to generate new ideas and innovations). The vertical business model is still more prevalent in domestic firms: it restricts innovations and limits intrapreneurship activities. However, the interviewees of the companies using the vertical business models still highlighted the importance of innovation and intrapreneurship and, in parallel, tried to encourage positive employee behaviour uniquely.

The horizontal management model companies use to encourage intrapreneurship by enhancing the employee's skills through training and workshops: training consists of simulations, which give the ability for an employee to experience an actual business problem situation without facing the risk of financial losses. In addition, intrapreneurship is encouraged through international business trips and workshops, where international experts in the same area can discuss and share their ideas.

Within the vertical business model, intrapreneurship is mostly encouraged through motivational systems (for instance, bonuses out of turnover or gifts) and communication technologies. To continue, company C, which is a domestic company, provides the employees with the possibility to get a loan without interest (to use these sources to implement a new business idea, beneficial for that firm). Thus, both types of companies understand the importance of intrapreneurship and use modern technologies to identify and unleash the hidden potential of the employees; however, *the main difference is related to the intensity and variety of those modern technologies used in business processes, particularly while creating the intrapreneurship environment.*

Firms are centred on implementing the intrapreneurial environment to strengthen or create a competitive advantage. At the same time, an intrapreneur plays a specific and unique role in a company, summarised in figure 4, where research results are structured and presented.

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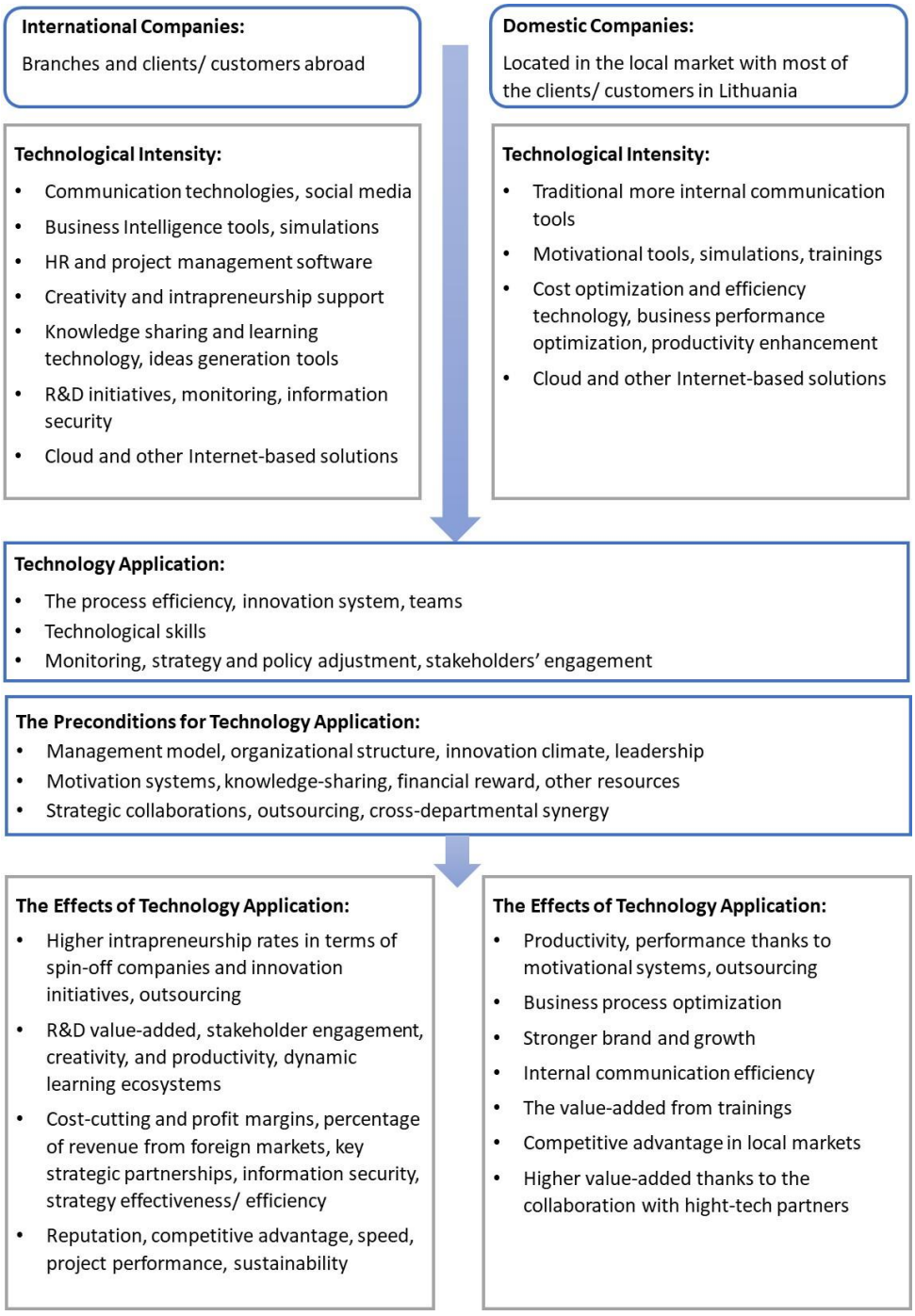


Figure 4. The role of modern technology while unleashing the intrapreneurship potential of international and domestic companies.
Source: prepared by the paper authors, based on the research results.

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5. Conclusions and recommendations

Modern technologies help businesses complete their tasks more efficiently, reduce costs, increase productivity, secure sensitive information, and complete many tasks on time, which is related to the employees' productivity and technological efficiency (they can focus more on priority activities). An intrapreneur should be the one who brings new business opportunities to a company while opening new tactics for growth; however, the financial support should be accompanied by other diverse motivational initiatives and practices. Technologies can make implementing the intrapreneurial culture within a company more accessible. Thanks to the technologies, employees can enhance the skills required to become intrapreneurs.

The present research findings showed that international companies are using modern technologies to create an intrapreneurial environment; domestic companies are less dependent on technology, and their managers' attitude towards the need for intrapreneurship is not in favour of technological enhancement. Nevertheless, based on the scholars, strong leadership and technologies are the factors that might help improve the intrapreneurship dynamics while establishing a strong intrapreneurial culture. International companies see the need to motivate their employees while creating an intrapreneurial culture via motivational systems, while domestic companies are more reluctant to develop motivational incentives for the intrapreneurs. This is also related to the strategy development stage of the examined firms: the domestic firms are relatively young, belonging to the cost-focus and brand creation stage (many activities should be outsourced due to the limited resources and relatively high OPEX expenditure, the innovation processes are still not well-established, so the companies are focusing on productivity; the international companies are more involved in diverse differentiation strategies and alternative revenue generation tactics across various markets (they emphasise more new digital solutions, the performance of country specialists and a rich innovation/ creativity system). Both companies can apply modern technology to strengthen their competitive advantages; however, the effectiveness and efficiency depend on creative leadership, the entrepreneurship culture, the managerial model/ structure, and the knowledge-sharing system enhancing technological skills. Modern technologies help apply the principles of the shared-value economy, find attractive collaboration opportunities, and contribute to faster and more efficient ways to commercialise innovative ideas. Moreover, modern technology, such as AI or HR-based software, could help identify the intrapreneurs and track their performance in terms of ideas generation, operational performance, and the progress of new intrapreneurial initiatives.

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HOW THE BLUE OCEAN STRATEGY HELPS INNOVATE SOCIAL INCLUSION*

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Abstract. This article aims to explore the techniques and features of the Blue Oceans Strategy and provide insights into the applicability of this famous approach. The paper analyzes the concept of the Blue Ocean strategy, its origins and development, the relation of the Blue Ocean's metaphor to innovation, the relation between the Blue Ocean and the Red Ocean strategy, the Blue Ocean strategy, social entrepreneurship, and social inclusion. The article examines examples of the application of the Blue Ocean Strategy in Lithuania and abroad. The scientific discussion on the issue of the Blue Ocean strategy (further - BOS) covers certain benefits present in each manifestation of the examined strategy. For instance, "value innovation" is one of the topics that has developed rapidly over the last two decades. The "value creation" (or "innovation") aims to create new demand through transforming user experience by offering 'scalable personalization' and using ubiquitous smart technologies to turn traditional products into interactive, information-rich inclusion platforms. Therefore, the Blue Ocean strategy presents a systematic approach to making the competition irrelevant. It outlines the principles and tools that any organization can use to create and capture its undiscovered blue oceans. The scope for defining entrepreneurship is broad and results in many definitions. The discussion turns around the concept of entrepreneurship, and the article's authors also engage themselves in the questions of whether and how to confirm the inter-relation of the BOS and entrepreneurial activities. The authors attempt to prove the principle of the Blue Ocean strategy to be perfectly adaptable to non-profit companies. A case study of the arts agency "Artscape" is provided, and the conclusions are drawn from this part. The authors claim that the theory of the Blue Ocean strategy is still relevant and motivating for the current companies, regardless of their legal status – budgetary or NGO.

Keywords: Blue Ocean strategy; Red Ocean strategy; innovation; social inclusion; entrepreneurship

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1. Introduction

Based on 150 examples of strategies accumulated over thirty years in thirty industries, Kim and Mauborgne (2004) argue that future business leaders will move forward not only by defeating competitors but also by creating the so-called blue oceans of undiscovered market space. Such strategic steps, called value innovations, should help overtake competitors, open up new demand, and make drastic value jumps for the company and its customers.

The research aims to investigate the methods and peculiarities of the "Blue" business strategy and provide insights into the applicability of this new approach.

Objectives of the research:
- to present the concept, benefits, and role of the Blue Ocean strategy in marketing studies by analyzing scientific literature;
- to summarize the knowledge of the Blue Ocean strategy and innovation, linking the Blue Ocean strategy with social entrepreneurship;
- to apply the case study method relating it to the Blue Ocean Strategy in practice.

Methodology. The article uses the methods of theoretical analysis, empirical research and case study analysis.

2. Theoretical background of the Blue Ocean Strategy

2.1. Blue Ocean Strategy concept

The Blue Ocean Strategy is meant to differentiate and lower costs to open up a new market space and create new demand simultaneously. It presumes the truth of the hypothetical development and increase of predominance of an 'undisputed market space' that makes competition insignificant. It is based on the view that market boundaries and industry structure are not self-evident and can be regrouped by the actions and beliefs of industry players.

Kim and Mauborgne (2005) mention value innovation as the foundation on which the Blue Ocean Strategy, which is created to satisfy customers, is based. The Blue Ocean Strategy creates an unquestionable market space thanks to valuable innovations. Therefore, value innovation is not only about fighting for market share with other organizations but also discovering new markets and innovative values for both the customers and the organization itself.

Additionally, Parvinen, Aspara, Hietanen and Kajalo (2011) analyze the role of new value-creation mechanisms in a company's sales strategy. Using value creation and strategic marketing as theoretical approaches, they examine the fundamentals of the Blue Ocean Strategy (BOS) and break down how BOS is reflected in sales management activities.

Tabaria, Ziabarib and Radmardc (2014) notice that the Blue Ocean Strategy is a concept dealing with the “value innovation” that question the traditional idea of surrogated value and cost. Value innovation occurs when the company's management decisions lead to cost structure improvements and increased value to buyers.

Raman (2014) analyzes that it is often considered a competitive market to be more effective as it seeks to enter new markets according to the needs raised by consumers. There may be improvements and innovations, such as the expansion of production at the subsystem level, without prejudice to the company's overall strategy.

Rebóna, Ocariza, Gerrikagoitia and Sorzabala (2015) mention that Kim and Mauborgne define the Blue Ocean Strategy as the 'undisputed market space' in which competition is not essential (Kim and Mauborgne, 2007). The

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implications of the Blue Ocean Strategy include generating strong growth and high profits for the company in the search for new market positions in which neither direct competitors nor accredited competition rule.

Alam and Islam (2017) analyze that the Blue Ocean Strategy is a concept that allows organizations to think and innovate in their business to help develop financial and economic sectors, which is a significant concern for the company to create sustainable profit. The Blue Ocean Strategy offers consumers a framework to establish undisputed market space and change concentration from the current competition to creating innovative value and demand. In contrast, the traditional participants of the Red Ocean Strategy are accustomed to the competition. Several organizations in many sectors apply this strategy to gain more success in their business.

Shafiq, Tasmin, Takala, Qureshi and Rashid (2018) state that competition becomes irrelevant with the Blue ocean strategy, not just as warfare with other organizations' markets or industries. The Blue Ocean creates an undisputed market space through value innovation.

Rezeki, Sentanu, Sanawiri, Shankar and Nguyen (2019) mention that the Blue Ocean Strategy hints at a business opportunity as an item with no challenge or less challenge. That is the procedure, which revolves around scanning a business that does not exist yet, and many firms do not have an assessment weight. Inside the consortium in its current state, most companies operate under exceptional conditions that challenge them and try their best to grab a piece of the cake.

Rahman and Choudhury (2019) notice the Blue Ocean Strategy is a theory that allows one to think and innovate for future business and helps a company get backing from financial and economic segments. Blue ocean strategy deals with the problem of success because the organizational model "makes competition insignificant."

Shafiq, Tasmin, Qureshi and Takala (2019) analyze the Blue Ocean Strategy as a coherent strategic model for constructing new markets and industries, where demand is created rather than fought, and competition becomes unimportant. The Blue Ocean Strategy has five shapes: creating a new undisputed market space; competition doesn't matter when making a new demand; differentiation and cost achievement breakthrough; and value price compromise.

Yunus and Sijabat (2021) analyze that the Blue Ocean Strategy can impact competitive advantage, which can determine the company's performance. This concept helps to review relevant articles on the Blue Ocean Strategy and link them to the firm strategy, competitive advantage and efficiency.

Sang and Kimitei (2021) notice that the Blue Ocean Strategy - in terms of latitudes and unexplored waters in the ocean - represent undiscovered and untapped market space characterized by demand generation, highly profitable growth and no competition.

Summarizing the analysis of the scientific literature, it can be stated that the Blue Ocean Strategy is identified as a market for a product or service in which it is minimal or no competition. This strategy is designed to find opportunities where very few businesses are in a given sector, and there is no pricing pressure. In a business world where companies try to outperform their competitors through various advertising, pricing, and other tactics, a Blue Ocean strategy takes a different approach to market and survive.

2.2. Blue Ocean Strategy and innovation

As the founders of the BOS Kim and Mauborgne (2005) call this type of innovation "value innovation", they say it needs to synchronize “utility, cost, and cost positions” (p. 12-14). This innovation is similar to what is known as “frugal innovation” (Philipson, 2020).

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Hong, Chai and Ismail (2011) insist on the idea that, instead of focusing on competition in existing markets, the Blue Ocean Strategy provides the value of innovation to create undisputed market space and break free from competition to achieve very profitable and sustainable growth. Therefore, once again, value innovation is a cornerstone of the Blue Ocean Strategy which means pursuing differentiation and low cost at the same time to create a leap in value for both buyers and customers for the company to emerge from the competition and create new customer demand and the undisputed market space.

Subedi (2013) also confirms that the Blue Ocean Strategy is focused on serving new customers to create a new demand rather than competing with existing markets by providing cheaper or better versions of existing products.

Bourletidis (2014) also comments that the Blue Ocean Strategy suggests that the organization should create new demand in an undisputed market space rather than competing face-to-face with other suppliers in the existing industry. Thus, the cornerstone of the Blue Ocean Strategy is “value innovation”. The blue ocean is created when a company achieves value through innovation that simultaneously creates value for both the buyer and the company. Innovation (product, service or delivery) must increase and create value for the market while reducing or eliminating the features or services that are less valued by the current or future needs.

Agnihotri (2015) also agrees that the Blue Ocean Strategy can be created through radical innovation, disruptive innovation, frugal innovation, a purely differentiated strategy, and a targeted differentiation strategy, not just value innovation. Thus, we propose that the method applies to value innovation and all types of invention.

Jedi, Zade and Rahmani (2015) propose that, generally, innovation is a basis for the Blue Ocean Strategy. It is called 'value innovation' because companies focus on shortcomings in this strategic competition rather than fierce competition, creating value for customers and a firm. Value innovation also leads to a new and non-competing environment and a lack of focus on competition. It is critically essential that value innovation equally emphasizes both value and innovation. Value without innovation means focusing on technology, the innovation market and prospects that might not respond to current customers' expectations. In this case, a distinction should be made between value innovation and technological innovation.

Soudi (2017) states that a company must constantly respond to demanding customers; on the other hand, it must adapt to the constant paradigm shift and react to a rapidly changing market. The issue is not just about implementing different strategies but about strategies compatible with the competitive environment that will allow a company to increase its market share. The question to be asked at this stage is: why compete in a highly segmented market? Companies are not focusing on new innovative segments that can offer a unique market position over competitors.

Muhammad, Tasmin and Qureshi (2018) notice that innovation is essential for the competitive advantage and success of an organization. All organizations need innovation to improve market share to be growing. Organizations get motivated by internationalization and competition to increase innovation and competitive advantage, as indicated earlier (Muhammad, Tasmin and Qureshi, 2018).

Leavy (2019) mentions that the Blue Ocean Strategy focuses on value innovations that reveal a new demand aggregated by redefining the category, such as the case of the “Cirque du Soleil” - the kind of entertainment that combines circus and theatre - and disruptive innovations tend to focus on creating new demand that expands the existing service market. Another example can be the Southwest Ryanair cheap flights business. Value creation (or “innovation”) aims at creating new demand through the transformation of user experience by offering "scalable personalization" and using ubiquitous smart technologies to turn traditional products into interactive, information-rich inclusion platforms, as LEGO does with robotic toys.

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Hanggara (2019) notices that the return on innovation results from the interaction between the business environment and companies' innovation strategies and opportunities.

There are many industries where the Blue Ocean Strategy (BOS) are already affecting the surrounding environment. That is why our research explores innovation and the effectiveness of innovation in various innovation areas, applying the Blue Ocean business environment. The relationship between the BOS and innovation performance has been identified by the BOS dimensions earlier. Determined by the need to analyze the strategy as the open source for innovations, BOS can be used to improve innovation efficiency in the future.

Hanggara (2019) notices that BOS shows that organizations must create new demand in an undisputed market rather than direct competition with other suppliers in the existing sector. The BOS is used as a base for making the value of innovation. BOS is created when a company achieves a novel value that simultaneously creates another value for both buyers and businesses. Innovation (in products, services or delivery) must increase and create market value while reducing or eliminating features or services that are less valued in current or future markets.

Rebbouh (2019) intends to say that, to provide theories with some key terms that are important when considering the importance of BOS to present some discussions on this concept, and give the experience of companies in applying the Blue Ocean Strategy, some new non-competitive business niches are being offered. This author considers the Blue Ocean Strategy as a new direction for organizations, which can be applied as a strategy to rely on innovation to create value for the customer.

Subagio (2020) states that the concept of "value innovation" is one of the topics in the strategic area that has developed rapidly over the last two decades. According to Leavy (2018), the value innovation has three main options for the application: the Blue Ocean Strategy (Kim, Mauborgne, 2005); disruption innovation (Christensen et al., 2003) and the value of co-creation (Prahalad, Ramaswamy, 2004). All three have certain features in common that set out the perspective of value innovation.

Hajar, Alkahtani, Ibrahim, Darun, Al-Sharafi and Tiong (2021) mention that the concept of value innovation is a summary of analytical results of 150 strategic steps involving more than 30 companies worldwide. A business survey has been launched in 30 industries and around 100 companies to quantify the impact of value innovation on company revenue growth and profit. Hajar, Alkahtani, Ibrahim, Darun, Al-Sharafi and Tiong (2021) argue that the logic of value innovation is not the creation of new technologies, competencies or market leadership but the effective use of those technological and managerial linkages between value innovation, construction of new needs and the change of the market where competition is not relevant.

Scarlat, and Panduru (2021) believe that existing companies' products are pretty innovative if sold alongside annual subscriptions for services provided. There are always individual customers whose purchasing decisions are not necessarily taken by end-users or their associations.

Unsal, and Altindag (2021) are convinced that it is essential that companies can adopt strategic approaches that are open to new ideas, be innovative and capable of creating new ones and operate under changing conditions to increase their productivity. In addition, managers should innovate and should be able to use modern management methods instead of conventional methods. In today's competitive environment, it is increasingly essential for companies to have managers who are open to new ideas, are knowledgeable about the Blue Ocean Strategy, and understand elements of the theory of entropy. Today it is also crucial for companies to create an innovative corporate culture to achieve success.

Sang, and Kimitei (2021) confirm BOS as the undiscovered and untapped market space characterized by demand generation, highly profitable growth and no competition.

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Asa, Olivier, Gebhardt and Kapolo (2021) highly estimate the value of innovation and consider it as a fundamental theory of the Blue Ocean concept. These two words must interlink for value proposition and cost differentiation because they depend on each other. If innovation is linked to value, it leads to the total balance, where value is enhanced but not relevant and not necessarily driven to compete in the market space.

Hammer (2022) emphasizes that in the ever-changing business world, the search for so-called 'Value Innovation' or 'Blue Oceans' is crucial for the competitiveness of companies. Three examples from Amazon, Apple and Alibaba illustrate how customers can become 'dependent' on innovative value-added services using a platform that integrates all services. Price elasticity on the buyer side is reduced, and additional consumption is generated this way. Meanwhile, convenience and an unconditional focus on all companies' services is paramount for customers.

2.3. Blue ocean strategy versus Red ocean strategy

Kim, Mauborgne (2005) describe how the Blue Ocean Strategy has become the result of fierce competition in a rival pool of a bloody red ocean. Based on a study of 150 strategic steps (more than 100 years in 30 industries), the authors prove that long-term success is not about fighting competitors but about creating blue oceans that are untapped new market areas ready for growth. The Blue ocean strategy,
Table 1 below summarizes the different features of market transfiguration and views on the competition, cost and value creation in the Red Ocean (Red Ocean Strategy) and the Blue Ocean development (Blue Ocean Strategy).

Table 1. Red Ocean Strategy versus Blue Ocean Strategy

Red Ocean Strategy	Blue Ocean Strategy
Compete in existing market space	Create uncontested market space
Beat the competition	Make the competition irrelevant
Exploit existing demand	Create and capture new demand
Make the value-cost trade-off	Break the value-cost trade-off
Align the whole system of a firm's activities with its strategic choice of differentiation or low cost	Align the whole system of a firm's activities in pursuit of differentiation and low cost

Source: Kim and Mauborgne (2004).

Kim and Mauborgne (2017) draw our attention to the fact that within the Blue Ocean, a company does not directly seek to compete for competence; however, this is why not knowing the theory, companies become stuck in competition. The Blue Ocean Strategy can also create a competitive advantage.

To make the theory clear, it should be noted that the Red Ocean Strategy works in the existing market areas where products, strategies and competitors are already known. Low price and quality are some of the factors behind the competition. The market is crowded, and the goal of all companies is to gain a little more market share every year. All actors' positions are well known, making it almost impossible for new entrants to settle and compete. Profits and growth are limited due to intense competition.

Indeed, once all the criteria are set, the competition becomes irrelevant. Nevertheless, creating a Blue Ocean requires thorough analysis, precise risk management, and some assets.
The Blue Oceans can embrace all the industries that do not exist today - including an unknown market space, unexplored and uncontaminated by competition. Like any blue ocean, it is vast, deep and powerful in terms of opportunities and profitable growth.

2.4. Blue Ocean Strategy, social entrepreneurship and social inclusion

When discussing the social side of the BOS, Dehkordi, Rezvani and Behravan (2012) add that they believe the construction of the Blue Ocean is not a static process.

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Lohtander, Aholainen, Volotinen, Peltokoski and Ratava (2017) state that the Blue Ocean Strategy is meant for a company to create a deeper understanding of the business environment.

Albayrak, and Beybur (2018) invite the companies to be different from their competitors in the way the Blue Ocean is and accept the obligation to examine what their customers' "needs are and preferences" are.

Islami, Mustafa and Topuzovska Latkovikj (2020) discuss that with the growth of the global market and the internationalization of companies, the uncertainty of companies is increasing. Like many other issues that raise the need for a clearly defined action plan, the importance of strategy today is greater than ever. Also, is it worth answering the question of the importance of a well-developed strategy? The first challenge companies entering the market face is finding a way to survive in that market. Statistics and research show that around a third of new European companies do not reach the second year of their existence, and 50-60 per cent fail to survive the seventh year (Islami, Mustafa and Topuzovska Latkovikj, 2020).

Yeshitila, Kitaw, Jilcha and Muchie (2020) conclude that a business strategy is one of the most critical management tools to steer the business in the right direction and a tool to sail the "business ship" before the flood and the Pacific Ocean swallows them all. The current reality of the business environment dictates that business competition exists in one form or another. Thus, businesses need to analyze the internal and external markets in which they operate and shape their business strategy as required. The business strategy gives companies a "radar" to navigate the market environment "sea", peacefully suppressing the effects of the "sea wave" so that the company can serve its customers strategically and in a unique location, to achieve its establishment goal.

Prince, Chapman and Cassey (2021) argue that the definition of entrepreneurship and the concept of entrepreneurship are highly relevant. The scope for defining entrepreneurship is broad, resulting in many definitions. The authors work on the concept of entrepreneurship to provide a comprehensive but at the same time consistent definition which would cover all entrepreneurial activities. The advantage of this concept is to create the end point of the entrepreneurial process that separates it from the realm of governance.

Abdel-Dayem, Ragheb, Hamaida and Abdel-Bary (2021) show that the Blue Ocean Strategy and niche marketing have had a significant positive impact on business entrepreneurship. These findings suggest companies should use the Blue Ocean Strategy to choose a niche market based on unique advantages and develop high-margin products through product customization strategies.

In their volume, Duncan-Horner, Farrelly and Rogers (2022) provide their insights on the fact that social entrepreneurship is a new social phenomenon that is gaining actual attractiveness for its ability to address complex social and environmental challenges in the face of global sustainability challenges.

3. Research methodology and methods

The authors have examined several theories here and now will move towards the case studies that will help to illustrate the theoretical insights. Some of the elements are explained further (the site "Press academia"):

- A case study is a research methodology that has commonly used in social sciences;
- A case study is a research strategy and an empirical inquiry that investigates a phenomenon within its real-life context;
- Case studies are based on an in-depth investigation of a phenomenon to explore the causes of underlying principles;
- A case study is a descriptive and exploratory analysis of a phenomenon;

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- A case study research can be single or multiple case studies, includes quantitative evidence, relies on various sources of evidence and benefits from the prior development of theoretical propositions;
- Case studies are analyses of institutions or other systems that are studied holistically by one or more methods.

3.1. Existing social capital companies applying Blue Ocean Strategy

"Vinted" (second-hand fashion industry)

The first and most relevant example concerning BOS in Lithuania can be "Vinted". According to the site Sifted (https://sifted.eu/articles/vinted-unicorn-3-5bn-lithuania/), it was founded in Vilnius in 2008 by Justas Janauskas and Milda Mitkutė. Linkedin (https://www.linkedin.com/company/vinted) also states that currently, the company is led by Thomas Plantenga and Mantas Mikuckas. "Vinted" is the most prominent fashion market in Europe, with 50 million in 16 countries by its popularity. A team of more than 1,000 people from "Vinted" offices in Vilnius, Berlin, Prague, Amsterdam, and Utrecht develops and maintains its Internet platform. "Vinted" is united by a unique work culture based on pursuing high goals, responsibility, co-creation, care and growth. "Vinted" is committed to creating an inclusive workplace where people from all layers of the societal ladder feel part of it. "Vinted" welcomes all suitably qualified individuals, regardless of their race, colour, national origin, nationality, gender, gender identity, sexual orientation, religion/belief, disability or age. According to the data (the portal Sifted), Lithuanian unicorn "Vinted" is now valued at 3.5 billion Euros (Portal Sifted) and became Lithuania's first (and the only) unicorn in November 2019, after the company raised 128 million Euros (Silicon Valley venture benchmarking record). At the time, "Vinted" had 25 million registered users across 11 markets, with 300 employees. Now the company is active in 12 European and US markets with a headcount of over 700. The team has grown by roughly 75 per cent in the year 2021 alone.

"Our investment approach focuses on investing behind long-term macro trends," Carolina Brochado, a partner at EQT Growth who is joining Vinted's board, tells Sifted. Brochado says they see the space Vinted operates in as a €100bn+ market. Growing at more than 35% yearly, it's "supported by secular mega-trends, including an increased focus on sustainability and greater demand for circular fashion."She adds: "With marketplace models, scale enables continued competitive advantage and network effects, which we see in Vinted versus competitors."

Netflix

Another example of the adopted Blue Ocean Strategy with a well-known mark of innovation is Netflix's with its on-demand streaming service. According to Encyclopaedia Britannica (https://www.britannica.com/topic/Netflix Inc), its success would have been hard to imagine when the company started operating more than 20 years ago as a DVD mail-order company. Today, Netflix operates in 190 countries, has about 200 million subscribers and a turnover of 20 billion US dollars. It became a decisive point for creating original content in 2020. They won 24 Oscar nominations, more than any other media company. This has disrupted rental services such as Blockbuster, the entire television industry, and pay-TV channels losing subscribers and trying to emulate Netflix's offering. Netflix is a prime example of the Blue Ocean's strategy. This has created a new market space for the on-demand broadcasting of films and TV series and has successfully changed how we use media. This has significantly increased convenience for the customer by allowing viewers to stream on-demand content. In partnership with TV manufacturers such as Samsung and Apple, Netflix is now integrated into most TVs, and HD-quality streaming will enable viewers to enjoy a high-quality experience similar to a traditional TV experience. Finally, many customer issues have been fixed, such as ad breaks and minimum duration contracts (viewers can cancel anytime). The Netflix case is a clear example of a company recognizing the potential of new technologies (such as faster internet speeds to stream quality content) and changing consumer trends and expectations (digital on demand and digital).

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3.2. The niches occupied in Lithuania

Saulius Žilėnas, the director of "Reitan Convenience Lithuania", the most popular spot which was called "Coffee Inn" until recently, has led the company for around a year and says that now the biggest ambition is to ensure the leadership of the "Caffeine" network and to increase the awareness of the Narvesen brand so that it becomes more modern, more suitable for those looking for food products (Verslo Žinios). We remind our readers that "Reitan Convenience Lithuania" acquired "Caffeine" in 2019. The BOS had a complete set of reasons to be applied in this case. The weight of kiosks in the business of the country is decreasing. A decade ago, there were over 400 of them in Lithuania, and now there are about 100 "Lietuvos Spauda" kiosks and about 60 "Narvesen" stores.
"*We aim to make food products that we are proud of becoming attractive goods. We are also considering various models of self-service stores, which our colleagues in Estonia and Scandinavia are trying; this can certainly be compatible with our business model*", the manager says.

The search for alternatives is driven by rising wages and rising costs of energy resources, so automation of processes makes sense. The Danish experience shows that self-service kiosks have prospects.
"We are also looking at sleeping districts where we can offer local cafes; we are experimenting with smaller formats. One such successful one is "Caffeine" near Kaunas Clinics", S. Žilėnas gives an example.

In 2023-2024 they are planning the development of drive-thru cafes, where coffee can be ordered and received without getting out of the car. In addition, they are negotiating with several supermarkets that do not have "Caffeine" yet. From S. Žilėnas, the biggest competition in the coffee shop business among the Baltic countries is in Lithuania. However, we do not have international brands that, for example, dominate in Poland. This gives the company an excellent reasoning space for applying the Blue Ocean strategy. Cafe chains operating in Lithuania are working well. However, there is still room for growth in the market, so "Caffeine" has excellent potential for BOS or niches and trying to stand out not only in the interior but also provide variety in products and their formats.

And now, we are going to discuss a specific segment of the Lithuanian market – the scene of the social movements and initiatives, added by some artistic dimensions, which are always searching for entrepreneurship.
One of the most influential institutions in Lithuania, marking the conjunction of social movement and culture, is the Open Lithuania Foundation (https://olf.lt/en). However, the programs at the foundation shifted, and the agendas transformed accordingly.

What should be emphasized while discussing the search for entrepreneurial spirit is that the Blue Ocean strategy principle is perfectly adaptable to non-profit companies. Currently, we might assume that one of the most active agencies combining social and artistic initiatives is the arts agency "Artscape." Affected by the Ukrainian war situation, the company is susceptible to societal changes and is open to implementing the BOS.

3.2.1. The case of Artscape

This company calls itself an agency and proclaims its mission as follows (Portal www.artscape.lt):
"We aim to provide an opportunity for vulnerable social groups to participate in culture and to initiate social change through high-quality art projects."
The article's authors conducted an interview with Aiste Ulubey, the agency's general manager. The company's main unique selling proposition (USP) is the art events dealing with some social *stigma*.
Aiste Ulubey thinks that their company is unique in this sort of classification; however, in general, the leading flagship company dealing with human stigma in Lithuania is Caritas. As they declare on their site: *"Caritas is an international Catholic organization that carries out humanitarian work worldwide and helps the poor, regardless of race, religion, gender or nationality. Caritas relies on the social teaching of the Catholic Church, which emphasizes human dignity. Caritas Lithuania is a*

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voluntary help group, the majority of members of which are more than 95 per cent volunteers. Caritas Lithuania is a public legal entity established by the Lithuanian Bishops' Conference following the canons of the Catholic Church (can. 115 § 3 and can. 116 § 1). It has economic, financial, organizational and legal independence. Caritas Lithuania is a member of the Caritas Internationalis Confederation and the Caritas Europa Region. Caritas Lithuania may also be a member of other national or international organizations. Caritas Lithuania is a community that includes all Caritas structures in Lithuania" (www.caritas.lt).

The authors attempted to identify the values and the activities of "Caritas" and the "Artscape". In this respect, the company "Artscape" is a competing member because their opponent Caritas responds instead to the general human stigmata (refugees, displaced persons and other victims of political and social conflicts). Before the interview, we examined the data provided at our national portal, where all businesses are registered on the Agency "Artscape" specificity.

Sometimes challenges can be turned into opportunities if considered creatively.
For instance, in the Report (digiACT) examining the cultural acts in various countries of the EU responding to COVID in 2020, it is said that:
Initially, the Lithuanian government tried to help the cultural sector survive after it banned all events and cultural institutions from working. The first help came after a couple of months; the open call for new virtual products and digitalization for cultural organizations was announced. This opportunity allowed many organizations to change their course of action by working online and creating new productions. However, many performing artists and technicians found themselves lost because they had never experienced a different pandemic-related field, and there were not many people working in such conditions. Young actors and technicians lost their income and inspiration as the world changed in minutes (…). During the pandemic period, the activity of cultural and artistic organizations increased significantly. In 2021, 368 cultural institutions applied to the Lithuanian Culture Council for funding. Most of them (about 60%) were non-governmental organizations. The Lithuanian Culture Council has funded almost 800 cultural and art organizations in the first half of 2021 (https://www.ltkt.lt/).

Therefore, the agency such as "Artscape" needs to find the so-called Blue Ocean strategies to create a new value within their services.
As Ms. Ulubey notes, their speciality is not only the urgent response to the stigmatized people but also the language of arts being applied in their projects and the efforts to reach cohesion of several sectors.

As it was explained earlier, it becomes clear that "Artscape" agency has conquered the undisputed market space, as put in the theoretical part. It holds a combination of features that make the competition at least not necessary if not anything else.

Some online psychology channels (portal The Clear Point Strategy) raise general questions to highlight the chosen company's pros and cons. We have used the questions better to identify Blue ocean opportunities within the selected company.

1. What do we do well? Why do customers choose us and stay with us?
   We communicate diversity and inclusion based on our values and methods – the values we believe are missing in the Lithuanian context. We are open to different artistic expressions: theatre, contemporary dance, fine arts, etc., with one standard to artistic collaborators: creative production has to be inclusive and enable marginalized communities to speak (give a voice).
2. What do our competitors do? Why might our ideal customers choose a different solution?
   Artscape has a team with diverse competencies from artistic, migration, and social field and including beneficiaries (from disadvantaged communities and those with stigma) in the decision-making we believe we are creating creative results that work both in the public eye and makes an impact in communities with stigma. Sense of being proud, a sense of belonging, connecting, and having a voice. The ethical process and inclusion give us support from within stigmatized communities (that makes us proud and humble and keeps us going).
3. Where are the red oceans? Which features and benefits do we compete for head to head with our competitors? We compete in fundraising and visibility.

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4. What is our “blue ocean”? What do we provide our customers that no one else can? We are proud of our tailored approach to tackling stigmas (continuously researched beneficiaries, consistently applying the principle 'not to harm') together with innovative artistic means - used theatre methods, documentary theatre, participatory performances, and community theatre.

3.2.2. The project Dance of Freedom as the manifestation of the Blue ocean strategy by “Artscape”

On the Independence Day of Ukraine in 2022, representatives of contemporary art presented an extraordinary spectacle to the people of Vilnius, Ukrainians and all the guests of the capital. The wall of an abandoned 'Moscow house' in Šnipiškės district, transformed into a symbol of Ukrainian strength, became the scene of a unique dance performed at a great height, attached with special equipment.

Ukraine's desire for freedom and peace was conveyed through modern dance by the pioneer of vertical dance in Lithuania, and the only performer of this dance, ballerina Inga Briazkalovaitė. On August 24, 2022, the dancer performed her vertical dance, "Dance of Freedom", by which the artist aimed to honour the defenders of Ukrainian freedom and once again reminded the world that Ukraine's fight for freedom is for all of us.

“I've been willing to express my support for Ukraine with a vertical dance for some time, and there couldn't be a better place than this. After seeing the news about a giant portrait of a Ukrainian volunteer-created by a robot from Estonia on the facade of a “Moscow house”, I looked at it and found a special opportunity to implement this idea with an unreal team that believed in my idea", said I. Briazkalovaitė.

So, where do we see the features of the Blue ocean strategy? When it comes to the formula of the ingredients that would allow us to evaluate the coverage of the new 'uncontested' area, we would suggest the following:

- Social Stigma (the “Rtscape” is looking at the social stigmata creatively;
- Art professionalism – putting all arts into the interdisciplinary project is also a manifestation of the BOS.
- Education and cohesion – the activities of the “Artscape” are recognizable by a great degree of integrating societal, community and artistic elements into one new product of culture.

According to Kotler et al., each market has four market roles (Kotler, Burton, Deans, Brown and Armstrong, 2015). However, due to the diversity of the companies and the themes of their activities, this analysis is very relative and proves the idea that competition here is insignificantly relevant.

Aistė Ulubey, head of the Artscape arts agency, says: "Art is stronger than any words; it can express what is happening in society – to send a message of solidarity and comfort. The dance performance "Dance for Freedom", which was performed on the fresco "Do peremogi/Iki pergalės", invites us to talk about hope and empathy through art. Although the war in Ukraine oppresses all of us, we invite everyone to discover the testimony of our unity and compassion in the work of artists who invite us to create, not destroy."

4. Discussion on a combination of ingredients (Stigma+Art+Action)?

According to the electronic source helping people deal with stigma (www.whocanyoutell.org/what-is-stigma), the latter is a degrading and debasing attitude of the society that discredits a person or a group because of an attribute (such as an illness, colour, nationality, or religion). The resulting coping behaviour of the affected person results in assumed stigma. This perceived or internalized stigma by the discredited person is equally destructive whether or not actual discrimination occurs. Stigma destroys a person's dignity, marginalizes affected individuals, violates fundamental human rights, markedly diminishes the chances of a stigmatized person achieving full potential, and seriously hampers the pursuit of happiness and contentment. When stigma is associated with a medical condition or disability, it prevents individuals from seeking evaluation and treatment, disclosing the diagnosis to the people most likely to provide support and following treatment guidelines.

Art can become a way to defeat stigmata. Our duty – is to demonstrate our purpose, the portal says. "What is the Change we’d like to see?” First, what is your purpose in using the arts for stigma reduction? Is it simply to raise awareness? To give a platform to artists who have experienced mental illness? Or are you focused on a specific change you'd like to see? If your goal or one of your goals in putting on the event is to reduce stigma, there are

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some things you may want to think about. The experts invite us to consider the following learning outcomes from our discussions about using arts for stigma reduction, as well as from the practical experience of WISE and its partner organizations in putting on stigma-reducing arts events.

1. Personal stories and contact are the main things we know to reduce stigma. Alas, the story can be utilized in a variety of ways.
2. We don't want to limit creative expression or try to narrowly define what "stigma-reducing art" looks like. If ten people look at the same art piece, they may all interpret it differently.
3. Art in itself is a form of therapy for people. The story may be about that.
4. Some art may express darkness and may have allowed a catharsis of sorts for the artist. Perhaps the experience of creating the art was part of a recovery process. If there is a story with it, then the story about its creation may have the opportunity to illuminate recovery.
5. Ultimately, we want to leave it up to the artists to decide for themselves. Do they want to share a story of recovery? Or do they want to let the work stand on its own?
6. When thinking of aesthetics in the art world, there is no “right” or “wrong” way of expression.
7. Creating art is often healing, but the experience of consuming it may be different.
8. Recovery is not linear. Art may show that.
   (Portal Eliminate Stigma)

To summarize, we can say that by identifying our unique selling points and responding to our new audiences, we have a chance to develop innovation in our social initiatives. In the case of the "Artscape" we can see that arts can cure stigmata as the Blue ocean strategy.

Conclusions

The research has aimed to investigate the methods and peculiarities of the "Blue" business strategy and provide insights on the applicability of this new approach. As demonstrated, the strategy's applicability is somewhat relevant and feasible. We proved this by the examples of the artistic socially-charged projects.

Objectives of the research were completed via the application of the various research methods; the knowledge on Blue ocean strategy and innovation was summarized, linking the Blue ocean strategy with social entrepreneurship and proving the fruitfulness of this method in the initiatives of social inclusion; the case study method was applied the concerning the Blue Ocean Strategy in practice, using the specific keywords and demonstrating the ways of managing social stigmata with the help of arts. The " Artscape " case study has shown the ingredients of social innovation, value and undisputed market space.

In conclusion, the authors were trying to explain if and how the doctrine of the Blue Ocean Strategy is still incredibly efficient and promising while trying to find a niche in the densely populated market of socially engaged companies.

With reference to Kim and Mauborgne (2005, 2007, 2017), the authors confirmed that new value and innovation could be found while stopping our search for competitors and starting to construct a new societal offer combining unusual new elements (just like the Cirque du Soleil did) and exploit new innovative features that can be born while applying these BOS principles: creating uncontested market space; making the competition irrelevant; creating and capturing new demand and breaking the value-cost trade-off, together with negotiation of flexible price, which, perhaps, asks for further research.

The novelty of the obtained results rests in the interpretation of the negative societal variables (such as economic or political stigmata) and efforts to transform them into acts of change (such as innovative performances), prompting specific solutions that companies can adopt while managing the shortcomings of their businesses.

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LEADING FACTORS FOR BLOCKCHAIN TECHNOLOGY IMPLEMENTATION IN THE BUSINESS ORGANISATIONS IN THE BULGARIAN CONTEXT*

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Abstract. Blockchain technology is recognised as a digital tool that contributes to increasing the competitiveness of a business organisation, and it is most often applied in the financial sector and supply chains. The technology is widely used in developed countries, but it is also gradually entering developing economies. Attention to technology is provoked under the influence of factors determining innovation development and penetration into the entrepreneurial ecosystem. Some of them are psychological, the others are economical, but in general, they influence the management decision-making to use the technology in the enterprises. The primary purpose of the research is to reveal and group the factors provoking the implementation of blockchain technology in Bulgarian companies. In order to collect the necessary data, an empirical study of the Bulgarian entrepreneurial ecosystem was conducted using a survey method. A factor analysis of the two groups of reasons motivating and limiting the application of blockchain technology was performed with a view to uncovering the hidden factors influencing its implementation in organisations. A regression analysis was then performed to answer the question of which factors most affect the interest in implementing BCT in the business organisation to increase their competitiveness in the supply chain. The research data can be used as a working framework for implementing decentralised software applications in companies that are not informed about the pros and cons of blockchain technology but are looking for a position in the global digitised world.

Keywords: blockchain technology; supply chains; relevant factors for blockchain technology implementation

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1. Introduction

Blockchain technology (BCT) started in 2008 (Nakamoto, 2008) with the explicit aim of changing the traditional financial system, but its diffuse spread penetrates all spheres of economic and social life. The rise of technology significantly impacts supply chains (SC) and financial transactions through the two primary development directions. This technology creates innovative opportunities for identification in various spheres of social and economic activity, including in the administration (Markov, 2022).

Opportunities for the application of innovation in supply chains through BCT (Kshetri, 2018) are associated with the use of smart contracts (Clack et al., 2016; Jankowiak, 2021), transparency of processes (Margo, 2017), reduction of inventories costs (Jiang, 2019), commercial finance (Puschmann, 2017) etc.

The mentioned advantages are part of the motivating factors influencing the decision to use BCT, but some reasons limit the technology implementation. The limiting factors are often recognised as weaknesses and threats associated with the dark side of cryptocurrencies (Lagarde, 2018), loss of digital assets as a result of cyber attacks (Chen & Zeng, 2022), risk of concentration in the mining industry (Schinckus, 2020). Factors leading to the use of the technology are known as motivators and limitations (Saberi et al. 2019), but economic and psychological causes stand out (Gigov & Koprinkova-Noncheva, 2021; Vavrecka et al., 2021).

The main objective of this article is to evaluate the impact of leading factors influencing the adoption of BCT in the field of supply chains. For this purpose, we conduct an empirical study in the Bulgarian entrepreneurial ecosystem using a survey method. The output data will perform a factor analysis which information will form research constructs applicable to regression analysis. Regression analysis will measure the strength of the relationship between the research constructs and the dependent variable. Our findings will help the local and global entrepreneurial ecosystem determine which leading factors will significantly impact managerial decision-making for the adoption of BCT. The research data can be used as a working framework for implementing decentralised software applications in companies that are not informed about the pros and cons of BCT, but are looking for a position in the global digitised world. On the other hand, the academic community could use the methodology to conduct analogical studies.

2. Theoretical background

The reason for conducting the current research is that blockchain technology (BCT) is increasingly recognised as a tool to increase the competitiveness of enterprises' supply chains (SC), providing interoperability of information systems (Dimitrov & Gigov, 2020), flexibility and traceability (Bai, Cordeiro & Sarkis, 2020; Tsolakis et al., 2021). Because Bulgarian companies need to increase their competitiveness, it is relevant to analyse the benefits of implementing BCT through its inherent tools. On the other hand, there are risks from the thoughtless adoption of the technology. The advantages and disadvantages are perceived as "motivators" and "barriers" that greatly influence the decision-making to use the technology within the company. Using the theory of consciousness to evaluate the use of BCT in the field of supply chain management implies an engagement and understanding of the problems it is supposed to solve (Verhoeven et al., 2018). Analysing the appropriateness of a given innovation suggests the study of good practices with an emphasis on the functionality of various BCT applications.

The main research objective is to discover the leading and latent factors influencing the use of BCT in Bulgarian enterprises. For this purpose, it is necessary to conduct a literature review on the problem, to analyse the good practices and the studies carried out so far on the subject. The literature review is an essential part of any study. It has proven to be a well-established practice for the reproducibility, traceability and transparency of reviewer decisions, procedures and conclusions (Bryman, 2012). In this regard, it is foregrounded in the current publication.

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Among the leading studies looking at the impact of implementing the BCT factors is the publication of Kayikci et al. (2022), oriented in the circular economy, presenting a model for identifying critical success factors. The authors also emphasise the need for cooperation and the strengthening of supply chains. The issue of discovering promising BCT implementations enhancing the company's competitiveness to maintain unique competitive advantages is also commented on. These circumstances also support the argument outlined in the present study that insufficient collaboration is a significant obstacle (barrier) to adopting the technology (Kouhizadeh et al., 2021). For this reason, it is necessary to measure the impact of the restriction in question.

Other authors present an analysis that examines the value that could be derived from using BCT within the company (Angelis & Ribeiro da Silva, 2018). The proposed evaluation framework, it is analysed the functionality of the different generations of BCT. Still, the picture is very general, and there is no research on the managers' opinions of the companies. However, joint driving forces are found, such as organisational barriers.

Significant conclusions are found in a publication investigating the sustainability of supply chains through BCT (Saberi et al. 2018), in which researchers separated the limiting factors into external and internal, with the internal to the firm being reduced to intra-organizational, inter-organisational, and system-related. In turn, Dubey et al. (2020) share the opinion of researchers on the topic and, on this basis, conduct an empirical study in the field of humanitarian SC, analysing trust and transparency to achieve resilience in SC in the context of natural disasters. The model of the research in question approaches the one we will propose, the essential difference being that we seek a broader view of the influencing factors and their grouping into separate variables with which to conduct applicable calculations.

In another article focused on analysing the advantages of using BCT in the SC of the fashion industry, Moretto et al. (2022) differentiate the influencing factors of driving forces and barriers, identically dividing them into internal and external to the business organisation. What is special here is the emphasis on external drivers (visibility along the chain, technological reasons, scaling up of good practices, responsibility to end users, use of critical success factors, and commitment to wholesalers). An interesting view in this regard is that of Anguelov and Kenova. They explore factors and sub-factors that affect the timeliness and reliability of deliveries and their importance for the efficiency of the logistic processes (2018). According to the classification of the internal factors of the model, they are fragmented into efficiency-oriented reasons (reducing the cost of delivery and insurance of goods) and effective (automation of processes). Internal motivators include information security and counterfeiting prevention, allocated to transparency and increasing trust in SC (Moretto & Macchion, 2022). On the other hand, the authors of the mentioned research define two groups of limiting factors (technological barriers and financial obstacles). Both factors are associated with the fear of passing implementation costs to the end customer, which marketers avoid. Guaranteeing the origin of the goods through the immutable records in the blockchain infrastructure affects the customer, as it has an impact on a subconscious level, i.e. the company is innovative, and products make customers matter (Moretto & Macchion, 2022). The second group of limitations is also discussed, related to the lack of BCT benchmark in SC with a view to rapid integration, ensuring interoperability (Saberi et al. 2019). The importance of internal factors for the level of enterprise competitiveness is also shared by many other authors (Stoyanova & Angelova, 2018).

In the context of the literature review, the majority of researchers support the statement that as the number of participants in the SC increases, the relevance of the use of BCT is confirmed, i.e. the complexity and globalisation of SC require the use of an information system ensuring traceability, reliability and security of information flows, which by default accompany material flows (Wang, Han & Beynon-Davies, 2019). From here follows the conclusion that the proposed driving forces and limitations are described, and, on their basis, variables can be created to participate in the compilation of an empirical model for calculating the influence of individual motivating and limiting factors. Factor analysis is suitable for constructing variables (Ngai, Cheng & Ho, 2004), as in the context of blockchain technology, similar analysis has been conducted to account for the impact of

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transaction confirmation times on the Ethereum and Bitcoin networks (Zhou, ZhiGang & Yuan, 2022). It has also been taken into consideration that all changes in the enterprise, including those related to logistics, must be carried out, paying attention to the enormous role of the human factor (Anguelov & Angelova, 2017). In this regard, one can consider the conclusions of researchers emphasising the functionalities of BCT, but above all, aimed at achieving competitive advantages in SC (Voss et al., 2002).

In support of what was said, Sahebi et al. (2020) share their method for investigating the influence of different limiting factors. Still, the guild's conclusions conclude that more analyses are needed to prove the applicability of BCT in SC (Böhmecke-Schwafert, Wehinger & Teigland, 2022). Based on those mentioned above, we propose a model of empirical research, which contains several main points: conducting factor analysis, constructing variables, and performing linear and non-linear regression analyses.

3. Research objective and methodology

The research objective and the methodology of the study are based on the toolkit of factor analysis to find the latent but leading factors stimulating and limiting the use of BCT in Bulgarian business organisations operating in the supply chain, locally and globally.

The factors influencing the implementation of Blockchain technology within the business organisation are drivers and limitations (Saberi et al. 2019). A study considering the possible reasons for the perception of BCT, conducted in the Bulgarian entrepreneurial ecosystem reflected the main arguments influencing the use of technology identified as motivators and barriers (Dimitrov & Gigov, 2021). Subsequently, they are structured as psychological-behavioural and economic (Gigov & Koprinkova-Noncheva, 2021), applying the tools inherent in socio-cognitive theories (Bandura, 1986).

The research methodology aims to answer the following research questions:

- How many factors are measured by the research variables from the two sets of reasons?
- Which variables measure which factors?
- Which aspects are represented by which factors?
- Which factor and sub-factor independent variables influence the dependent variable "planning and using of BCT to increase the competitiveness of the supply chains of Bulgarian enterprises".

The questionnaire consists of three blocks, which contain a total of 37 questions. It should be noted that the original model of the questionnaire provided by Saberi et al. (2019), for which we are grateful, contains 64 questions. The statistical tools "Jasp", "R", and "SPSS" are used for the statistical processing of the answers to these questions. The input data was collected through webinar surveys, mainly oriented in the field of Supply Chain Management (SCM). After collecting the data, their descriptive analysis was performed (Dimitrov & Gigov, 2021). To answer the research questions, the research methodology goes through several steps.

The **first step** consists of a preliminary check of the collected data for the adequacy of the sample for factor analysis. This includes checking the internal consistency of the statements in the survey constructs using the Kaiser-Meyer-Olkin, Bartlett and Anti-image correlation matrix tests. According to the Kaiser-Meier-Olkin test, values above 0.5 indicate the presence of at least one latent factor and that all assessed variables are adequate for applying factor analysis. When the values on the diagonal of the anti-image correlation matrix for each statement in the survey construct are greater than 0.6, this is also an indicator of the adequacy of the data sample for factor analysis.

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The **second step** involves factor extraction and analysis of the number of factors revealed. The principal components without the factor rotation method are used for factor extraction. The tools Total variance explained matrix, Scree plot, Communalities and Component matrix are used to analyse the obtained results. After applying the Principal Components Method without factor rotation, an analysis of the total variance of the influencing factors is first performed. The matrix indicates how much of the total variance is explained by the impact of the revealed factors. In the matrix, all variables are considered as factors (components). Each component receives a quality score described by the "eigenvalue" indicator. Only components with high eigenvalues are perceived as main factors. A further analysis of the number of revealed factors is obtained through the scree plot diagram. It visualises the eigenvalues (quality results) determined by the previous method. Components that have eigenvalues above 1 are considered "strong factors". It is assumed that the factors that are located to the point where the line from the steep passes into the bed have the strongest influence. The third analysis of the results involved the calculation of the communality coefficient. It indicates the extent to which the revealed principal factors account for the variance of the input variables used. Values in the range [0 ÷ +1] are considered reliable. The closer the value is to 1, the more reliable the factor is and should be included in the analysis. Values above 0.5 are considered relevant. Component matrix shows the correlation between the variables and the revealed factors – factor loadings. The analysis is applied to obtain more rigorous, objective information about influencing factors. Only those links whose weight is greater than 0.5 are depicted.

In the **third step**, the factors are rotated and constructed. Ideally, each input variable should measure exactly one factor. When a variable has a cross-loading, i.e. it measures several components simultaneously, this complicates the interpretation of the revealed factors. To improve the factor extraction results, the method of principal components with orthogonal rotation using the Varimax (Cureton & Mulaik, 1975) with Kaiser Normalization method is used. The goal is to attempt to redistribute the factor loadings so that each variable has to measure exactly one factor. The results for the weight of each variable according to its association with the corresponding factor are displayed in the Rotated Component Matrix. Each factor reflects the communalities between the variables that measure it. Therefore, the main task when constructing the factors is to carry out a correct interpretation of the general characteristic that the variables measure. Once an interpretable pattern of factor loadings is obtained, factor or component names should be assigned according to the measurement's general leading characteristic. Variables with higher factor loadings should play a more important role in factor naming.

In **the fourth step,** the independent variables are constructed according to latent factors obtained as a result of the factor analysis. Each latent factor assembles the sub-factor variables (motivators and barriers) and transforms them into a separate independent variable. With the obtained constructs, linear and non-linear regression analysis will be applied to determine the influence on the dependent variable "Planning and use of BCT".

After performing the calculations, we proceed to the interpretation of the results.

4. Results and discussion

4.1. Sampling Adequacy Check

The sampling adequacy measure considers how well different statements can form a measurement scale. These scales are considered as latent factors. The evaluation of the initial baseline data using the Kaiser-Meyer-Olkin test of the factors motivating the implementation of BCT is shown in Table 1.

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Table 1. KMO and Bartlett's Test on motivators

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,742
Bartlett's Test of Sphericity	Approx. Chi-Square	278,774
	df	45
	Sig.	,000

The values of the indicator confirm the presence of at least one latent factor, and all other variables are adequate to the model for the application of factor analysis. The evaluation of the initial baseline data for the factors limiting the implementation of BCT (barriers) by the Kaiser-Meier-Olkin test is shown in Table 2. The values of the indicator confirm the presence of at least one significant factor. The detailed analysis found that the other variables have values adequate for their inclusion in the factor analysis.

Table 2. KMO and Bartlett's Test on barriers

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,753
Bartlett's Test of Sphericity	Approx. Chi-Square	282,879
	df	66
	Sig.	,000

The detailed check using the Anti-image correlation matrix tool of the internal consistency of the statements in the survey constructs for the motivating factors (table 3) and limiting factors (table 4) shows that the values on the diagonal of the anti-image correlation matrix for each statement in the survey construct are greater than 0.6, which is also an indicator of the adequacy of the data sample for conducting factor analysis.

Table 3. Anti-image Correlation Matrix on "motivators"

Increasing the transparency, traceability and immutability of information	,759[a]	-,145	-,050	-,226	-,046	-,220	,138	,169	,010	-,027
Digitisation of supply chains	-,145	,766[a]	-,131	-,236	-,352	,124	-,273	-,164	,071	,017
Reduction of intermediaries in trade processes	-,050	-,131	,711[a]	-,304	-,036	,199	-,278	,156	-,211	-,070
The ability to use smart contracts	-,226	-,236	-,304	,727[a]	,203	-,341	,096	-,108	-,049	-,026
Improving the processes of delivery of goods	-,046	-,352	-,036	,203	,762[a]	-,252	-,271	,018	-,148	-,003
Trade contracts risk prevention	-,220	,124	,199	-,341	-,252	,725[a]	-,148	-,256	-,272	,007
Reduce the cost of maintaining inventories	,138	-,273	-,278	,096	-,271	-,148	,735[a]	,133	-,003	,071
low costs of implementing the technology	,169	-,164	,156	-,108	,018	-,256	,133	,675[a]	-,250	,024
Obtaining competitive advantages	,010	,071	-,211	-,049	-,148	-,272	-,003	-,250	,799[a]	-,185
External factors	-,027	,017	-,070	-,026	-,003	,007	,071	,024	-,185	,716[a]
a. Measures of Sampling Adequacy (MSA)										

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Table 4. Anti-image Correlation Matrix on "barriers"

Anti-image Matrices "barriers"											
Financial constraints	,761	-,022	-,345	,041	,068	,074	-,016	-,163	,023	-,078	-,099
Lack of company and organisational strategies	-,022	,686	-,042	-,526	-,121	-,221	,087	-,202	-,166	,024	,138
Lack of expertise in the company	-,345	-,042	,767	-,053	-,173	-,074	-,220	,042	,046	-,296	,099
The organisational culture would not accept the introduction of such a project	,041	-,526	-,053	,675	,037	,099	-,039	-,125	,022	,004	-,026
Lack of interoperability with existing IT-Systems	,068	-,121	-,173	,037	,705	-,248	,137	-,044	,090	-,015	-,359
lack of a BCT benchmark for rapid implementation of the technology	,074	-,221	-,074	,099	-,248	,832	-,079	-,115	-,027	-,176	-,054
Lack of knowledge among clients about BTC	-,016	,087	-,220	-,039	,137	-,079	,759	-,323	-,051	-,011	-,229
Lack of cooperation and coordination between our partners for inclusion in Blockchain smart grid	-,163	-,202	,042	-,125	-,044	-,115	-,323	,818	-,083	-,082	,089
Sensitivity to sharing information in permissioned grids	,023	-,166	,046	,022	,090	-,027	-,051	-,083	,788	-,162	-,230
Limited information infrastructure caused by the requirement for all participants to be "on-board"	-,078	,024	-,296	,004	-,015	-,176	-,011	-,082	-,162	,841	-,169
Insufficient development of the BCT	-,099	,138	,099	-,026	-,359	-,054	-,229	,089	-,230	-,169	,673

4.2. Factor extraction and analysis of the number of factors revealed

Factor extraction was performed using the method of principal components without factor rotation. The analysis of the results of factor extraction is carried out separately for the two groups of reasons - "motivators" and "barriers".

Analysis of the results of the factor analysis of the group of reasons motivating the use of BCT

The analysis of the total variance of the influencing factors for the group of motivators (Table 5) shows that the first four hidden factors have the most pronounced variance, with the cumulative accumulation amounting to 67.39%. For additional certainty, a 5th factor is added, accompanied by its own value of 11%, and the value of the total cumulative variance becomes 78.04%. Thus, the analysis continues with 5 factors, the results of which correlate in 78.04% of cases.

Table 5. Total Variance Explained on "motivators"

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,468	34,684	34,684	3,468	34,684	34,684	2,084	20,841	20,841
2	1,489	14,890	49,574	1,489	14,890	49,574	1,926	19,261	40,103
3	1,096	10,956	60,530	1,096	10,956	60,530	1,400	13,996	54,099
4	,997	9,969	70,499	,997	9,969	70,499	1,329	13,292	67,390
5	,755	7,547	78,045	,755	7,547	78,045	1,066	10,655	78,045
6	,630	6,296	84,341						
7	,497	4,967	89,308						
8	,416	4,165	93,473						
9	,372	3,723	97,196						
10	,280	2,804	100,000						
Extraction Method: Principal Component Analysis.									

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Viewing the results regarding the number of factors using a scree plot shows the contribution of the respective motivating factor to the final score (Fig. 1). Factors located in a position where the line goes from steep to gentle descent have the strongest influence, i.e. the first four. As we noted, we will use in the analysis 5 main factors that explain 78.04% of the total variance.

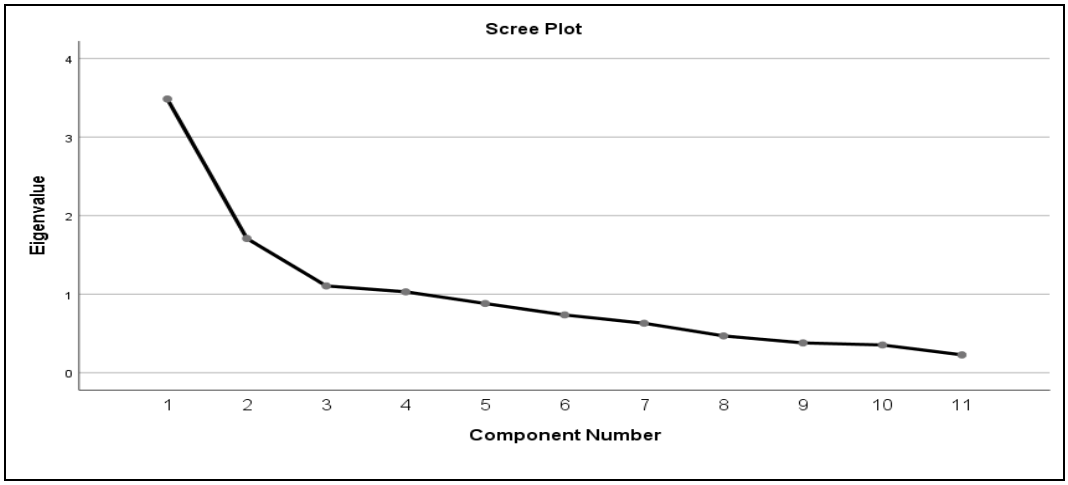


Figure 1. "Scree plot" diagram on "motivators"

The values of the coefficient of communalities as a result of the factor analysis for the group of reasons motivating the use of BCT for five main factors are shown in Table 6.

Table 6. Communalities on "motivators"

Communalities		
	Initial	Extraction
Increasing the transparency, traceability and immutability of information	1,000	,877
Digitisation of supply chains	1,000	,638
Increasing information security through decentralisation storage	1,000	,851
Reduction of intermediaries in trade processes	1,000	,792
The ability to use smart contracts	1,000	,807
Protection of intellectual property	1,000	,739
Improving the processes of delivery of goods	1,000	,738
Trade contracts risk prevention	1,000	,773
Reduce the cost of maintaining inventories	1,000	,659
Low costs of implementing the technology	1,000	,773
Obtaining competitive advantages	1,000	,877
External factors	1,000	,896
Extraction Method: Principal Component Analysis.		

The data visualise high values of the coefficients close to +1, which is considered a positive moment in the current stage of the analysis, i.e. the studied statements are significantly related to the discovered motivating factors. The distribution of motivating reasons to the revealed factors and their factor loading is shown in table 7.

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Table 7. Allocation of variables to relevant motivating factors

	Component				
	1	2	3	4	5
Increasing the transparency, traceability and immutability of information	,502	,520			
Digitisation of supply chains	,703				
Reduction of intermediaries in trade processes	,566				
The ability to use smart contracts	,671	,567			
Improving the processes of delivery of goods	,680				
Trade contracts risk prevention	,711				
Reduce the cost of maintaining inventories	,567	-,540			
Low costs of implementing the technology		,578	,567		
Obtaining competitive advantages	,663				
External factors				,757	,523
Extraction Method: Principal Component Analysis.					
a. 5 components extracted.					

It is important to note that some variables measure more than one factor. Also, a large number of variables correlated only with the first factor. This requires applying the factor rotation method to more clearly redistribute the variables to the revealed factors.

Analysis of the results of the factor analysis of the group of reasons limiting the use of BCT

The analysis of the total variance of the influencing factors for the group of motivators (Table 8) shows that the first three hidden factors have the most pronounced variance, with the cumulative accumulation amounting to 52.08%. For additional security, a 4th factor is added with its value of 13,45%, and the value of the total cumulative variance becomes 65,54%. Thus, the analysis continues with 4 factors that explain the total variance with 65,54%.

Table 8. Total Variance Explained on "barriers"

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,601	32,737	32,737	3,601	32,737	32,737	1,978	17,981	17,981
2	1,464	13,310	46,048	1,464	13,310	46,048	1,971	17,920	35,902
3	1,159	10,536	56,583	1,159	10,536	56,583	1,780	16,186	52,088
4	,985	8,952	65,535	,985	8,952	65,535	1,479	13,447	65,535
5	,782	7,109	72,643						
6	,715	6,497	79,141						
7	,607	5,518	84,658						
8	,518	4,713	89,372						
9	,489	4,447	93,819						
10	,349	3,177	96,996						
11	,330	3,004	100,000						
Extraction Method: Principal Component Analysis.									

Reviewing the results of the factor analysis through the scree plot diagram (Fig. 2) shows that three factors have the strongest influence, located in the position where the line from steep to gentle descent. As noted, we will use in the analysis 4 main factors that explain 65,54% of the total variance.

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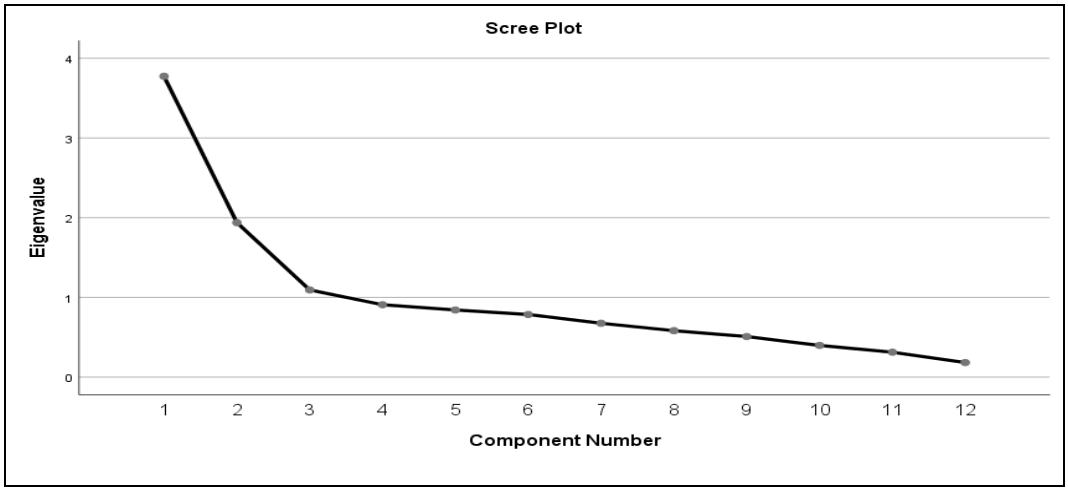


Figure 2. "Scree plot" diagram on "barriers"

The values of the coefficient of communalities as a result of the factor analysis for the group of reasons limiting the use of BCT for four main factors are shown in Table 9.

Table 9. Communalities on "barriers"

Communalities		
	Initial	Extraction
Financial constraints	1,000	,651
Lack of company and organisational strategies	1,000	,790
Lack of expertise in the company	1,000	,695
The organisational culture would not accept the introduction of such a project	1,000	,699
Lack of interoperability with existing IT-Systems	1,000	,771
Lack of a BCT benchmark for rapid implementation of the technology	1,000	,568
Lack of knowledge among clients about BCT	1,000	,546
Lack of cooperation and coordination between our partners for inclusion in Blockchain smart grid	1,000	,584
Sensitivity to sharing information in permissioned grids	1,000	,722
Limited information infrastructure caused by the requirement for all participants to be "on-board"	1,000	,525
Insufficient development of the BCT	1,000	,660
Extraction Method: Principal Component Analysis.		

Inspection of the output data revealed high communality values for the limiting factors (above 0.5), confirming the relevance of the method. The distribution of reasons limiting the use of BCT to the revealed factors and their factor loading is shown in Table 10.

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Table 10. Component matrix "barriers"

	Component			
	1	2	3	4
Financial constraints	,585		-,591	
Lack of company and organisational strategies	,619	,639		
Lack of expertise in the company	,659			
The organisational culture would not accept the introduction of such a project	,502	,692		
Lack of interoperability with existing IT-Systems	,607		,522	
Lack of a BCT benchmark for rapid implementation of the technology	,644			
Lack of knowledge among clients about BTC	,586			
Lack of cooperation and coordination between our partners for inclusion in Blockchain smart grid	,666			
Sensitivity to sharing information in permissioned grids	,517			,680
Limited information infrastructure caused by the requirement for all participants to be "on-board"	,654			
Insufficient development of the BCT	,532	-,515		
Extraction Method: Principal Component Analysis.				
a. 4 components extracted.				

It can be seen from the table that a large number of variables correlated only with the first factor. This requires applying the factor rotation method to more clearly reallocate the variables to the revealed limiting factors.

4.3. Rotation of the factors and construction of the new variables

The rotation further helps distinguish the factors and explores their role in relation to the relevance of the statements in the factor analysis. An orthogonal rotation was performed for analysis purposes. The application of the method of rotating the data for the motivating factors is placed in table 11, and the limiting factors are in table 12. The results show that rotating the motivating factors results in a more even distribution of the variables to the factors and a unique distribution of each variable to the revealed factors.

Table 11. Rotated Component Matrix on "motivators"

	Component				
	1	2	3	4	5
Increasing the transparency, traceability and immutability of information			,922		
Digitisation of supply chains	,659				
Reduction of intermediaries in trade processes				,851	
The ability to use smart contracts				,586	
Improving the processes of delivery of goods	,852				
Trade contracts risk prevention		,675			
Reduce the cost of maintaining inventories	,812				
Low costs of implementing the technology		,578			
Obtaining competitive advantages		,665			
External factors					,940
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]					
a. Rotation converged in 7 iterations.					

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Table 12. Rotated Component Matrix on "barriers"

	Component			
	1	2	3	4
Financial constraints	,806			
Lack of company and organisational strategies		,856		
Lack of expertise in the company	,756			
The organisational culture would not accept the introduction of such a project		,833		
Lack of interoperability with existing IT-Systems			,869	
Lack of a BCT benchmark for rapid implementation of the technology			,646	
Lack of knowledge among clients about BCT	,529			
Lack of cooperation and coordination between our partners for inclusion in Blockchain smart grid		,565		
Sensitivity to sharing information in permissioned grids				,824
Limited information infrastructure caused by the requirement for all participants to be "on-board"				,865
Insufficient development of the BCT				,582
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. [a]				
a. Rotation converged in 6 iterations.				

Based on an analysis of the results of tables 11 and 12 and an interpretation of the general characteristics of the variables allocated to each factor, the following names of the leading motivating and limiting factors were derived (Table 13).

Table 13. Name of the leading motivating and limiting factors

№	Motivators	Barriers
1	Leading to optimise the processes in Supply chain	Technological and subjective limitations
2	Improving company reputation	Constraints caused by organisational policies
3	Factors building trustiness	Communication and financial barriers
4	Web3 factors	Lack of trust and connectivity
5	Unmanageable risks	

4.4. Performing a regression analysis with variables obtained as a result of the factor analysis

Calculations begin by constructing the variables "latent motivators" and "latent barriers". According to social-cognitive theories (Bandura, 1986), "motivators" refer to expectations, while "barriers refer to self-regulation. On this basis, calculations are carried out to answer the question of which variables are influencing to the greatest extent, the interest in implementing BCT in the business organisation to increase the competitiveness of the enterprise in the field of SC. For this purpose, it is appropriate to formulate two hypotheses, namely:

- H1: The "latent motivators" do not influence interest in using blockchain technology to increase the competitiveness of enterprise supply chains;
- H2: The "latent barriers" do not limit the use of blockchain technology as a tool to increase business competitiveness.

In the current case, a linear multifactorial regression analysis is applied with variables constituting the latent motivating and limiting factors, with the first step being a model summary (Table 14).

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Table 14. Model summary of the model with independent constructs inherent to the latent motivating and limiting factors

Model Summary[b]									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,558[a]	,312	,245	,926	,312	4,684	9	93	,000
a. Predictors: (Constant), Lack of trust and connectivity, Unmanageable risks, Leading to optimise the processes in Supply chain, Factors building trustiness, Technological and subjective limitations, Improving company reputation, Communication and financial barriers, Web3 Factors, Constraints caused by organisational policies									
b. Dependent Variable: Planning and using blockchain technology									

The data support the model's reliability, with the measure of correlation (R) between the dependent and independent variables having an appropriate value (.558). The coefficient of determination also yields an applicable value (.312). On the other hand, information about the significance of the model (Sig F = .000) is relevant to continue the analysis.

The calculations continue by reviewing the independent sub-variables making up the main research constructs and considering the validity of their values to continue the analysis (Table 15).

Table 15. Reliability and Applicability Check of the Independent Variables

Coefficients[a]										
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95,0% Confidence Interval for B		Correlations	Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Partial	Tolerance	VIF
(Constant)	2,223	,727		3,056	,003	,779	3,668			
Leading to optimise the processes in Supply chain (**LOPSC**)	,001	,030	,004	,036	,971	-,058	,061	,004	,687	1,456
Improving company reputation (**ICR**)	,078	,044	,184	1,761	,082	-,010	,166	,180	,676	1,480
Factors building trustiness (**FBT**)	,027	,070	,037	,387	,700	-,113	,167	,040	,820	1,220
Web3 factor (**W3F**)	,145	,052	,295	2,793	,006	,042	,248	,278	,664	1,507
Unmanageable risks (**UmR**)	,028	,037	,068	,776	,440	-,044	,101	,080	,951	1,051
Technological and subjective limitations (**TSL**)	-,025	,034	-,076	-,735	,464	-,093	,043	-,076	,684	1,463
Constraints caused by organisational policies (**CCOP**)	-,078	,035	-,241	-2,250	,027	-,147	-,009	-,227	,643	1,555
Communication and financial barriers (**CFB**)	-,027	,042	-,066	-,657	,513	-,111	,056	-,068	,745	1,342
Lack of trust and connectivity (**LTC**)	,105	,074	,131	1,407	,163	-,043	,252	,144	,852	1,173

An initial review reported overall high reliability of the constructs, but a closer reading highlighted several key points, namely:

- the assertion certainty indicator (Sig) provided reliable data only for the sub-variables: **LOPSC, ICR, W3F, CCOP**;
- the verification of the confidence interval confirms alternative hypotheses about the influence of the factors: **W3F, CCOP**, i.e.:

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  - web3 factors (**W3F**) are essential for increasing the competitiveness of the business unit's supply chains;
  - the limitations created as a result of organisational policies (**CCOP**) negatively affect the competitiveness of the company, by not adopting new technologies.
- partial correlation is acceptable only for the factors: **W3F, CCOP**;
- the coefficient for independence between the factors (tolerance) marks acceptable values (≥0.5), which supports the conduct of the analysis;
- the "VIF" indicator reports stable values (≤10).

The discovered problems provide an opportunity to calculate the most significant latent factors. Still, before proceeding to this phase, it is appropriate to compile the regression model with the independent variables obtained in the result of the factor analysis. The regression model has the following form:

$$\hat{y} = 2{,}223 + 0{,}001 \cdot \mathbf{LOPSC} + 0{,}078 \cdot \mathbf{ICR} + 0{,}027 \cdot \mathbf{FBT} + 0{,}145 \cdot \mathbf{W3F} + 0{,}028 \cdot \mathbf{UmR} - 0{,}025 \cdot \mathbf{TSL} - - 0{,}078 \cdot \mathbf{CCOP} - 0{,}027 \cdot \mathbf{CFB} - 0{,}105 \cdot \mathbf{LTC}$$

Following the research methodology, a non-linear regression analysis is performed (Table 16).

Table 16. Output data obtained as a result of non-linear regression analysis

Parameter Estimates				
Parameter	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
a Constant	1,821	,772	,288	3,353
b1 Leading to optimise the processes in Supply chain (**LOPSC**)	,006	,063	-,120	,133
b2 Improving company reputation (**ICR**)	,230	,135	-,039	,499
b3 Factors building trustiness (**FBT**)	,010	,050	-,090	,110
b4 Web3 factor (**W3F**)	,252	,098	,058	,446
b5 Unmanageable risks (**UmR**)	,041	,038	-,034	,115
b6 Technological and subjective limitations (**TSL**)	-,060	,129	-,316	,196
b7 Constraints caused by organisational policies (**CCOP**)	-,157	,068	-,292	-,022
b8 Communication and financial barriers (**CFB**)	-,022	,111	-,242	,199
b9 Lack of trust and connectivity (**LTC**)	,046	,047	-,047	,140

After performing the calculations, the nonlinear regression equation has the following form:

$$\hat{y} = 1{,}821 + 0{,}006 \cdot \mathbf{LOPSC} + 0{,}230 \cdot \mathbf{ICR} + 0{,}010 \cdot \mathbf{FBT} + 0{,}252 \cdot \mathbf{W3F} + 0{,}041 \cdot \mathbf{UmR} - 0{,}060 \cdot \mathbf{TSL} - - 0{,}157 \cdot \mathbf{CCOP} - 0{,}022 \cdot \mathbf{CFB} - 0{,}046 \cdot \mathbf{LTC}$$

The analysis achieves better results, but the confidence interval values again report the desired direction of the regression equation for only two of the latent factors. After analysing the source data, we propose the following regression equation:

$$\hat{y} = 3{,}177 + 0{,}168 \cdot \mathbf{W3F} - 0{,}102 \cdot \mathbf{CCOP}$$

where:
W3F – Web3 factors
CCOP – Constraints caused by organisational policies

The indicated latent factors contain several significant sub-variables. In order to find the most significant influencing sub-variables, we apply a stepwise regression analysis (Table 17).

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Table 17. Output data of the significant sub-variables inherent in the latent factors

Variables Entered/Removed[a]			
Model	Variables Entered	Variables Removed	Method
1	11.5. The ability to use smart contracts	.	Stepwise (Criteria: Probability-of-F-to-enter <= ,050; Probability-of-F-to-remove >= ,100).
2	12.2. Lack of company and organisational strategies	.	Stepwise (Criteria: Probability-of-F-to-enter <= ,050; Probability-of-F-to-remove >= ,100).
a. Dependent Variable: Planning and using blockchain technology			

For more detailed information, we check the main data reliability indicators (Table 18).

Table 18. Data needed to build the regression model

Coefficients[a]											
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95,0% Confidence Interval for B		Correlations	Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Partial	Tolerance	VIF
1	(Constant)	2,762	,426		6,479	,000	1,916	3,608			
	11.5. The ability to use smart contracts (**ASCs**)	,331	,081	,360	4,071	,000	,170	,492	,375	,952	1,050
	12.2. Lack of company and organisational strategies (**LCOS**)	-,186	,059	-,277	-3,140	,002	-,303	-,068	-,298	,952	1,050
a. Dependent Variable: Planning and using blockchain technology											

The information from the table provides information in several main directions, namely:

- the direction of the regression model is correct, as the sub-variable forming part of the latent motivating factors "Web3 factor" (usability of smart contracts) follows a positive direction, i.e. increasing the importance of the factor positively affects the dependent variable;
- the sub-variable (lack of company-organisational strategies for technology adoption) inherent in the latent limiting factors follows the correct negative direction, i.e. an increase in the value of the independent variable negatively affects the dependent variable "increasing the competitiveness of supply chains through the use of BCT";
- the reliability indicator reports the required values (Sig ≤ 0.05), supporting the adequacy of the model;
- the confidence interval regarding the influence of the two factors confirms alternative hypotheses identical to those mentioned above;
- the partial correlation for the latent motivating sub-factor was higher than that of the limiting statements;
- the indicator of independence between the factor sub-variables (tolerance) has a value close to +1, verifying the model's reliability.

After reflecting on the conclusions obtained when conducting a stepwise regression, it is appropriate to construct the regression equation with the emitted influencing latent factors.

Hence, the regression model takes the following form:

$\hat{y} = 2{,}762 + 0{,}331 \cdot \mathbf{ASCs} - 0{,}186 \cdot \mathbf{LCOS}$

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For a more adequate interpretation of the data, we present a non-linear regression analysis with the above-mentioned sub-factor variables (Table 19).

Table 19. Values involved in the non-linear regression model

Parameter Estimates				
Parameter	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
a	2,787	,361	2,072	3,503
b1 the ability to use smart contracts (**ASCs**)	,260	,081	,100	,420
b2 lack of company and organisational strategies (**LCOS**)	-,116	,038	-,190	-,041

The baseline information supports the adequacy of the regression model, both with the direction of the equation and the fact that the absence of "0" at the limits of the confidence interval confirms the alternative hypotheses. The regression equation will take the following form:

$\hat{y}$ = 2,787 + 0,260 . **ASCs** – 0,116 . **LCOS**

The data depict a positive impact on increasing the competitiveness of the supply chains of Bulgarian companies through BCT and, in particular, the use of smart contracts. On the other hand, the lack of organisational policies and strategy for the implementation of BCT reduces the possibility of positioning in the global digitised supply chains, as a result of which the competitiveness of the company is threatened.

Conclusions

Blockchain technology is an innovative tool with many advantages. Still, in developing economies such as Bulgaria, many negative opinions are influenced mainly by the volatility of cryptocurrencies. Despite the negative comments, there are also positive statements backed by scientific facts.

The present study performs an in-depth analysis of the so-called hidden but leading factors influencing the decision to implement Blockchain technology within the business organisation. The calculations depict more motivating than limiting factors, a sign of recognition of technology relevant to business management.

The conducted regression analyses supported the use of BCT to increase the competitiveness of the supply chains of Bulgarian enterprises. Still, the statements and conclusions refer to the globalised digitalised supply chains. The main factors affecting the implementation of blockchain technology in companies are the possibility of using smart contracts and increasing competitiveness. On the other hand, the lack of organisational policies and development strategies limits the diffusion of the technology and decreases the possibility of positioning in the global SC.

The resulting new groups of factors can be used as research constructs in future research in the high information technology applications in supply chains.

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ENTREPRENEURIAL TALENT: THE BALTICS IN THE MIRROR OF INTERNATIONAL STUDIES

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Abstract. The aim of this article is to confirm empirically the role of education in shaping and enhancing the role of entrepreneurial talent in the economic development of the Baltic countries. The following tasks were consistently solved: clarifying the relevance of the topic of entrepreneurial talent and reflecting this multifaceted phenomenon in the socio-economic works of contemporary authors, studying the experience of teams of international research projects, where the main or great attention is paid to entrepreneurial talent, then, in a comparative perspective, assessing the role of entrepreneurial talent in the Baltic countries, the most important factors that act both as the most significant positive conditions of its impact on the economic growth of individual countries, and inhibit positive dynamics. The empirical basis for the research was composed of the international research projects, Global Entrepreneurship Monitor (GEM), Global Talent Competitiveness Index (GTGI), the report of the World Economic Forum as well as the authors' own research into student entrepreneurial potential and entrepreneurial universities. Causal analysis and comparative analysis were used as the main research methods. In the course of the research work, the terminology used is clarified in relation to the main subject of the research - entrepreneurial talent as the most important factor in the economic development of countries and regions. The ranking of factors positively influencing the effectiveness of entrepreneurial talent, especially from the standpoint of opportunities in the field of education, has been carried out. The article includes three sections. The first section is devoted Entrepreneurial Talent as an important element of economic activity, second section - Entrepreneurship and entrepreneurial talent as a subject of international research and the third section - Entrepreneurship in the Baltic States in the evaluation of international studies. The research shows both the importance of entrepreneurial talent among other drivers of economic growth and the quality of entrepreneurial education in general education schools and universities. Therefore it is extremely important to expand the practice of entrepreneurial education for students of all specialties, gradually turning educational and research higher education institutions into entrepreneurial universities.

Keywords: talent; entrepreneurial talent; entrepreneurial education; talent competitiveness; economic growth; Baltics

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1. Introduction

Talent is the outstanding abilities of a person, manifested in a certain field of activity, allowing to achieve high results on the basis of making non-standard decisions.

Talent determines a high level of development of abilities that enable a person to successfully, independently and originally perform a certain activity. Such a combination of abilities makes it possible to obtain a product of activity that is distinguished by novelty, a high level of performance and social significance. Whether the existing potential will develop, owing to which a person will begin to think, reason, solve some problems better than others, which will allow him to see natural phenomena from a different unexpected side - is a "competence" of not so much biological as social factors: living conditions, obtained knowledge, education, acquisition of labour skills.

Recent advances in the social sciences, neurophysiology and neuroentrepreneurship indicate that the personality of entrepreneurs has its own characteristics. The science has gone even further: the results of research in the field of cognitive science indicate that entrepreneurs have a special type of thinking. Based on this specificity of thinking, the sociology of personality and human psychology, it is possible to build a system for preparing entrepreneurs and supporting the development of their projects in a different way. Proper training of entrepreneurs is the key to effective development of entrepreneurship.

An entrepreneur is a person who organises the use of production resources in the most profitable way in order to obtain a regular income. Entrepreneurs take on the risks of the uncertainty of the external environment, possible failures. Entrepreneurial talent is needed to find a way out of various non-standard situations.

Entrepreneurial talent is a very complex subject. Entrepreneurial talent lives in a very dynamic and complex world, it is the successful reaction of an entrepreneur to the yet hidden opportunities for innovation in various spheres of society in order to ensure profit and economic growth.

Small and medium enterprises (SMEs) play a critical role in job creation. Since there is a close relationship between the performance of small and medium-sized firms and key policy goals such as employment or economic growth, it is necessary to focus on a more detailed understanding of the entrepreneurial drivers of economic growth. The role of entrepreneurial talent is considered crucial in the innovation arena due to the role that start-ups play. We would like to highlight the fact that (as in case with innovation) entrepreneurial talent reflects a state of mind that must permeate all economic and social systems in order to be fully exploited. In other words, entrepreneurial talent should be seen as a strategic factor not only in nascent and smaller organisations, but also in larger organisations and in central and local governments. Available data and experience point to some practical ways in which entrepreneurial talent can actually grow, be attracted and nurture.

2. Literature review

In fact, the entrepreneurial talent as a resource is often wasted and suffers from overall misuse: many entrepreneurial talents will eventually disappear, working in inefficient and risk-averse organisational structures where their potential contribution to innovation and growth will be ignored or suppressed. In the modern economy, such irrational distribution remains a frequent phenomenon, while its cost is constantly growing making it a priority goal for increasing the competitiveness of talents in general. Therefore, the interest of researchers in general in the problems of entrepreneurial talent has increased significantly in recent years. Let us analyse, for example, the reflection of the issue of entrepreneurial talent in the authoritative Scopus database.

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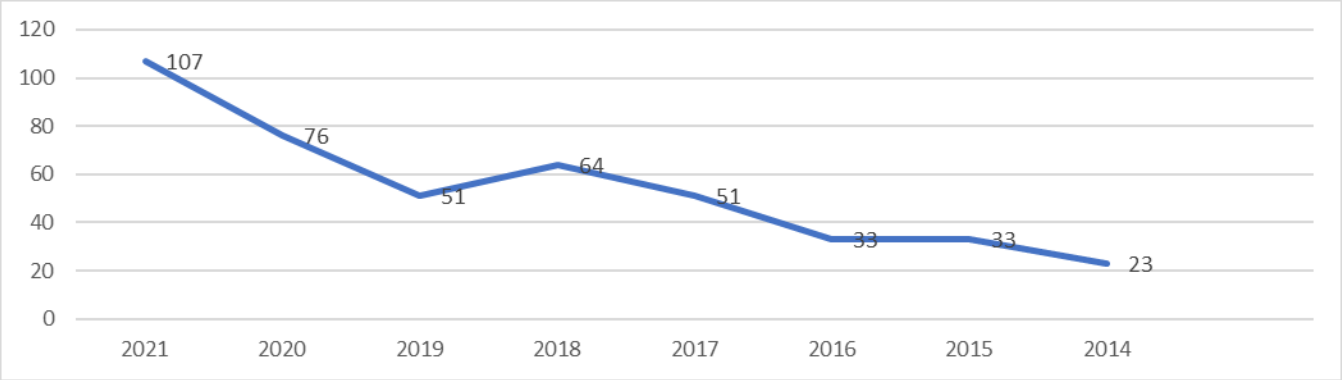


Fig. 1. Number of papers (by year) that contain the words "Entrepreneurial talent" in the title, abstract, or keywords in the Scopus database from 2014 to 2021
Source: elaborated by the authors based on SCOPUS database

The results displayed in Figures 1 and 2 confirm the high interest of scientists from various fields of science in the topic "Entrepreneurial talent". Publications were indexed especially rapidly in the Scopus database in 2020 and 2021, when the number of such publications increased compared to 2014 and reached 107. Most of the publications are related to business, management and accounting, however, 20.6% of the total number of publications are related to social sciences.

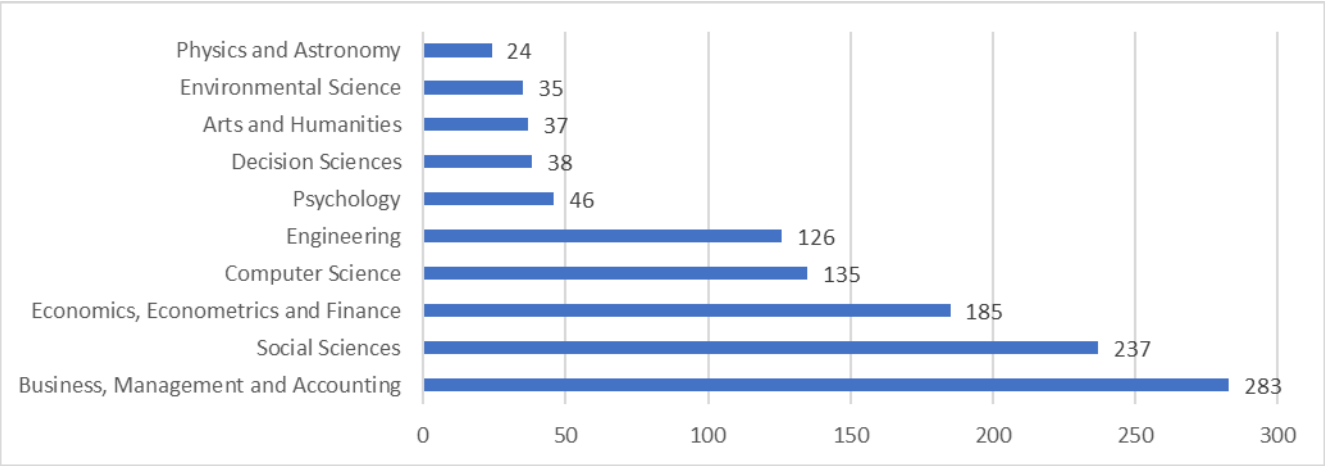


Fig. 2. Number of papers (by field of science) that contain the words "Entrepreneurial talent" in the title, abstract or keywords in the Scopus database from 2014 to 2021
Source: elaborated by the authors based on SCOPUS database

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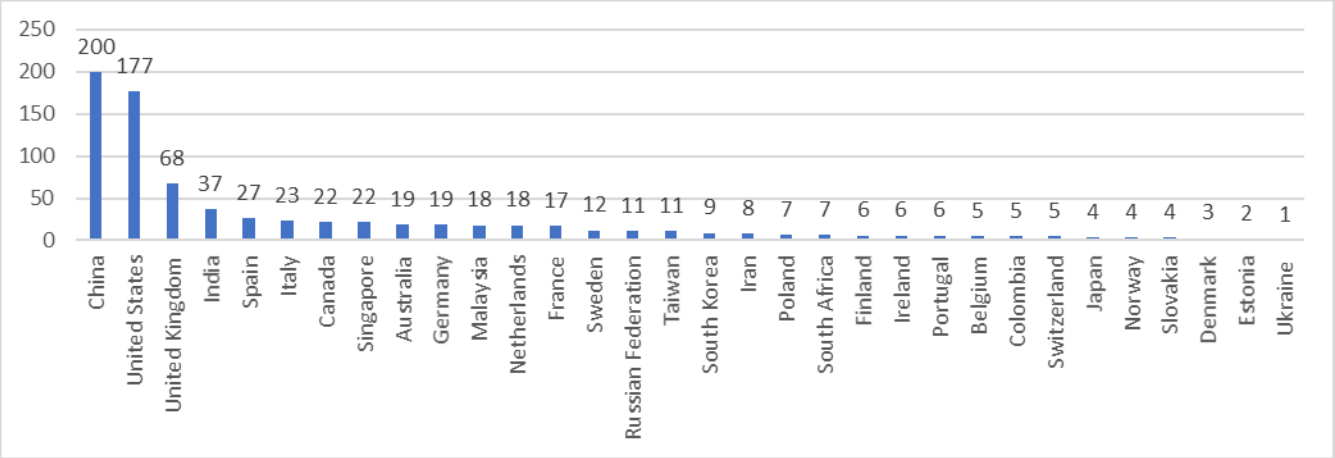


Fig. 3. Number of papers (by country) that contain the words "Entrepreneurial talent" in the title, abstract, or keywords in the Scopus database from 2014 to 2021
Source: elaborated by the authors based on SCOPUS database

Scholars allocate a central place to entrepreneurial talent in the economy (Baumol, 1990, 2010). Moreover, significant variance is assumed within the dependent level of the enterprise performance (Chaganti & Schneer, 1994; Zou et al., 2010). Mayer-Haug K., Read S., Brinckmann J., Dew N., and Grichnik D. in their research expand the analysis of entrepreneurship by combining empirical data on differences in the nature of entrepreneurial talent with differences in the results of enterprises led by entrepreneurs (Mayer-Haug et.al., 2013). From a policy point of view, a better understanding of such element as entrepreneurial talent is associated with such an aspect as enterprise efficiency, that is, the ability to effectively use limited resources. If the relationship were well understood, funds could be directed towards developing those aspects of entrepreneurial talent that have the greatest impact on the desired outcomes of the enterprise (Nyström, 2008). Moreover, previous work by researchers suggests that cultural and economic contexts influence the availability and use of entrepreneurial talent (Zhang et al., 2010; Zhang et al., 2022). Therefore, understanding the impact of these contextual factors on the relationship between entrepreneurial talent and SME performance can also be useful to policy makers around the world. The results of the many studies show the positive impact of talent development on sustainability, company performance, given the moderating role of environmental dynamism (Kafetzopoulos & Gotzamani, 2022; Vaillant, 2022; Mudjijah et al., 2022; An & Xu, 2021).

Latvian researchers in their article argue that talent in the information society is most likely a synthesis of creative work, culture and creativity, which acquires special value in the talent economy and contributes to the competitiveness of a country (Selivanova et al., 2021).

In these terms entrepreneurial talent plays a special role, which leads to success in any sector of the economy, education, state and local government.

3. Theoretical basis and methodology of the research

The general and special methods were used for the study, in particular: historical – to research the state of study of the problem; analytical-synthetic, comparative – to identify trends in the field of media criticism on the basis of the collected empirical material; inductive – to generalize and systematize the

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conclusions. The method of typological analysis was used to differentiate the amount of media-critical studies. The method of content analysis was used to study the documents.

Entrepreneurial Talent as an important element of economic activity. To be competitive in a globalised economy requires local knowledge and skills. That is why new models of regional development emphasise development based on the unique assets and circumstances of the region, as well as the development of knowledge-based industries.

Governments naturally view higher education institutions as sources of knowledge and innovation, as well as drivers of regional development. Our research into the entrepreneurial potential of students has shown the enormous resources of university youth in real and potential use of their entrepreneurial ambitions and talents for the benefit of their regions. However, there exist many obstacles. Among the 10 factors being present in the university environment and affecting the opening of a business, Latvian students most often indicated the risk, probable losses and threats in the implementation of such an intention (83% agree with this statement). As can be seen from the students' responses, they unequivocally attribute risk to an obstacle to starting their own business, when the HEI does not form a broader and more positively coloured view of the risk phenomenon. Apparently, neither in academic affairs, nor in research work or meetings with successful entrepreneurs, our students receive knowledge and beliefs about the positive role of risk, about its functions such as protective, analytical, innovative, regulatory ones.

When starting any new business, it is necessary to evaluate not only risks, but also chances. Lectures, conversations and discussions with students should dwell upon both risks and chances - both forms of updating the results of decisions made and actions taken in an uncertain and unpredictable future. In this case, the risks are unfavourable events for the person, while the chances are favourable ones. At the same time, it is important to show young people that in order to make rationally justified decisions, one needs to predict and evaluate both risks and chances, since when setting goals and making decisions, a person relies primarily on achieving success, that is, chances, rather than on failure, that is risks (Menshikov & Ruza, 2021).

Unfortunately, higher education institutions do not always have established contacts with local economic players. Institutional culture, inadequate funding, public policy direction, and the limited ability of local and regional agents to engage in higher education or vice versa are just some of the barriers to strengthening links between these different actors. Using the entrepreneurial potential for better interaction is a way to promote regional economic interests.

The strategic role of higher education institutions in supporting regional development can be implemented through: knowledge creation through research and technology transfer; knowledge transfer through education and human resource development, and cultural and community development through entrepreneurial talent, which can help create an environment in which innovations flourish.

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Fig. 4. The Complex Process Model of Entrepreneurship
Source: elaborated by the authors based on Kerr at al., 2018

Entrepreneurship is a complex process involving many variables that interact with each other to provide the context for starting and running a new business. Successful entrepreneurship is specifically the result of how the individual, human capital and the environment contribute to the activity. The process always takes place in the context of a particular national culture (Frese, 2009; (Brandstatter, 2010). In terms of talent competitiveness, the key question suggested in Figure 4 is: which of the factors mentioned can influence or be influenced by strategies, policies and targeted measures? As noted by Kerr et al. (2018), "researchers in some disciplines (but rarely in economics) go beyond studying interactions to construct a 'complex model of an entrepreneurial process' in which the relationships between these variables are displayed and ultimately determine the success of the enterprise." The approach described above (Kerr et al., 2018) offers a valuable starting point for transferring personality traits into reproducible skills, which can then be transferred into policies, priorities, and targeted actions adapted to different economic conditions.

Entrepreneurial Talent is important to reduce skill inequality. The fact that entrepreneurial talent cannot be reduced to personal qualities (rather opposite, it can be defined as a combination of skills that can be measured, improved, and better used), is particularly important in poorer and faster-growing economies, as talent disparities between rich and poor countries tend to increase. Lerner M., Brush C., and Hisrich, R. (Lerner et al. 1997) showed that entrepreneurial talent is likely to vary (change) depending on the level of development of the country's economy. Nobody can one ignore the fact that becoming an entrepreneur may be an option (or an ambition) in developed countries, while it is often simply a necessity to survive in poorer conditions.

The example of China is particularly revealing in this context. It is quite striking that the rise of China has been strongly correlated with the transfer of a significant amount of talent from the public sector (including state-owned enterprises) to the private sector, which has led to the rapid emergence of such giants as IT company Tencent, e-commerce giant Alibaba and home appliance manufacturer Haier (Chakravarthy & Yau, 2022).

China's economic miracle over the past three decades can be explained by the redistribution of entrepreneurial talent from the government/state and the agricultural sector to entrepreneurial activity. This shift was unprecedented in the last two thousand years of Chinese history. When entrepreneurial talent shifted more to business activities, it created wealth and an unprecedented growth of the economy. Three dominant groups of entrepreneurs provided this dynamics and result: (1) peasants who became entrepreneurs, (2) civil servants who became entrepreneurs, and (3) overseas-returned, and engineers-turned entrepreneurs. The success of the Chinese economy arises from a gradual replacement of position-based rights with property-based rights that has triggered this reallocation of entrepreneurial talent.)

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4. Research results and discussion

Entrepreneurship and entrepreneurial talent as a subject of international research. Governments and other stakeholders are increasingly in need of reliable and trustworthy information to make key decisions aimed at stimulating sustainable and efficient forms of entrepreneurship that promote fair competition and the development of entrepreneurial ecosystems. Accordingly, the role of the *Global Entrepreneurship Monitor* (GEM) as the largest collaborative international research initiative that analyses entrepreneurship in all its forms and types, and the characteristics associated with it, taking into account temporal and spatial factors, is becoming increasingly important. This project is a collaborative effort between the non-profit organisation Global Entrepreneurship Research Association, the founding institutions London Business School (UK) and Babson College (USA), and a combined consortium of national teams, predominantly represented by researchers from leading academic institutions. The GEM Global Report 2021-2022 (GEM, 2022) compares the situation in the 52 GEM study countries in 2021, during this challenging turbulent period dominated by the global COVID-19 pandemic. More than 148,000 people responded the GEM surveys in 2021, adding to the core GEM database, which has been collected since 1999 and now includes more than three million responses. 50 national teams took part in the preparation of the GEM 2021 study. These 50 countries are grouped by income level:
Level A: 19 high-income countries with GDP per capita over $40,000;
Level B: 19 countries with GDP per capita between $20,000 and $40,000;
Level C: 12 countries with GDP per capita less than $20,000.

For each country, GEM considers two elements:
1. Entrepreneurial behaviour and perception of entrepreneurship in society.
2. National context and its impact on entrepreneurship.

The second part of the study analyses environmental factors and their impact on business conditions in the country, and more recently also assesses government responses to the pandemic. GEM describes the "context" in terms of the entrepreneurial characteristics of a certain country. These characteristics of the socio-economic environment are called Entrepreneurial Framework Conditions - EFC. To assess the national conditions for the development of entrepreneurship, National Expert Survey (NES) are conducted. The need to conduct them is explained by the lack of data on the specific factors that determine the business environment at the international level. The sample of experts should consist of at least 36 respondents who are carefully selected based on the area of their expertise (must meet one of the conditions for entrepreneurship development) and knowledge.

Since 2018, as part of the GEM study, a composite indicator that reflects the framework conditions for entrepreneurship in the country has been calculated - the National Entrepreneurship Context Index (NECI), which assesses Entrepreneurial Framework Conditions in the country by the ease of starting and developing a business. The National Entrepreneurial Context Index (NECI) brings together EFCs into a single indicator.

The results for 2021 support earlier assertions: the consensus among experts is that the United Arab Emirates, with the highest NECI score of 6.8, may be the best place to start a new business. This is followed by the Netherlands, Finland, Saudi Arabia and Lithuania. All of these countries, with the exception of Lithuania, are Level A economies. Of the five countries with the lowest NECI scores, all but Belarus (Level B) are Level C economies. Latvia, with a NECI of -5.0, ranked 16th (Verhovskaja et al., 2022).

As expected, there is a U-shaped relationship between early-stage entrepreneurial activity and economic development, indicating that higher entrepreneurial activity is not necessarily found in regions with higher economic wealth per capita. The main explanation is that less developed countries have the highest levels of entrepreneurial activity motivated by limited opportunities in the labour market (necessity-driven

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entrepreneurship). However, this does not mean that entrepreneurial activity in such countries is not a driver of socio-economic development. In fact, the quality of entrepreneurship and the number of entrepreneurs, as well as the extent to which entrepreneurship can become a locomotive of social and economic transformations, depends on the conditions created in the country for the development of entrepreneurship.

***Global Talent Competitiveness Index*.** In the global research practice, in relation to a territory, talent is measured either from the position of the competitiveness of a particular territory in relation to talent, or from the position of the creative industries of the economy. In particular, the Global Talent Competitiveness Index (GTCI) is used, the conceptual idea of which is that countries compete with each other in the global space in terms of adapting to talents, nurturing, attracting and retaining talents that contribute to the economic development of a country (Cornell et al. 2018).

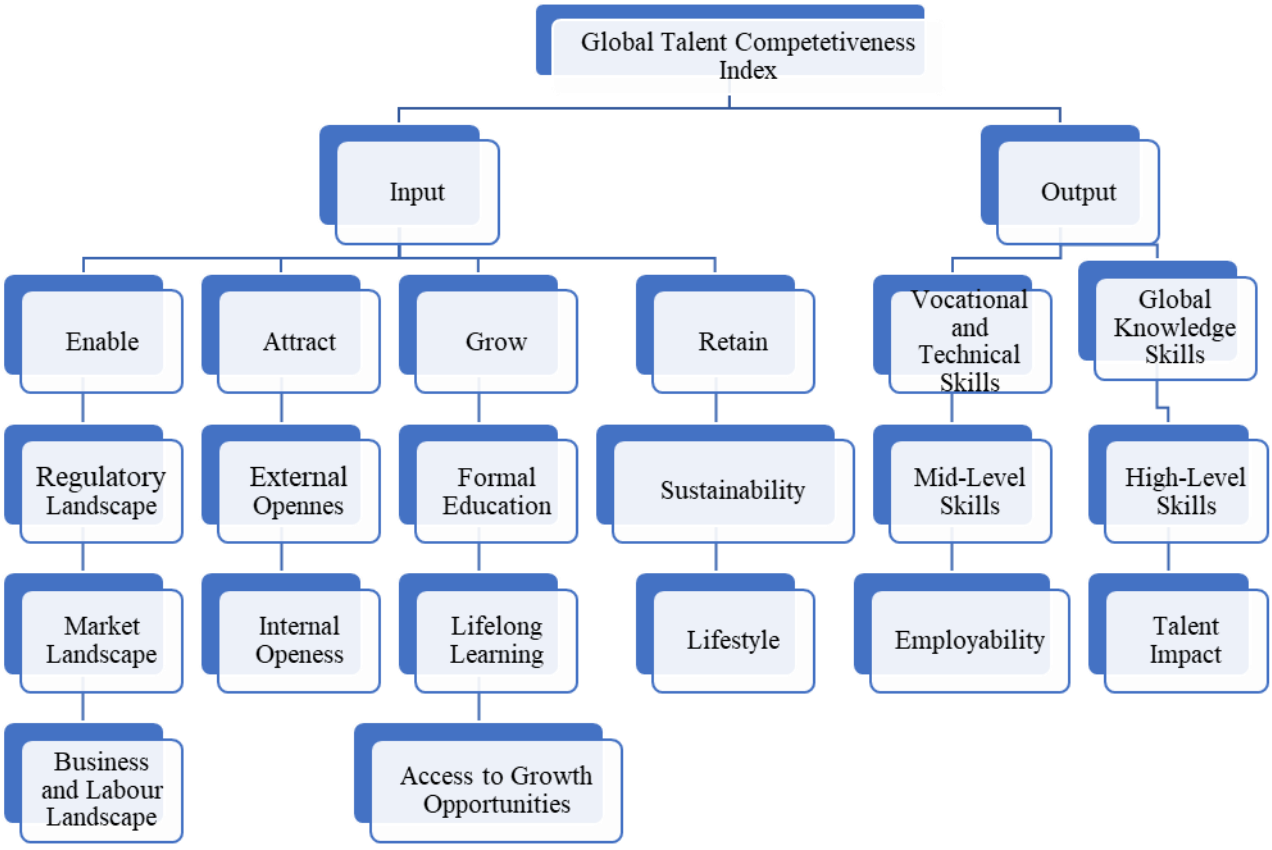


Fig. 5. The Global Talent Competitiveness Index (GTCI).
Source: elaborated by the authors based on (The Global.. 2019).

The GTCI calculation paradigm is an entry-exit model, combining an assessment of the opportunities and means aimed at developing talent in each country ("talent input") with the quality of human capital available to states for use in labour markets ("talent output"). In each country, analysts assessed six key indicators: market and regulatory conditions in the labour market; chances for career growth; the ability of employers to attract skilled labour from around the world; the ability to retain highly qualified personnel; production skills of employees and their global knowledge. (Govorova, 2018)

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Let us compare the GTCI performance over 3 trienniums: 2014-2016 compared to 2017–2019 and 2019-2021. Comparing and contrasting the earlier period with the later period helps to identify general trends in talent competitiveness. A total of 86 countries participated in the GTCI project, of which 42 were high income countries, 27 were upper middle-income countries, 16 were lower middle-income countries, and 1 was a low-income country.

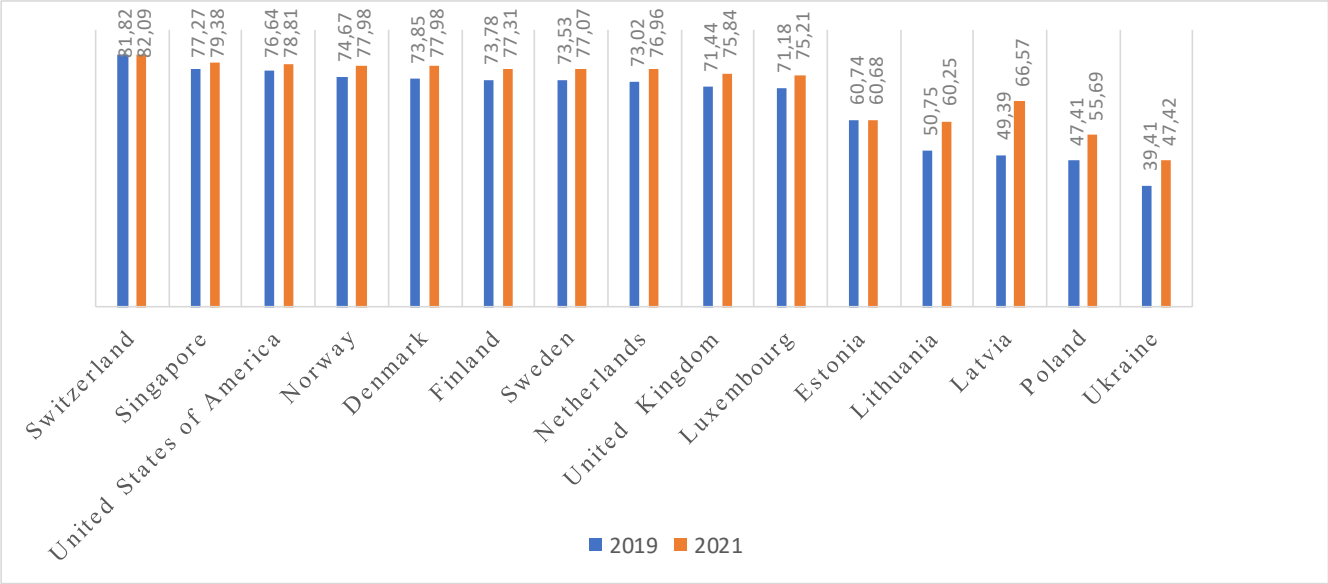


Fig. 6. Global Talent Competitiveness Index 2019, 2021 ranking
Source: elaborated by the authors based on (The Global.. 2019, 2021).

Switzerland leads the index in 2021 with a score of (82,09). Singapore (79,38) and the USA (78,81) take the second and third lines of the index. Switzerland is recognised as the most attractive country for talented and qualified specialists (for the fourth time), and Zurich is one of the most popular cities in the world (2nd place). European countries consistently dominate the rankings, with 7 in the top ten and 14 in the top 20.

According to GTCI, high-income developed countries continue to occupy the top positions in the GTCI scores, and there is a high correlation between GDP per capita and GTCI performance. European countries continue to lead the GTCI rankings; 16 of them are in the top 25, including Estonia (rank 21). Latvia in 2019 occupied the 27th position and Lithuania the 32nd position, noticeably yielding to Estonia. In 2021, the situation has changed somewhat - Estonia, Latvia, Lithuania have moved to new positions – 23rd, 34th, 35th ranks.

Not only states, but also individual regions and cities participate in the competition to attract talents. A special section of the publication is dedicated to the analysis and assessment of cities as key players in the global arena of talent. Addressing the societal challenges associated with digitalisation and automation requires close communication and interaction between stakeholders such as government, municipalities, businesses and educational institutions. The top ten cities also include an overwhelming majority of “Europeans”. Judging by the rating, small cities and megacities are able to combine high quality of life and international career opportunities.

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As the authors of the research note, the pandemic has changed the definition of international talent mobility. As online tools opened new doors to "work from anywhere", a new disparity arose between those who could work online and those who had to be physically present at the workplace. At the same time, according to the authors of the index, more developed countries have the stability to invest in lifelong learning, strengthening skills, and attracting and retaining talent from around the world.

Global Competitiveness Report of the World Economic Forum. The Global Competitiveness Report of the World Economic Forum (2017, 2018) also has metrics that measure countries' talent competitiveness through two separate components included in the Global Competitiveness Index: country capacity to attract talent and country capacity to retain talent.

Latvian researchers, using data from the Global Competitiveness Reports of the World Economic Forum, back in 2014 empirically established the priority of attitudes towards talents in comparison with the quantitative indicators of people with higher education for the economic growth of countries and regions. (Stankevich et al. 2014; Voronov, 2020; Voronov, 2018)

The analysis of the factors analysed in international projects and playing a key role in the struggle of countries for talents allows us to conclude that the real "drivers" of a country's competitiveness include entrepreneurship, science, technology, logistics and education, and the key players here are often not the entire states, but rather individual regions or cities. The traditional physical infrastructure is gradually pushed away to the background in the economic accents of developed countries. The generation, storage, transfer of information and knowledge, healthcare and environmental conservation, focused on the development of human potential, especially the cultivation, retention and attraction of talented entrepreneurs, come to the fore. This means, first of all, an active policy in the labour and educational spheres, promoting entrepreneurship, mobility, lifelong learning and adaptation to dynamically changing market needs.

Entrepreneurship in the Baltic States in the evaluation of international studies. The Baltic countries (Latvia, Lithuania and Estonia), according to international studies, occupy quite high positions in the ratings, in one way or another reflecting the role of entrepreneurship in the economic growth. Thus, Lithuania is highly rated in the latest GEM report. Lithuania ranks 1st among Level B countries in terms of the totality of assessments of various entrepreneurship indicators. This country leads in many areas related to entrepreneurship as the absolute leader of Level B countries. Lithuania leads in the transfer and application of research and development (collected 5,8 out of 10 points), entrepreneurial education in schools (4,7 out of 10 points), commercial and professional infrastructure (6,8 out of 10 points), ease of entry into a new business (in terms of potential difficulties and rules) (6,5 out of 10 points), social and cultural norms (6,2 out of 10 points) and in many other areas.

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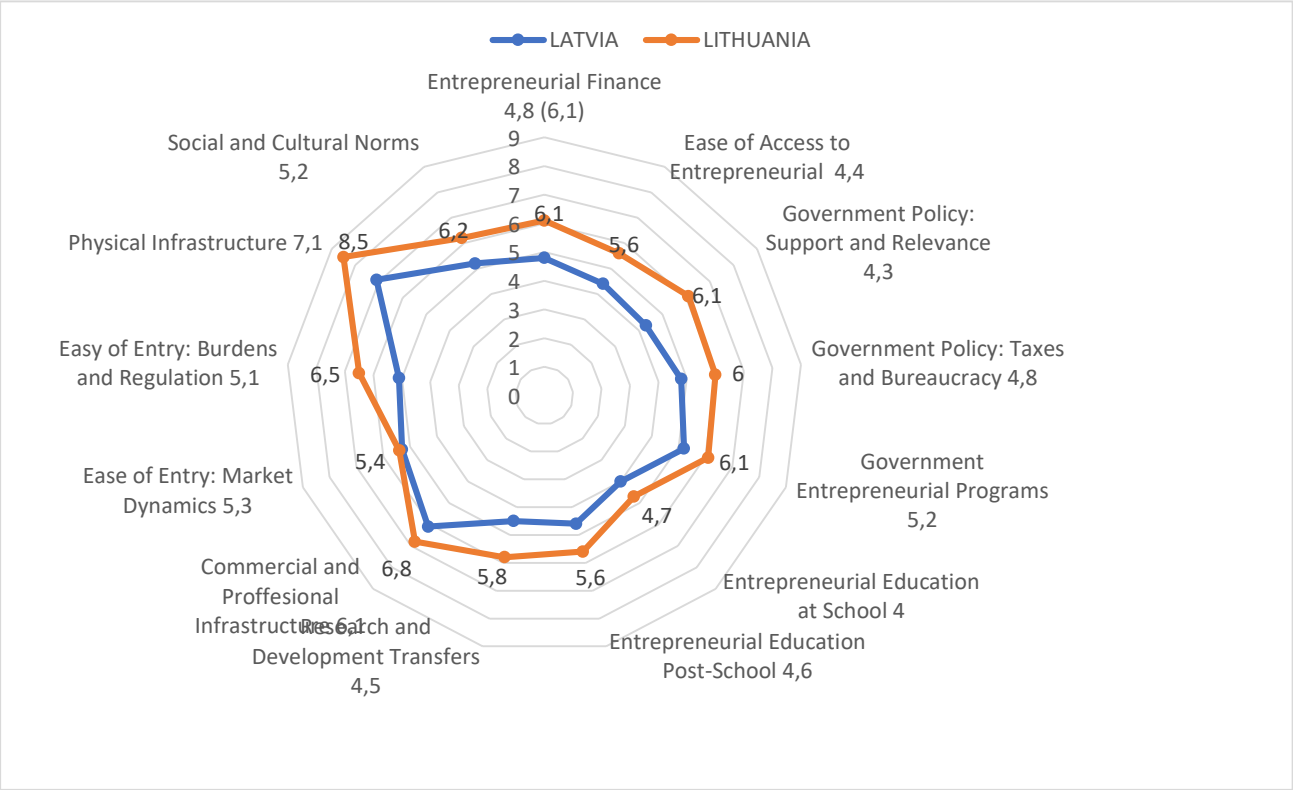


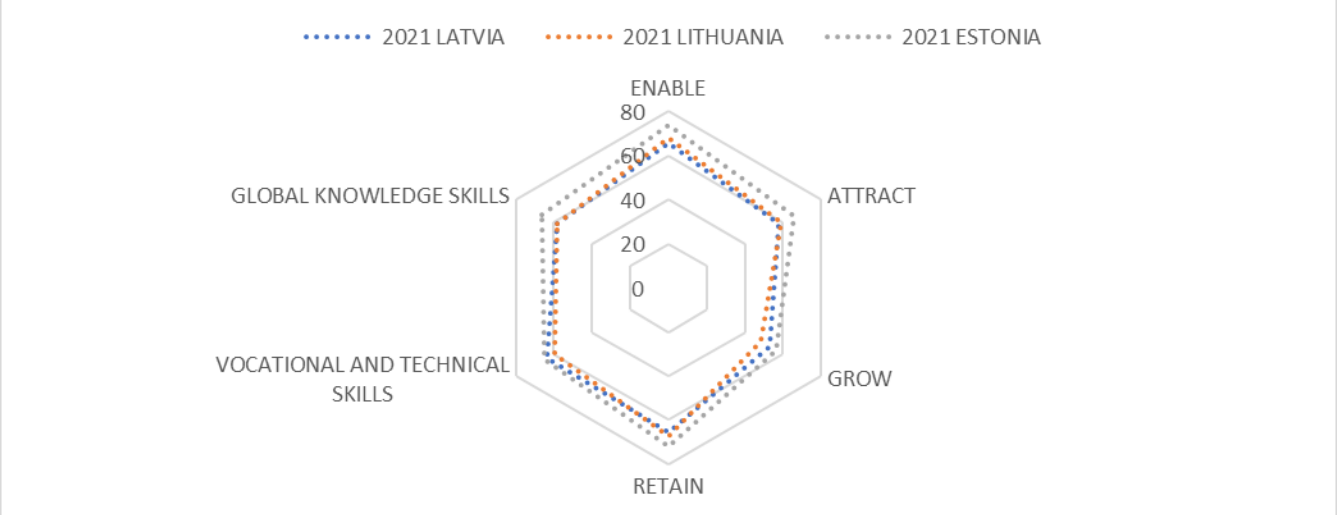
Fig. 7. Expert ratings of the entrepreneurial framework conditions in Latvia and Lithuania.
Source: elaborated by the authors based on (GEM, 2022).

However, when analysing the GEM for Lithuania, one has to emphasise the significant reserves of support for entrepreneurship. Lithuania, like other EU countries, has relatively low scores in entrepreneurial education both at school (4,7) and after school (5,6), although it is ahead of all Level B countries in entrepreneurial education at school. Unfortunately, against the background of Lithuania, Latvia needs even stronger attention to entrepreneurial education both at school (4,0) and after school (4,6)

The GTCI calculation paradigm is an entry-exit model, combining an assessment of the opportunities and means aimed at developing talent in each country ("talent input") with the quality of human capital available to states for use in labour markets ("talent output"). In each country, analysts assessed six key indicators: market and regulatory conditions in the labour market; chances for career growth; the ability of employers to attract skilled labour force from around the world; the ability to retain highly qualified personnel; production skills of employees and their global knowledge.

Global Talent Competitiveness Index (GTCI) for the Baltic States 2021 shows Estonia with 66,57, Latvia – 60,68, Lithuania – 60,25.

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	2019	2021	2019	2021	2019	2021
	Latvia		Lithuania		Estonia	
ENABLE	58,81	65,54	64,48	68,23	72,34	73,80
ATTRACT	46,47	58,04	46,53	59,34	54,96	65,68
GROW	41,68	53,01	47,90	48,54	55,19	56,39
RETAIN	61,90	65,79	64,28	67,37	68,28	71,95
VOCATIONAL AND TECHNICAL SKILLS	48,63	63,71	39,48	59,65	58,03	65,04
GLOBAL KNOWLEDGE SKILLS	38,83	57,96	41,81	58,34	55,63	66,58

Fig. 8. GTCI 2021 Latvia, Lithuania, Etonia Profile by Pillar.
Source: elaborated by the authors based on (The Global..2021).

In their study Selivanova et al. identified the statistically significant factors driving the economic viability of countries around the world, the 2 out of 15 factors: the macroeconomic environment and a country's ability to attract talent. Interestingly, the ability of a country to attract talent, in contrast to the GTCI as a whole, is the most powerful of the 15 factors used in the regression analysis and becomes practically the main incentive for the economic growth of the countries in the modern world. However, the stable and sustainable economic viability of countries in today's world requires their fuller competitiveness in talent, which includes the ability of countries to adapt to talent, attract it, and grow and retain talent in their territory (i.e. GTCI). (Selivanova et al. 2021).

Thus, both in attracting talents and in growing talents, of the three Baltic countries, Estonia received the highest score (65,68 and 56,39). Lithuania ranks second in terms of attracting talents (59,34), Latvia is in third place (58,04), however, in terms of growing talents, Latvia is in the second (53,01), Lithuania (48,54) is in the third place. While, according to quantitative estimates, for example, higher education, Latvia is the leader (64,92), followed by Lithuania (51,33) and Estonia (48,96), according to qualitative estimates, we see the opposite picture - Estonia leads in terms of spending on higher education (76,29), followed by Latvia (58,53) and Lithuania (52,42). Estonia is noticeably ahead of Latvia and Lithuania in terms of university rankings (respectively 34,72; 24,63; 24,27). We are again convinced that for entrepreneurial talent and its transformation into economic growth and competitiveness of the country, it is important not so much quantitative indicators, as qualitative ones.

Although in general there is a moderately strong and statistically significant correlation between the indicator - people with higher education and real GDP per capita (r=0.090, p=0.630), Latvia and its neighbouring Baltic

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regions are below the correlation curve, which means that an additional percentage of people with higher education contributes less than 1% to real GDP growth.

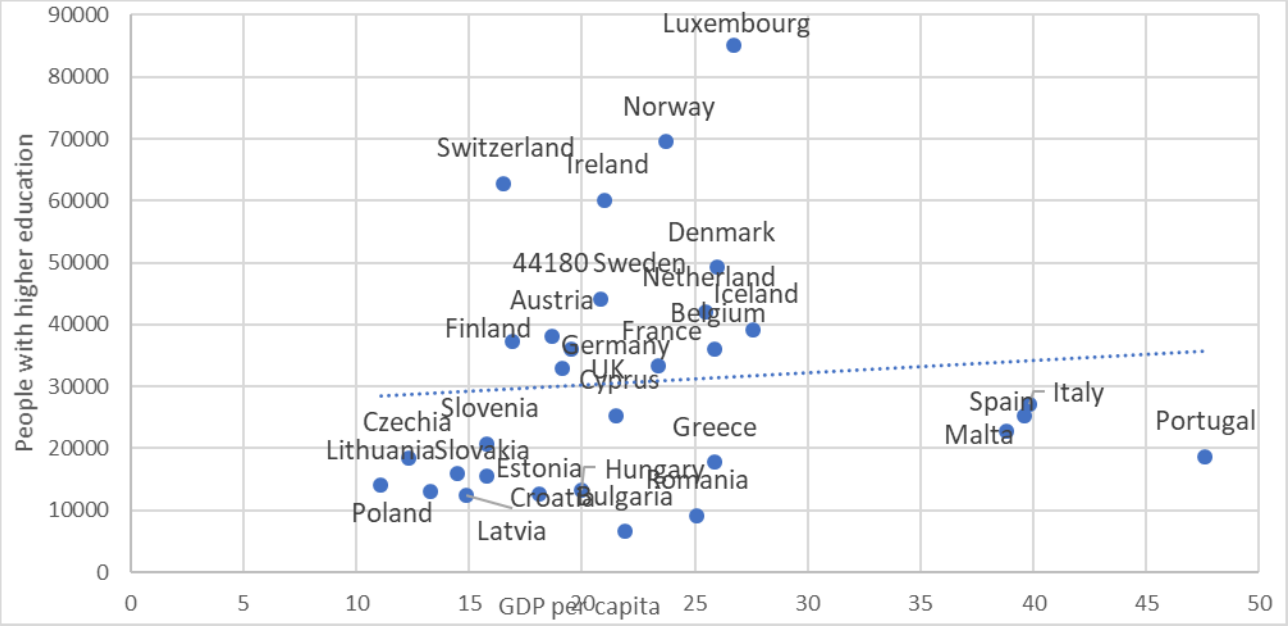


Fig. 9. Correlation interaction of individuals with higher education and GDP per capita, Pearson correlation (2020)
Source: elaborated by the authors based on (Eurostat, 2020)

The quality of education must be improved to meet modern requirements and promote the economic growth. In terms of quality of education, according to GEM, Latvia is inferior to Estonia and Lithuania in terms of Tertiary education expenditure, while in terms of Reading, Mathematics and Natural sciences and University rankings, Latvia is second only to Estonia. (The Global.., 2021)

Although the level of education varies, there is a clear correlation between the quality of a country's educational system and its overall economic position and overall well-being. In general, developed countries tend to offer their citizens a higher quality of education than the least developed countries. Education is certainly a vital factor for overall health condition in any country. According to the Global Partnership for Education, education is considered a human right and plays a critical role in human, social and economic development. (Global Partnership..2020). The annual Top Countries report produced by US News and World Report, BAV Group, and the Wharton School of the University of Pennsylvania, has an entire section dedicated to education. The report polls thousands of people in 78 countries and then ranks those countries based on survey responses. The educational part of the survey collects scores on three equally weighted attributes: a well-developed public education system, the opportunity to enter a university, and the provision of high-quality education. As of 2021, the top ten countries in the ranking of the best educational system are: The United States, The United Kingdom; Germany, Canada, France, Switzerland, Japan, Australia, Sweden, The Netherlands. The Baltic countries in this ranking are in the 42nd place - Lithuania, 44th - Estonia and 50th - Latvia. (Countries, 2021; Konstatntinov, 2019)

Even though the United States has the most popular education system in the world, American students consistently score lower in math and science than students from many other countries. Debates about why the United States' education rankings have fallen by international standards over the past three decades often point to public spending on education not keeping up with inflation.

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Most of the results and rankings regarding education around the world **relate to adult literacy rates and levels of education completed**. However, some studies consider current students and their knowledge and skills in different subjects.

Higher levels of education are usually associated with higher levels of entrepreneurial activity, perhaps because the educated are more confident in having the skills and abilities to start their own business or because they have a greater ability to spot opportunities. Thus, the GEM APS asked respondents about their level of education, which makes it possible to classify respondents with and without higher education, and the coefficient of entrepreneurial activity. Fig. 10 shows the level of TEA for graduates and non-graduates in each country. Those with higher education as opposed to those with the incomplete education are more likely to start their own businesses in 36 out of 47 countries and four of them are in Europe (Spain, France, Italy and Luxembourg), where graduates start their own business more than twice as much as non-graduates. Therefore, as a rule, graduates are more likely to start new business than those with the incomplete education.

11 economies with higher level of entrepreneurship among non-graduates (as opposed to graduates) include two Level C economies (Morocco and South Africa), three Level B economies (Latvia, Kazakhstan and Turkey) and six Level A economies (Norway, Japan, USA, Saudi Arabia, United States United Arab Emirates and Israel). The latter six are among the most knowledge-based economies in the world, and yet those without a higher education are more likely to start a business than those with a degree.

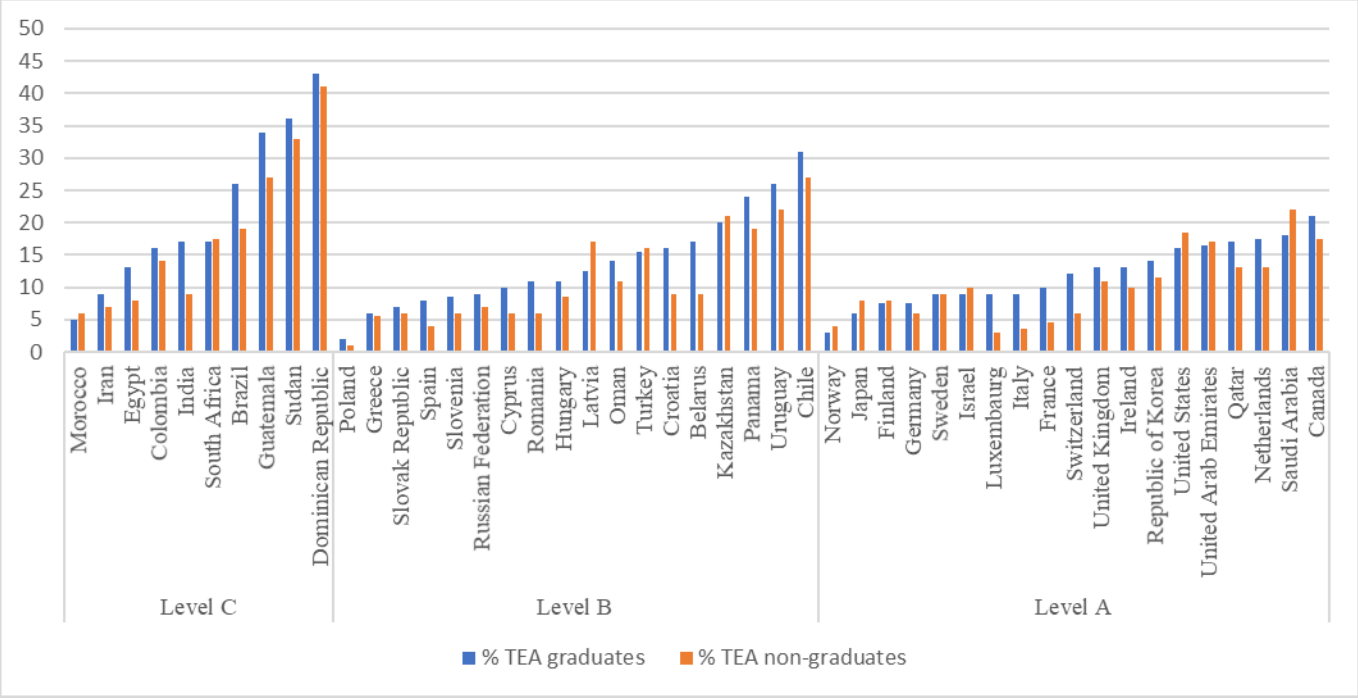


Fig. 10. Levels of Total early-stage Entrepreneurial Activity (TEA) for graduates and non-graduates (% TEA graduates and % TEA non-graduates)
Source: elaborated by the authors based on (GEM, 2021)

On the other hand, in many countries educational systems are considered inadequate. This may be due to internal conflict, economic problems or underfunding of programmes.

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Table 1. Impact Rankings 2022: quality education

	Rank	Name of university	Quality education
Denmark	1	Aalborg University	91,5
Saudi Arabia	2	King Abdulaziz University	89,9
Hong Kong	3	Lingnan University Hong Kong	88,8
Italy	4	University of Bologna	86,8
Latvia	301-400	University of Latvia	58,1-61,9
	401-600	Liepaja University	49,8-58,0
	801-1000	Latvia University of Life Sciences and Technologies	33,7-41,6
	801-1000	Riga Stradiņš University	33,7-41,6
Lithuania	601-800	Kaunas University of Technology	41,7-49,7
	601-800	Vytautas Magnus University	41,7-49,8
	801-1000	Mykolas Romeris University	33,7-41,6

Source: elaborated by the authors based on (Countries with the Best.., 2021)

The Times Higher Education Impact Rankings is the only global performance table that ranks universities by the United Nations Sustainable Development Goals (SDGs), where carefully calibrated metrics are used to provide a comprehensive and balanced comparison across four broad areas: research, management, outreach activities and training. The SDG – the quality education measures the contribution of universities to early and lifelong learning, their pedagogical research and their commitment to inclusive education. The list includes 1180 universities from 106 countries/regions.

Having reviewed the methodology of Impact Rankings 2022: Quality Education (see table 1), it has been identified that Aalborg University in Denmark leads the list, while King Abdulaziz University in Saudi Arabia and Lingnan University in Hong Kong close the top three. Spain is the most represented country in the first top 100 with 11 institutions, followed by Chile. The Sustainable Development Goals (SDGs) cannot be achieved without quality education and the cultivation of innovative and international talents (Jiao et.al 2022). Notably, universities play a central role in growing the entrepreneurial talent (Martínez-Martínez & Ventura, 2020).

Entrepreneurial education at the basic level (primary and secondary education) is rated by most European countries as one of the most negative framework conditions. Experts overwhelmingly recommend entrepreneurship as a pedagogical tool, especially in the early years of schooling.

Over the past 10 years, the proportion of young people under the age of 30 (which includes the vast majority of students) among those who founded their own enterprise has significantly decreased - from 47,1% to 37,5%. Although, according to sociological data, 52% in Latvia and 74% in Georgia of the students surveyed want to engage in entrepreneurship. The main reason, according to the authors, is the lack of a system of training students for entrepreneurial competences in universities, which in fact requires of a modern university to significantly and deeply change its mission. Entrepreneurial universities have a huge role to play in the future (Menshikov & Ruza 2021).

It is legitimate to conclude that, taking the number of innate entrepreneurial talents as a given, investment in education should be used to increase the supply of entrepreneurship in the economy and enhance the

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entrepreneurial culture, in which entrepreneurial universities should play a huge role (Hessels, 2017; Bianchi, 2010; Lackéus, 2020; Nabi et al., 2017; Yang et al., 2021; Ferrante, 2005; Gold, 2017; Gubbins et al., 2018; Holden, 2019; Mackay, 2017; Dutta, 2022; European.., 2014).

5. Conclusions

Entrepreneurship is a powerful catalyst that can help create a level and efficient playing field for developed and developing countries and regions. Building entrepreneurship into the education system and making it more widely accessible is an important step in building an innovative culture, as well as in the rise of individual entrepreneurs and entrepreneurial organisations, which in turn can generate economic growth and jobs and can help improve the quality of life around the world. Despite the enormous growth in the scale of education, many problems remain unsolved. One of the fundamental challenges is related to the formation and enhancement of the role of entrepreneurial talent. Countries compete on a global scale to grow the best talents; attract the talents that are needed; and retain those workers who contribute to competitiveness, innovation and growth. All indicators of The Global Talent Competitiveness Index of the Baltic States (Pillars) in 2021 increased compared to 2019, but still noticeably lower than in high-income countries. The lowest rates are observed in growing talents. Growing in high-income countries should be equal to such countries as the United States (81,32), Singapore (80,33). Of the Baltic countries, Estonia shows the best indicator (56,39). Latvia and Lithuania have Grow scores of 53,01 and 48,54, respectively. In attracting talents, the leaders in high-income countries are Luxembourg (86,75), Singapore (84,06). Of the Baltic countries, Lithuania shows the best indicator (68,23). For Estonia and Latvia, the difference in indicators is insignificant and amount to 65,68 and 65,54, respectively.

Financial investments in higher education provide a very minimal return on investment in the success of the Baltic regions. The quality of education must be improved to meet modern requirements and promote the economic growth. In terms of the quality of education, according to GEM, Latvia is inferior to Estonia and Lithuania in such an indicator as Tertiary education expenditure, while in terms of Reading, Mathematics and Natural sciences and University ranking, Latvia is second only to Estonia. Higher levels of education are usually associated with higher levels of entrepreneurial activity, perhaps because the educated are more confident in having the skills and abilities to start their own business or because they have a greater ability to spot opportunities. Also, the inability of the economy to match entrepreneurial talent with opportunities will mean that efforts to increase the supply of entrepreneurship will have little impact on development. As a result of the global Covid-19 pandemic, many businesses have faced difficulties or even gone bankrupt. Only companies with flexible operations and the ability to quickly adapt to market changes have survived. Others saw the crisis as an opportunity to meet the new needs of the market and come up with fresh ideas for it. The common aspect of these companies is their team of entrepreneurial people who stay passionate and create a culture of constant innovation. It is legitimate to conclude that, taking the number of innate entrepreneurial talents as a given, investment in education should be used to increase the supply of entrepreneurship in the economy and enhance the entrepreneurial culture, in which entrepreneurial universities should play a huge role.

The novelty of the research findings is to empirically confirm the role of entrepreneurial talent in the economic development of the Baltic countries.

The materials, findings and conclusions of the research can be used by research organisations, government bodies, institutions of higher education, student organisations. Our research may make scientists - entrepreneurs and strategists realise how important it is to modernise Latvian higher education, thereby making a huge contribution to the development of the economy

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INTEGRATED WATER RESOURCES MANAGEMENT IN AN URBAN CONCEPT: RESULTS FROM WATER SMART CITIES AND WATER MANAGEMENT INSTITUTIONS IN SLOVAKIA*

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Abstract. Climate change, urbanisation and population growth are creating the necessity in urban systems to integrate the management of water resources which volume been significantly declined. Several cities are already feeling water stress. The solution is to conceptualise Smart Cities that are considering aspects of effective water resources management. Countries like Slovakia have not been adequately considering these issues as much as they should. Responding to the opportunity to fill a research gap, primary research has been conducted that seeks i) to update data from the Arcadis Sustainable Cities Water Index in selected cities and for Slovakia; ii) to identify the current situation in integrated water resources management both globally and in Slovakia; and iii) to propose a process for integrated management of limited water resources based on our own research findings. Research data were collected through sociological interrogation that was processed and subsequently evaluated. The findings point to the need to build resilience, efficiency and quality in water resources both in urban environments and in water management institutions. The main output from this paper is a proposed process for managing water resources within the Smart Cities concept. It can be utilised for strategic city management, water management institutions, fellow researchers and residents of any city implementing it in their own practices. Part of planned future research is to verify the process in practice.

Keywords: integrated water management; sustainable development; water management institutions; strategic management practices for sustainability

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1. Introduction

Water is the driving force behind the emergence and development of human civilisation, which climate change is significantly affecting (Kopáček et al., 2021; Stelian, & Juhasz, 2022).

According to a 2019 study by Nature Climate Change, it has had a rapid impact on both groundwater and drinking water supplies (Szalai, 2019). Most countries in the world have reached the final phase, which means that more than 10,000 years will be required for water resources to regenerate from the state of their current ecosystems (Szalai, 2019). Scientists foresee up to 4.5 billion of Earth's population by 2025 experiencing water scarcity due to stress on water supplies (Mann, 2021).

Climate change affects both social and ecological systems with positive and negative interlinkages between them. To conserve limited water resources in future, Smart Cities need to incorporate integrated water management into their urban concepts (Kleinová, 2018; Nzimakwe, 2020; Alexopoulos et al., 2021; Elgamal & Khafif, 2021; Todorova & Parzhanova, 2020).

2. Research background

Several authors have taken different approaches to conceptualising integrated water management. Taji et al. (2021) define it as urban development to capture water, construct water ecosystems for cities and create a community for conservation and low consumption of water resources. They argue for the incorporation of modern technology, adaptation and transparency in water management (Taji et al., 2021).

Vacca (2021) defines integrated water management as citizen-centred (social) management that responds flexibly to a growing urban population through sustainable, safe water resource solutions. Jindal et al. (2022) define the term as the monitoring of consumed water in order to ensure its sufficiency, quality and availability within the entire urban area.

This paper views the concept of integrated water management as a comprehensive and flexible approach to managing limited water resources in response to climate change. It operates on the basis of elements and the relationships between them.

The issue of integrated water management in global Smart Cities has been discussed in several scientific publications. The most recent studies conducted this year have concentrated on flood management, applications and the economic framework (Yereseme et al., 2022; Oberascher et al., 2022; Grigg, 2022).

Best water practices in Smart Cities can be analysed by using the Arcadis Sustainable Cities Water Index. This index was selected based on our previous research (Šulyová et al., 2021; Šulyová & Kubina, 2021b). The ranking in Arcadis Sustainable Cities Water Index was last updated in 2016. The articles that used the given ranking in their analyzes used data from 2012 and 2016. However, updating the data with analyzes conducted from other studies only reflects the situation in 2020 and uses mostly secondary data (Maiolo et al., 2018; Batten, 2018; Hoekstra et al., 2018; Alkhalidi et al., 2018; Sáez et al., 2020; van Ginkel et al., 2018).

In Slovakia, water resources are likewise in an unfavourable situation, with scientists predicting 30-50% less water in Slovakia by 2075. Local resources have felt the impact of climate change since the 1980s (Szalai, 2019). Even though Slovakia has no Smart Cities itself, as part of our own research activity, we deal with building this

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concept in the given area (Šulyová & Vodák, 2020; Kubina et al., 2021a; Kubina et al., 2021b; Vodák et al., 2021; Šulyová et al., 2021; Šulyová & Kubina, 2022a; Šulyová & Kubina, 2022b).

The most water-stressed parts of Slovakia can be found in the west and south of the country, while eastern Slovakia's water stress is moderate and the north of Slovakia is the least stressed.

Climatologists believe Slovakia's climate to be moving closer to what countries like Croatia and Bulgaria are now experiencing. According to the Slovak Hydrometeorological Institute (SHI), the amount of precipitation in Slovakia has changed dramatically since 2000 (Pekárová, 2018). The European Union Water Framework Directive (2000/60/EC) seeks to regulate the situation legislatively with the objective of good water status achievable by 2027 and for updates every six years. The last update took place in 2021 (Strelková, 2021).

All locations in Slovakia are currently experiencing a shortage of water resources. Slovakia's population consumes 630 cubic metres of water each year, of which 58% of the total comes from groundwater and 52% from surface freshwater resources. According to Pekárová (2018), industry consumes the most water resources (52%), followed by households (43%) and agriculture (5%). It has become crucial to learn from mistakes of past civilisations and droughts Slovakia experienced between 1861 and 1870 (Pekárová, 2018). A timely response is essential when contending with the alarming situation in water resources.

In the face of the critical situation described above, there were relevant articles published that discussed integrated water management in Slovakia, appearing in 1994, 2016 and 2017. They focused on trends in water use, reservoir water and wastewater treatment (Zeleňáková et al., 2017; Fidlerová & Hlúbiková, 2016; Námer & Hyánek, 1994).

Nevertheless, an opportunity to fill the emerging research gap has been presented by the severity of the crisis in water resources, the relative lack of research into the issue, outdated Arcadis rankings and the lack of primary sources.

The aim of this article is i) to update data from the Arcadis Sustainable Cities Water Index in selected cities and for Slovakia; ii) to identify the current situation in integrated water resources management both globally and in Slovakia; and iii) to propose a process for integrated management of limited water resources based on our own research findings.

The basis of the research activity is represented by the research questions set out in section 3 and the hypotheses that serve to verify, describe and better understand the issue in the territory of Slovakia, as follows:

Hypothesis 1: *If climate change is directly related to population size, then water scarcity will be reflected in Slovakia's large cities (with populations greater than 100,000).*

Hypothesis 2: *If a city's readiness to implement the Smart City concept is related to the factors of water resources management/troubleshooting water issues, then the greatest potential for Slovakia successfully implementing the Smart City concept in the area of water resources management have cities with populations greater than 100,000.*

3. Methodology

Study area – the research was focused on the world's best practice Smart Cities according to a selected ranking and on cities in Slovakia. Among member states of the European Union, Slovakia ranks 31st by population. Its area is 49,035 square kilometres and the population is 5,449,270 (Slovensko – regionální geografie, 2022; Slovensko, 2022; Slovenská republika – sumárne štatistiky, 2022). Slovakia has no Smart Cities itself at this time

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although initial conceptualisation initiatives started in 2017. They remain only theoretical and the concepts have yet to be put into practice (Bakonyi, 2020). None of the plans presented have ever been implemented (Ministerstvo hospodárstva Slovenskej republiky, 2017). However, climate change, migration and population growth, evident in the scarcity of resources, are creating the conditions for conceptualising Smart Cities and pressure is being put on Slovakia to follow through on its first Smart Cities and to embrace principles of integrated water management. Research involved the contact of 71 sufficiently populated district cities, covering an adequate enough area to be feasible, out of the 141 cities registered in Slovakia's eight regions (Zoznam miest na Slovensku, 2022).

The aim of article is i) to update data from the Arcadis Sustainable Cities Water Index in selected cities and for Slovakia; ii) to identify the current situation in integrated water resources management both globally and in Slovakia; and iii) to propose a process for integrated management of limited water resources based on our own research findings.

Intensive research needed to be carried out because Smart Cities are a topic that has not been sufficiently covered in Slovakia and no research with this type of focus had been previously done in Slovakia. The results bring new findings and fill a research gap that exists according to section 2. Obtained results from this paper can serve as a basis for identifying best practice and adopting best practices in another Smart Cities, water management institutions, fellow researches or strategic city management. Obtained results can have positive impact also on resident´s motivation for protection of limited water resources.

Subjects of research – Smart City respondents consisting of the following:

- The world's best practice cities according to the rankings in the 2016 Arcadis Sustainable Cities Water Index (Batten, 2016);
- Slovakia's 71 district cities (see Appendix 1);
- Representatives from water management institutions in Slovakia responsible for managing water resources: Department of Strategic Water Planning at the Ministry of the Environment, Slovak Hydrometerological Institute, Slovak Water Management Company, Water Management Research Institute and Slovak Environmental Inspectorate.

Cities in Slovakia were categorised by their size into five groups:

1. Less than 6,000 (two cities)
2. 6,000 – 10,999 (5 cities)
3. 11,000 – 19,999 (22 cities)
4. 20,000 – 99,999 (40 cities)
5. 100,000 or more (two cities)

For research purposes, contact was made with cities which water management practices had been ranked best by the 2016 Arcadis Sustainable Cities Water Index. The intention behind selection of the cities to approach was to include twelve best practice cities, chosen according to their position in the rankings. In addition for the sake of interest, a city from among those ranked in the middle of the index ranking and a city from the bottom of the ranking were randomly selected. All of the subjects of research (respondents) were approached and given a questionnaire survey over a 14-month time interval (June 2021 to August 2022).

Arcadis Sustainable Cities Water Index – Arcadis was selected due to its previous use in our research and our ambition was to follow up on this research. Because the ranking of the cities had not been updated since 2016, an opportunity was created to fill a gap with our own research. Arcadis is a consultancy that has identified 50 cities in 31 countries across the globe as samples for its Sustainable Cities Water Index. The cities were selected on the

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basis of their extensive geographical coverage and took into account their economies and environmental aspects in their sustainable consumption of water resources. Table 1 displays the three elements examined in compiling the Sustainable Cities Water Index. Each element consists of a group of indicators assessed on a scale from a minimum of 0 to a maximum of 100 (Batten, 2016).

Table 1. List of indicators characterizing the elements of sustainable Water Smart Cities

	Resilience	Efficiency	Quality
	Water stress level	Fees	
	Lots of green	Consumption measurement	Pollution of streams
Elements	Flood risk	Sanitation	Sanitation
	Risk associated with natural disasters	State of drinking water	Drinking water level
	Water balance	Water recycling	
	Water reserves	Flow	

Source: own processing according to Batten, 2016

Methods – primary research was comprised of sociological interrogation with an online questionnaire created in Google Forms, which contained the research questions below. They were developed from previous research and the results therefrom, with the aim of follow-up research and to prepare this article.

- To what degree do the indicators cover urban resilience in specific cities?
- To what degree do the indicators cover efficiency of water resources in specific cities?
- To what degree do the indicators cover quality of water resources in specific cities?
- What specific cities are experiencing water scarcity?
- What is the level of the city's strategic management's readiness to put the Smart City concept into practice?
- Does integrated water resources management stimulate principles of sustainable urban development?
- What are the implications of climate change for water resource management?
- What drove integrated water resources management to be implemented?
- What economic measures for water resources management are exploited by stakeholders?
- Which water resources management activities are being implemented?
- What elements are used to manage limited water resources in urban environments?
- What processes have been implemented within the social aspect of water resources management?

Data obtained from responses to the resilience, efficiency and quality research questions were then used to update the Arcadis rankings. The data obtained from the questionnaires were then statistically processed in IBM SPSS Statistics 26 software, where the variables were correlated according to their type for ordinal numbers with Spearman's rank correlation coefficient (rho) to compare two variables. In addition to the statistical tests, a hypothesis verification method and a Pareto distribution diagram were also used. Comparative methods were applied through benchmarking for the results from Smart Cities and water management institutions in Slovakia, while problem-solving methods such as modelling, creativity, logic, synthesis, induction and deduction contributed toward the development of a process for integrated water resources management.

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4. Results

4.1. Profile of respondents

4.1.1. Sampled cities

After contacting mayors in selected cities several times with an online questionnaire, responses were obtained from 10 Smart Cities around the world (71.4% success rate) and all 71 district cities in Slovakia (100% success rate). The Table 2 shows in boldface the cities that participated in the research. Institutions in Slovakia responsible for water resources management were including because there is no Smart City or Water Smart City in Slovakia to represent it.

Table 2. Selection of addressed places, area of integrated water resources management

Arcadis Sustainable Cities Water Index	**Water Smart Cities**	**Ranking**	**Selection argument**
Top	**Rotterdam**	1.	Best practice
	Copenhagen	2.	
	Amsterdam	3.	
	Berlin	4.	
	Brussel	5.	
	Toronto	6.	
	Frankfurt	7.	
	Sydney	8.	
	Birmingham	9.	
	Manchester	10.	
	Melbourne	11.	
	Paris	12.	
Middle	**Seoul**	23.	Random choice
End	**Rio de Janeiro**	44.	

Source: own processing according to Batten, 2016

4.1.2. Slovakian water management institutions sampled

Questionnaires were completed by five representatives from institutions in Slovakia that are responsible for water resources management: Department of Strategic Water Planning at the Ministry of the Environment, Slovak Hydrometerological Institute, Slovak Water Management Company, Water Management Research Institute and Slovak Environmental Inspectorate.

4.2. Verification of hypotheses

Water-related issues caused by climate change (rated on a scale of 1-3 where 1 equals minor, 2 equals moderate and 5 equals significant) and city size (five specified categories – see the research background section 3) are ordinal variables of Hypothesis 1 (Table 4). Because it was an element in the particular research question, information needed to be obtains on water scarcity indicators.

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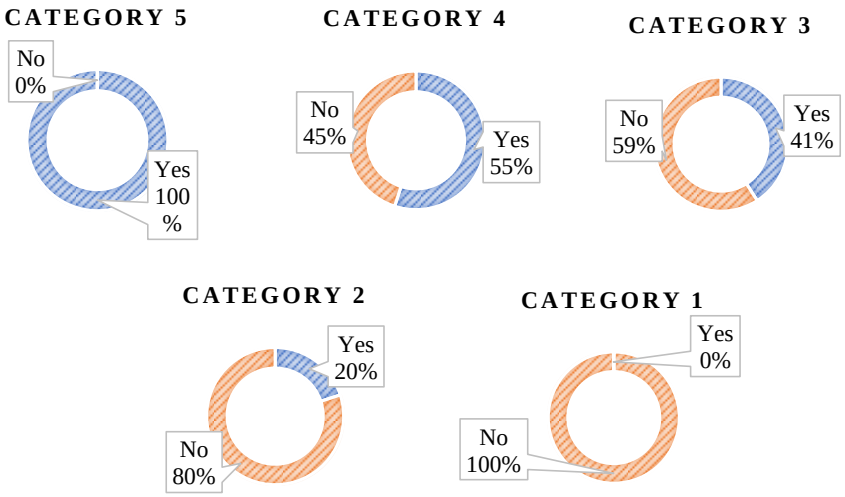


Figure 1. Problems with lack of water resources in five categories of cities in Slovakia
Source: own processing according to research data

What specific cities are experiencing water scarcity?
The collected data covers five categories of cities dependent on their size (see Figure 1, in order of relevance from the largest to the smallest cities). The following findings can be reasoned from the results:

- Category 5 – water scarcity was confirmed in both cities with populations greater than 100,000
- Category 4 (population 20,000 – 99,999) – of the 40 cities, 55% indicated that water scarcity existed
- Category 3 (population 11,000 – 19,999), Category 2 (6,000 – 10,999) and Category 1 (less than 6,000) – a decreasing number of these cities indicated that water scarcity existed.

The results show a correlation between water scarcity and population, but it needs to be confirmed through statistical verification (Table 4).

What is the level of the city's strategic management's readiness to put the Smart City concept into practice?
The nature of the research questions required information to be obtained about the level of readiness to implement Smart City concepts in practice and on the water scarcity indicator (Figures 1 and 2). Figure 2 and Table 3 show the processed results and how they were interpreted. They show that the cities in Bratislava Region are the most prepared to adopt the Smart City concept into practice.

Table 3. Average value of city readiness for the Smart City concept by region

Region	Readiness (average value)
Bratislavský	6.4
Banskobystrický	2.1
Košický	2.9
Nitriansky	2.4
Prešovský	2.5
Trenčiansky	2.8
Trnavský	2.8
Žilinský	3.4

Source: own processing according to research data

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Cities in Žilina and Košice Regions were the second and third most prepared, respectively. But compared to Bratislava Region, they were on average about two times less prepared.

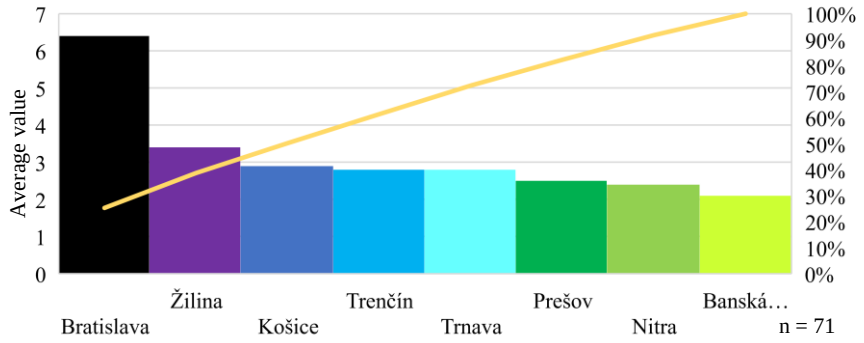


Figure 2. Readiness of Slovak cities according to regions for the building of the Smart Cities concept
Source: own processing according to research data

Statistical verification of the hypothesis

The correlation between the variables was statistically verified by Spearman's rho, as displayed in Table 4.

Table 4. Statistical verification of hypotheses

Hypothesis 1			
Spearman´s rho		Problem_water	Size
Problem_water	Correlation coefficient	1,000	,447**
	Sig.	-	,000
	Number/Amount (N)	71	71
Size	Correlation coefficient	,447**	1,000
	Sig.	,000	-
	Number/Amount (N)	71	71
Hypothesis 2			
Spearman´s rho		Problem_water	Readiness
Problem_water	Correlation coefficient	1,000	,548**
	Sig.	-	,000
	Number/Amount (N)	71	71
Readiness	Correlation coefficient	,548**	1,000
	Sig.	,000	-
	Number/Amount (N)	71	71

** the correlation is significant at level 0.05

Source: own processing according to primary research data

The information argues for a direct link between population size and climate change. Data processing highlighted water scarcity issues in large cities with a population of over 100,000, while Spearman's rho confirms a significant correlation, therefore Hypothesis 1 is accepted. The results in Table 4 confirmed a significant level of correlation between the variables of water scarcity and readiness, So Hypothesis 2 is accepted.

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4.3. Assessment of data for updated rankings in the Arcadis Sustainable Cities Water Index

4.3.1. Resilience

To what degree do the indicators cover urban resilience in specific cities? (1 = minimum, 10 = maximum)

The optimal number of points for evaluating urban resilience should be 15. In water resources management, such issues as lack of water resources, green areas, risk associated with water disasters, flood threat and unbalanced water consumption should score 1 point (total of 5 points).

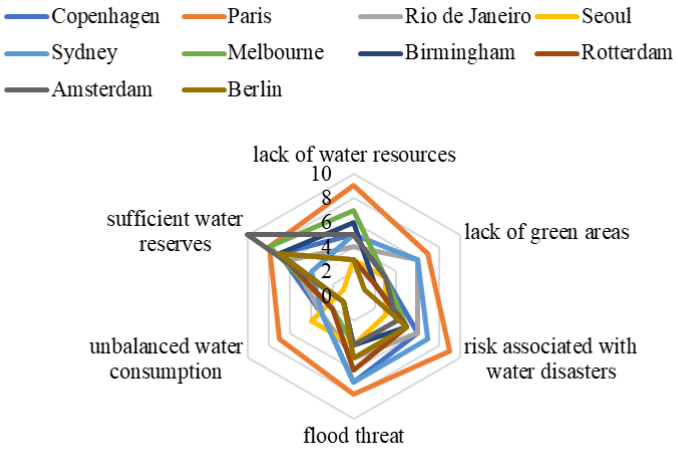


Figure 3. Benchmarking in the area of the resilience element of the world's best water practices
Source: own processing according to research data

If a city has sufficient water reserves, it should optimally score 10 points for it. Amsterdam has the most water reserves, Seoul the least. Paris scores the lowest in urban resilience according to the benchmarking in Figure 3. The Slovak Hydrometeorological Institute gave the most positive assessment of water resources (Figure 4).

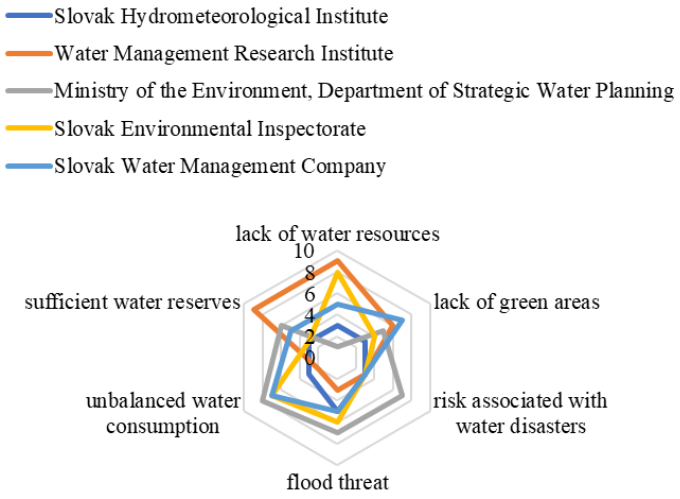


Figure 4. Benchmarking in the field of resistance element in Slovakia
Source: own processing according to research data

The opinion of the five Slovakian institutions was that the values coming out of the benchmarking were hardly uniform and large differences between them could be seen. For example, the Water Management Research

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Institute evaluated water reserves at nine points, the Ministry of the Environment gave six points, the reserves scored only five points with the Slovakian Water Management Company and both Slovak Hydrometeorological Institute and the Slovak Environmental Inspectorate assessed them at only three points. Awareness of the current state of the examined indictors in Slovakia can be described as ambiguous and chaotic.

4.3.2. Efficiency

To what degree do the indicators cover efficiency of water resources in specific cities? (1 = minimum, 10 = maximum)

In the optimal case of integrated water resources management, high water leakage, water charges and insufficient provision of water services should score only one point (for a total of three points). Conversely, elements such as waste water reuse, monitoring of consumed water and drinking water levels, including sufficient level of sanitation, should receive the full ten points each (for a total of 40 points). Therefore, the optimal number of points for a best practice city should be 43 points.

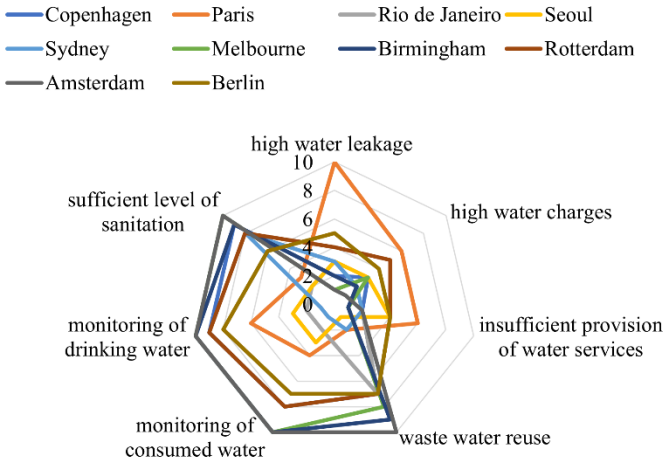


Figure 5. Benchmarking in the area of efficiency of world cities of best water practice
Source: own processing according to research data

Birmingham and Melbourne received the best scores for water resources efficiency according to the benchmarking on Figure 5. The least efficient city from the outcome of primary research was Seoul. The five institutions in Slovakia rated efficiency quite homogeneously (Figure 6).

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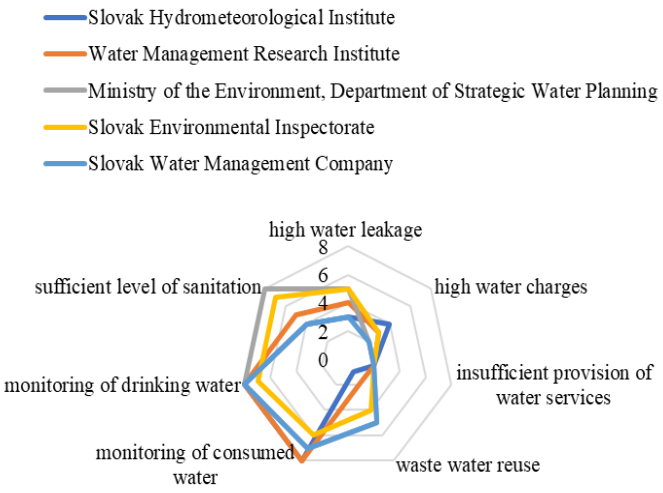


Figure 6. Benchmarking in the field of efficiency element in Slovakia
Source: own processing according to research data

Slovakia's monitoring is optimal according to the results from the assessment, although the country in general does not make adequate use of wastewater.

3.3.3. Quality of water resources

To what degree do the indicators cover quality of water resources in specific cities? (1 = minimum, 10 = maximum)

Optimally, regular wastewater treatment should be assessed at ten points in water quality, while the other benchmarks in Figure 7 would be awarded one point each (for a total of three points).

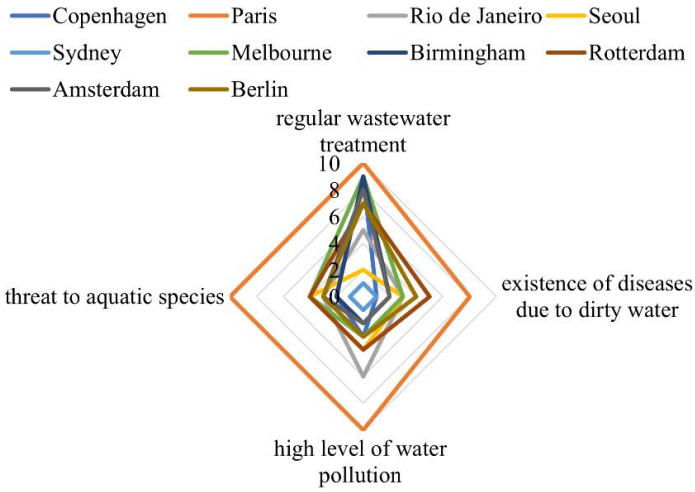


Figure 7. Benchmarking in the area of water quality element of best water practice
Source: own processing according to research data

The overall optimal score should therefore be 13 points. Figure 7 show cities such as Seoul, Birmingham, Melbourne, Amsterdam and Berlin to come closest to the optimal state in benchmarking results, while Paris received the least optimal score. In Slovakia, both the Ministry of the Environment and the Slovakian Environmental Inspectorate have taken a critical view of quality (Figure 8). Although wastewater is regularly

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treated in Slovakia according to the assessment of quality, efficiency data indicates that these water resources are not reused.

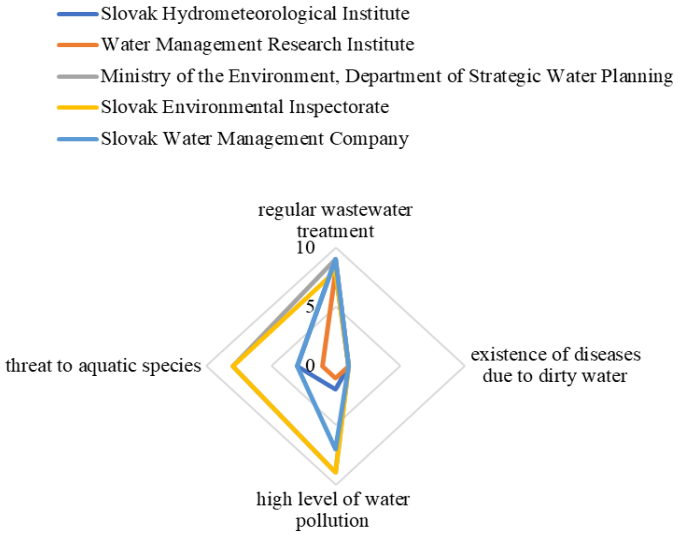


Figure 8. Benchmarking in the field of water resources quality in Slovakia
Source: own processing according to research data

In pollution of water resources, none of the institutions have taken the same view regarding the existence of diseases due to poor water quality and the threat they pose to aquatic species. However, the most relevant opinion here is expressed by the Ministry of the Environment and Slovak Environmental Inspectorate, both of which monitor water quality.

4.4. Integrated water resources management

Part of this paper concentrates on the responses to research questions and findings from them have identified the current state of water resources management in both the world's best water practice cities and in water institutions operating in Slovakia (because of the absence of Smart Cities in the country).

Does integrated water resources management stimulate principles of sustainable urban development?
An overwhelming majority of global respondents believe that integrated water resources management significantly stimulates principles of sustainable urban development. On a scale of 1 (minimum) to 10 (maximum), Figure 9 assesses water resources management institutions in Slovakia for their level of stimulation at 6, 9 and 10 points.

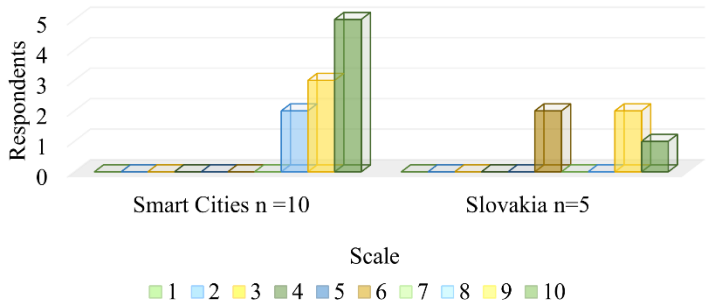


Figure 9. Evaluation of the impact of stimulating water management on sustainable urban development
Source: own processing according to research data

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The result suggests that the world's Smart Cities consider integrated water resources to be more related to sustainable urban development.

What are the implications of climate change for water resource management?
Using a scale of 1 (minimum) to 10 (maximum), the answers given by both global and local respondents suggest that climate change has a significant impact on effective water resources management. The respondents from foreign Smart Cities rated the implications at 8-10 and the institutions in Slovakia put them at 7-8 out of a possible 10 points (Figure 10).

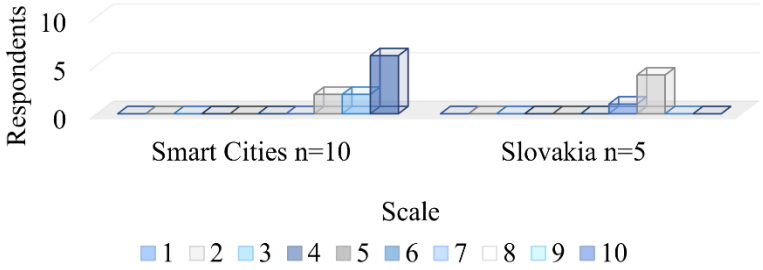


Figure 10. Impact of climate change on water resources management
Source: own processing according to research data

What drove integrated water resources management to be implemented?
Respondents consider climate change, out of the five options shown in Figure 11 in the global Smart Cities' best water practices, as the main driver for implementing integrated water resources management.

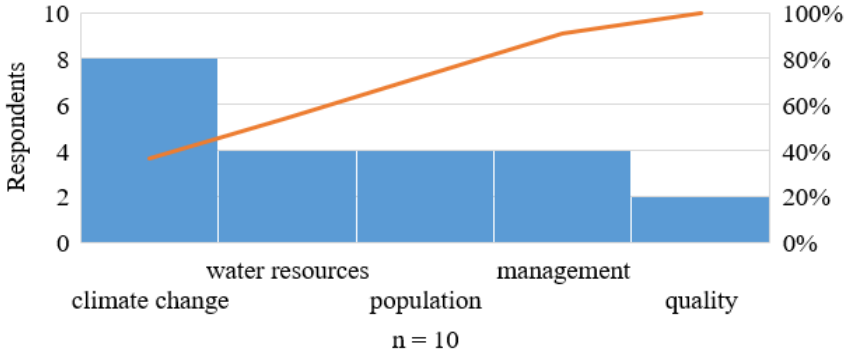


Figure 11. Reasons for the implementation of integrated water management - world cities
Source: own processing according to research data

Second place was occupied by water scarcity, linked to the growing urban population. According to the answers the selected sample of respondents provided, neither management nor quality of water resources were seen to be the key causes behind the emergence of the necessity to implement integrated water resources management in practice based on Smart City approaches. Figure 12 shows the key reasons for water resources management, according to the five water institutions in Slovakia, to have been current ineffective management of scarce resources, climate change and poor water quality.

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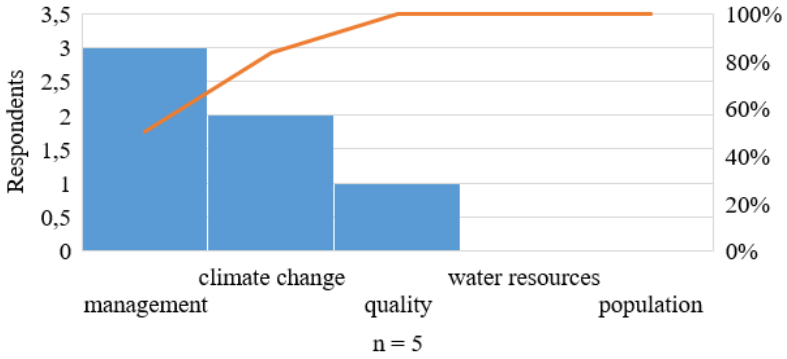


Figure 12. Reasons for the implementation of integrated water management - water institutions in Slovakia
Source: own processing according to research data

None of the respondents associated climate change with the gradual reduction in the limited number of water resources, which rapid decline they put down to population growth. While representatives of Smart Cities are aware of the links, water institutions in Slovakia are not. In discussing ineffective management of scarce water resources, the Department of Strategic Water Planning at the Ministry of the Environment attributed the low level of effective management mainly due to its fragmented nature.

What economic measures for water resources management are exploited by stakeholders?
Cities and institutions, irrespective of geography, currently favour negative form of motivation such as higher sanctions for inefficient water consumption over subsidies for efficient water management (Figure 13).

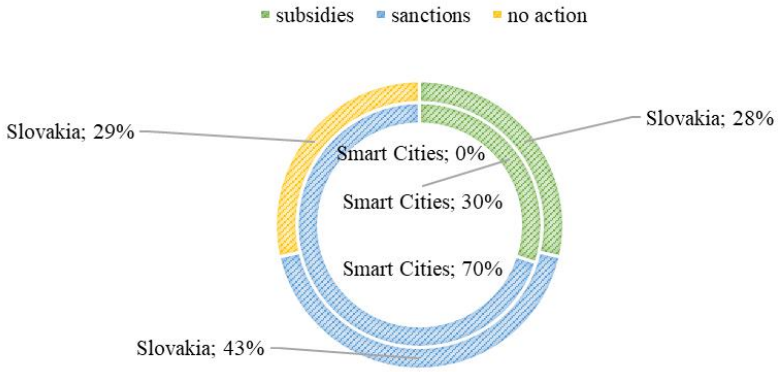


Figure 13. Evaluation of measures in the field of water resources management
Source: own processing according to research data

The Department of Strategic Water Planning stated that sanctions are imposed on national water administration authorities and district authorities and on cities when either violate general binding regulations governing them. Slovak Hydrometeorological Institute believes economic tools such as sanctions and financial assistance to be only supportive. Slovakia therefore emphasises regulatory instruments and planning more, while not imposing any action.

Which water resources management activities are being implemented?
The best water practice cities globally primarily act to control, storage and monitoring of water resources (Figure 14).

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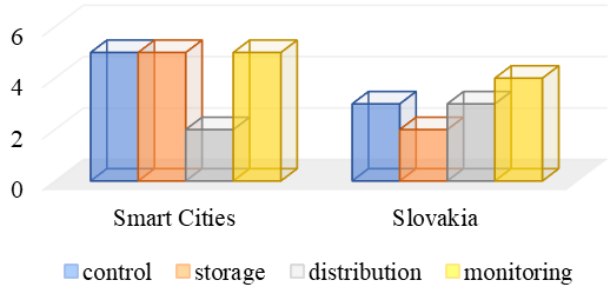


Figure 14. Evaluation of the implemented activities of the city in the field of water resources
Source: own processing according to research data

In Slovakia, a city manages its water resources primarily through control and monitoring.

What elements are used to manage limited water resources in urban environments?
Figure 15 shows 90% of the Smart Cities selected from the 2016 Arcadis ranking consider plans, watercourse maps, information systems, guidelines and regulation on water consumption to be the key elements in water resources management.

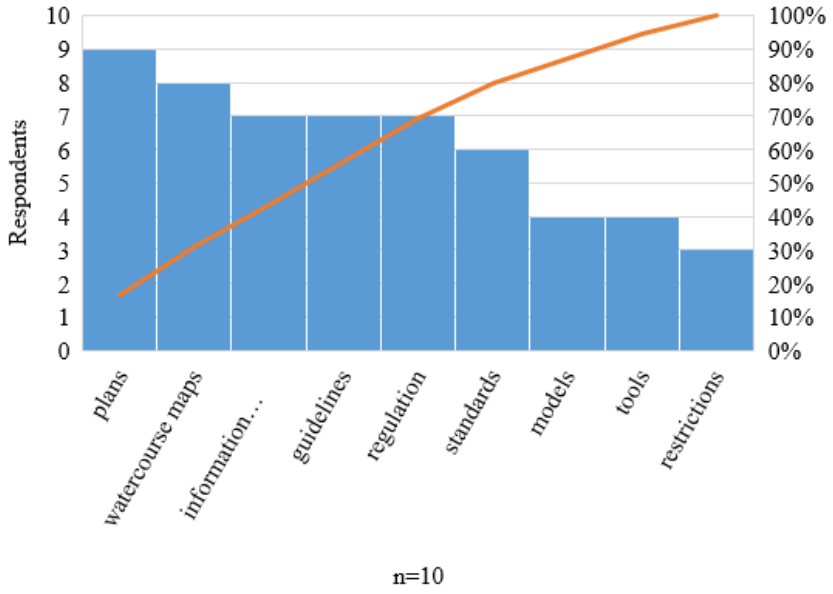


Figure 15. Elements of water management in the urban environment - the world's best water practice
Source: own processing according to research data

The least preferred option is restrictions. The outcome of research, displayed in Figure 16, list Slovakia's key elements as watercourse maps, plans and information systems.

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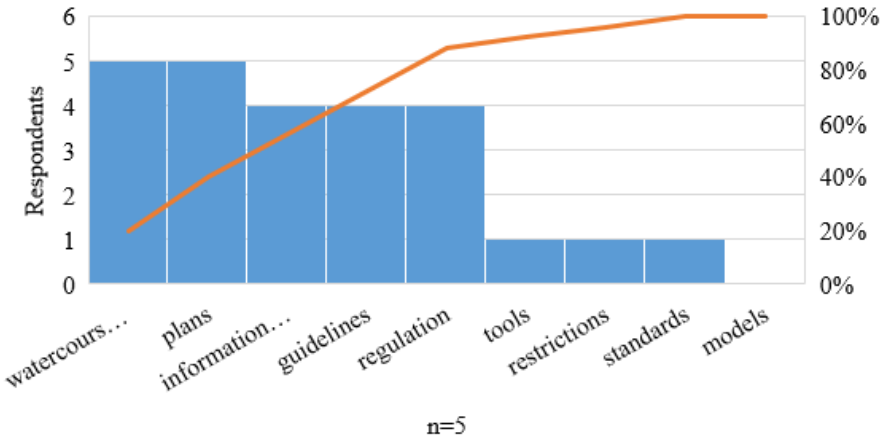


Figure 16. Elements of water management in the urban environment - Slovakia
Source: own processing according to research data

Models are absent, while management and decision support tools, restrictions and standards are poorly covered.

What processes have been implemented within the social aspect of water resources management?
All of the respondents mention raising awareness, encouraging participation and providing information as part of the social aspect of water resources management (Figure 17). Smart Citis are also socially raising awareness about climate change and its impact on limited water resources.

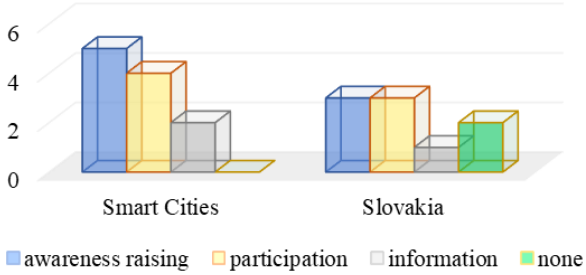


Figure 17. Implemented processes within the social side of water resources management
Source: own processing according to research data

Compared to the global cities, some of the water institutions, such as the Slovak Environmental Inspectorate and the Slovakian Water Management Company have not implemented any processes yet within the social aspect of water resources management.

4.5. Summarising the main findings

In urban resilience, Seoul has the best practice with a score (18 points) oscillating toward the optimal value of 15. In terms of water resources efficiency, the best practice cities include Birmingham and Melbourne, each having the optimal score of 43. Regarding water quality, the last of the three elements examined, best practices were once again observed in Seoul, which scored the optimal number of points (13). Paris was the least effective city for integrated water resources management among the selected cities.

Cities such as Berlin, Amsterdam, Rotterdam, Melbourne and Birmingham, can likewise be perceived as examples of "best practice" according to the results displayed in Table 5.

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Averaging the scores given to Slovakia's five water institutions on the three elements made it possible to express the resilience, efficiency and quality of water resources management in the country Table 5. Here, Slovakia ranks third worst in resilience, reflects the average ranking in terms of efficiency and has the second lowest ranking in water quality. Compared to the world's best water practices, Slovakia's level of water resources management is quite low (Table 5). Based on our own research, it was possible to update some amount of data from the 2016 Arcadis Sustainable Cities Water Index and this is also shown in Table 5.

Table 5. Summary evaluation of elements of integrated water city management

City	Element					
	Resilience	Optimum	Efficiency	Optimum	Quality	Optimum
Copenhagen	31	15	40	43	15	13
Paris	48		37		38	
Rio de Janeiro	30		20		17	
Seoul	18		19		13	
Sydney	32		19		4	
Melbourne	29		43		19	
Birmingham	25		43		15	
Rotterdam	25		45		20	
Amsterdam	27		44		15	
Berlin	22		41		17	
Slovakia	30		33		20	

Source: own processing according to research results in section 4.3.

According to own research results authors conclude that integrated water resources management stimulates sustainable urban development. Simultaneously, climate change affects every city and it has an impact on the management of limited resources.

Management is primarily carried out through control and monitoring of water resources. The tools used in practice are maps, plans and information systems. An interesting finding from primary research is that both the global cities and Slovakian water institutions currently prefer negative motivation to motivate behaviour in the form of sanctions for inefficient management of limited water resources.

While the social side of management builds and raises awareness, encourages participation and shares relevant information, some of the institutions in Slovakia responsible for managing water resources have never implemented any processes involving the social aspect of management (Figure 17).

A summary of the main findings can be found in Table 6.

Table 6. Summary of main findings

Hypothesis		Result
1	If climate change is directly related to population size, then water scarcity will be reflected in Slovakia's large cities (with populations greater than 100,000).	Confirmed
2	If a city's readiness to implement the Smart City concept is related to the factors of water resources management/troubleshooting water issues, then the greatest potential for Slovakia successfully implementing the Smart City concept in the area of water resources management have cities with populations greater than 100,000.	Confirmed
Research questions		Answers
To what degree do the indicators cover urban resilience in specific cities?		Best practice = Amsterdam Worst practice = Paris Slovakia (avarage points) = 30
To what degree do the indicators cover efficiency of water resources in specific cities?		Best practice = Amsterdam, Birmingham Worst practice = Seoul, Sydney

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	Slovakia (avarage points) = 33
To what degree do the indicators cover quality of water resources in specific cities?	Best practice = Birmingham, Melbourne, Amsterdam, Berlin Worst practice = Paris Slovakia (avarage points) = 20
Does integrated water resources management stimulate principles of sustainable urban development?	yes
What are the implications of climate change for water resource management?	significant
What drove integrated water resources management to be implemented?	Water Smart Cities = climate change, water scarcity, population Slovakia = inefficient management, climate change, low quality of water resources
What economic measures for water resources management are exploited by stakeholders?	Water Smart Cities = sanctions (70 %) Slovakia = sanctions (60 %)
Which water resources management activities are being implemented?	Water Smart Cities = control, storage, monitoring Slovakia = control, monitoring
What elements are used to manage limited water resources in urban environments?	Water Smart Cities, Slovakia = plans, water resource maps, information systems
What processes have been implemented within the social aspect of water resources management?	Water Smart Cities = awareness, information, participationSlovakia = awareness, information, participation, no processes

Source: own processing according to section 4 Results

The benefit to be gained is information for the creation of an integrated water resources management process and the subsequent verification thereof in practice at cities within Slovakia that have the greatest potential to become Smart Cities, namely those with populations greater than 100,000 (as implied in the verification of Hypothesis 1 and Hypothesis 2 and as displayed in Table 6).

5. Discussion

The actual design for managing limited water resources in the Smart City concept consists of the existing and new activities marked in yellow on Figure 18.

In managing water resources, the watercourses (and the data collected from these sources) have to be primarily mapped. Segmenting them into smaller units would simplify monitoring and delegation, but it should not fragment the system excessively. Several authors share this view (Batten, 2016; Šulyová et al., 2021; Koutsoyiannis, 2021; Bell, 2020; Köster, 2019; Nieuwenhuis et al., 2022).

When creating strategic documents, it is essential for goals to be set that reflect the Smart City vision and to develop plans. Iftekhar & Islam (2022) share the same opinion, emphasising the creation of master plans and strategies for integrated urban water management. Standards such as setting minimum and maximum consumption thresholds would be subsequently identified and then used to assess whether targets have been met. These standards should be harmonised both with existing legislation governing water resources management and for conceptualising Smart Cities. Hydrological issues may arise unless political and administrative aspects are harmonised (Nicollier et al., 2022).

The outcome of primary main research showed cities preferring projects to strategies, which in most cases were absent. Therefore, an element of strategy development and expert evaluation (e.g. by water research institutions) was incorporated into designing the process.
Afterward, decisions would be made on whether the strategy is appropriate for implementation. If not, it would need to be adapted and re-evaluated. If the strategy were to meet conditions for implementation, funds would then

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be obtained to implement the water projects. According to Iftekhar & Pannell (2022), decision-making in integrated water management plays an essential role in the building of water-sensitive urban designs.

City councils should seek to build a blue-green infrastructure to capture water resources whose depletion is causing climate change on a global scale. This is driving construction of the so-called "sponge city". Water management also includes recycling and distributing water, a view is supported by opinion of several authors (Lara-Valencia et al., 2022; Yang et al., 2022; Wang et al., 2022; Pokhrel et al., 2022).

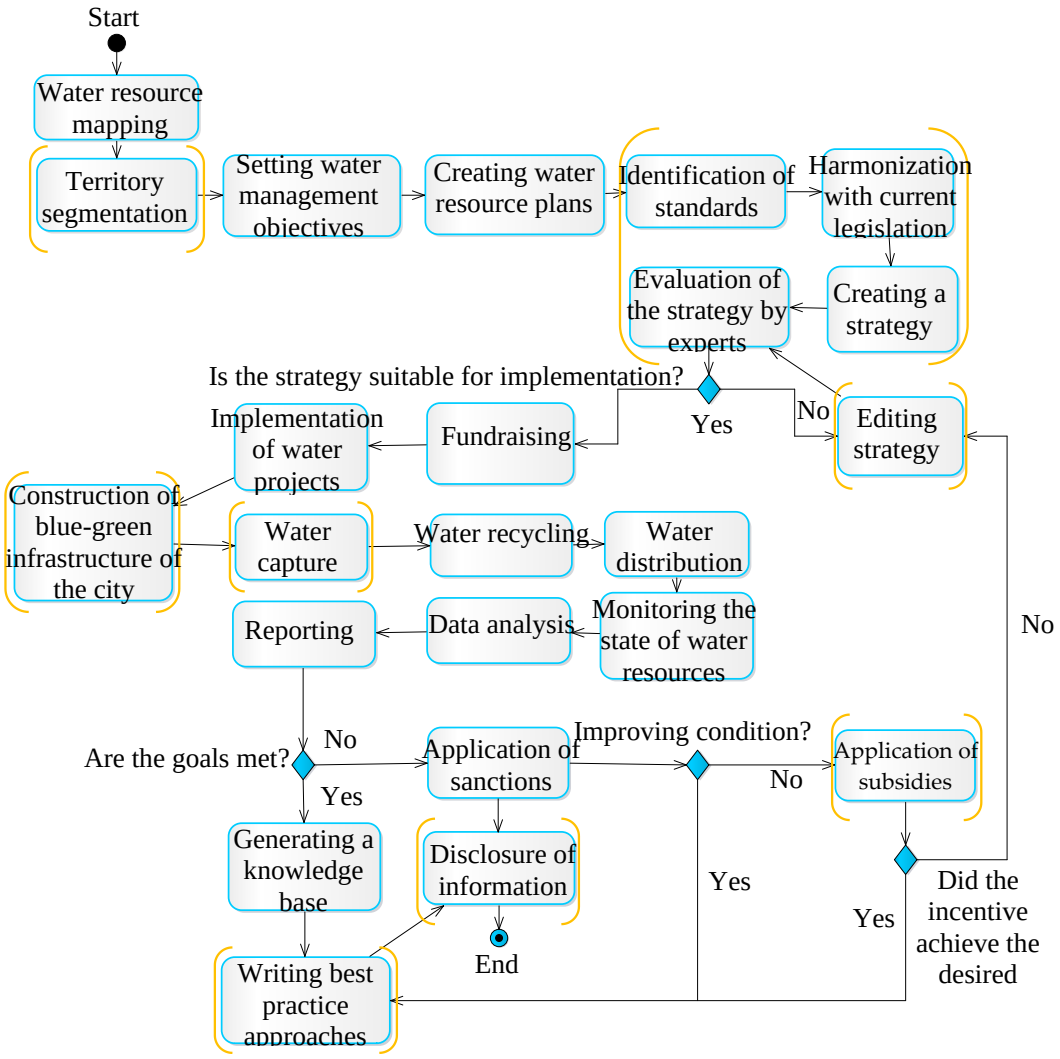


Figure 18. The process of managing limited water resources in the Smart Cities concept
Source: own processing according to own research

Assessment of the current situation would be mediated through monitoring, analysis of the collected data and the drafting of reports (Rentachintala et al., 2022). If the objectives are met, a knowledge database will be generated, best practice cases written up as a model for other cities and, in the end, relevant information will be published.

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These activities will contribute toward raising awareness and building trust (Vacca, 2021; Ahmed et al., 2022; Garciadiego, 2022). The need to develop a process for managing scarce water resources based on integrating the process into the urban environment, both in the wake of climate change and because of the currently low efficiency in how water resources are managed now, has been recognised by several authors (Wang et al., 2022; Kitessa et al., 2022; Ksibi et al., 2022).

Unless the objectives are met, the usual economic measures, namely sanctions, will be imposed. Even negative information has to be published in order to build trust. If the situation fails to improve, a positive incentive will be employed, such as grants appropriated for reduced water consumption.
The success of these incentives will be written into best practice cases and subsequently published. Unless financial assistance guarantees the desired effect (specifically to reach the outlined objectives), a strategy will need to be adapted which objectives are likely to be very ambitious, but which would have to be achieved through evolutionary development (Batten, 2016; Šulyová & Kubina, 2022b).

5.1. Benefits and a utilisation of process for managing scarce water resources in the smart cities concept

The proposed process shown in Figure 18 contributes theoretically to the management of scarce resources in an urban environment as it fills a research gap in this area with data derived from the results of our own research. Once it has been implemented in practice, it will convey practical benefits from lower consumption of water resources, efficient management based on blue-green infrastructure, continuous improvement of the system and a positive impact socially on residents, winning their trust, awareness and involvement. The findings in this paper constitute a model for implementation for fellow researchers, urban strategic management and water management institutions can utilise for conceptualising and developing sustainable water Smart Cities which results will be perceivable by residents.

5.2. Limitations of the model

Limitations of the process include the following:

- Research was confined to best water practice cities and to Slovakia;
- Dependence on a city's size as the process would be best implemented in a city which population is greater than 100,000;
- Taking an innovative approach primarily for cities just planning to conceptualise a Smart City or for a Smart City in the development phase;
- Conditions set out for putting Smart City concepts in practice, such as achieving an adequate level of government support and a level of trust and willingness by residents to commit themselves to a Smart City;
- Need for verification of it in practice.

5.3. Future research

Part of future research includes verifying the model in practice.

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Conclusions

Water resources are in grave condition. Water Smart Cities need today to develop preventive measures. The outcome from our own research points toward the importance of integrated management of water resources that are being greatly affected by climate change. The global water Smart Cities ranked in the Arcadis Sustainable Cities Water Index provide a major reference for the elements of water resources resilience, efficiency and quality. However, the social aspect should not be neglected, namely residents and their level of awareness, trust and participation. In most cities, negative motivation prevail in the form of sanctions. The world's best practice cities are implementing integrated water resources management as a consequence of climate change and Slovakia, a country that does not even have one Smart City within its borders, is seeking to take this approach due either to a currently ineffective water strategy or a complete lack of one. Cities with populations over 100,000 are particularly vulnerable to water stress. Yet our own research confirms that conceptualising a Smart City and developing the concepts can reduce or even eliminate water shortages.

The main output from this paper is a process for managing limited water resources within the Smart Cities concept that comprises both current and new activities. It was developed from findings in our own research and the model created from previous research, which it complements. Innovative elements are, in particular, the application of grants and financial assistance, raising awareness, the building of blue-green infrastructure, and harmonisation with legislation that stresses integration. Inspiration from best water practice, including an updated ranking from Arcadis through its own research, is essential.

The proposed process outlines an implementation pattern especially for strategic urban management, water management institutions and research findings utilisable by fellow researchers. Positive impacts from the process will have an effect even on residents. When implementing the process, it is also necessary to take its limitations into account such as its origin from research, conditions for implementation and its link to the size of the city in the Smart City concept (in the conceptualisation and development phases, among other things). Part of future research includes planning to verify the model in practice.

Appendix 1.

List of 71 district towns involved in the research

Bratislavský kraj: Bratislava**,** Malacky**,** Pezinok**,** Senec
Trnavský kraj: Dunajská Streda, Galanta, Hlohovec, Piešťany, Senica, Skalica, Trnava
Nitriansky kraj: Komárno, Levice, Nitra, Nové Zámky, Šaľa, Topoľčany, Zlaté Moravce
Trenčiansky kraj: Bánovce nad Bebravou, Ilava, Myjava, Nové mesto nad Váhom, Partizánske, Považská Bystrica, Prievidza, Púchov, Trenčín
Banskobystrický kraj: Banská Bystrica, Banská Štiavnica, Brezno, Detva, Krupina, Lučenec, Poltár, Revúca, Rimavská Sobota, Veľký Krtíš, Zvolen, Žarnovica, Žiar nad Hronom
Žilinský kraj: Bytča, Čadca, Dolný Kubín, Kysucké Nové Mesto, Liptovský Mikuláš, Martin Námestovo, Ružomberok, Turčianske Teplice, Tvrdošín, Žilina
Prešovský kraj: Bardejov, Humenné, Kežmarok, Levoča, Medzilaborce, Poprad, Prešov, Sabinov, Snina, Stará Ľubovňa, Stropkov, Svidník, Vranov nad Topľou
Košický kraj: Gelnica, Košice, Michalovce, Rožňava, Sobrance, Spišská Nová Ves, Trebišov

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EFFICIENCY OF BANKING SECTORS OF THE EUROPEAN UNION. A COMPARATIVE BENCHMARKING ANALYSIS BEFORE AND DURING THE COVID-19 PANDEMIC

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Abstract. The banking industry is a crucial sector for any country's economic growth. Therefore, it is essential to study factors that affect bank performance as the findings of this research help regulators and managers make better decisions. Thus, the paper will aim to determine the efficiency level of the banking sectors of the 27 EU countries before and during the COVID-19 pandemic. The article applies the non-parametric Data Envelopment Analysis (DEA) method to measure the performance and efficiency of banking sectors belonging to 27 EU countries. The operationalisation of the objective/methodology will be done by using data from the Eurostat database. The authors will verify the research hypothesis that the number of efficient banking sectors in the EU during the COVID-19 pandemic is lower than before the pandemic. The research period covers years between 2008-2020. The hypothesis was verified negatively because the number of efficient banking sectors during the COVID-19 pandemic was higher than previously. The number of effective banking sectors in the research period wasn't constant. Six effective banking sectors operated in 2020 (the first year of the COVID-19 pandemic), one even more effectively than in 2019. Those effective ones in the entire study period were banking sectors from Cyprus, Luxembourg and Romania.

Keywords: banking sector; Data Envelopment Analysis; Non-Parametric Approach; efficiency

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1. Introduction

The banking sector in most economies is seen as the bloodstream of the economy, an essential part of the financial system, which plays a vital role in achieving economic growth and expansion thanks to the fact that it is the primary source of funds for long-term investments and the foundation of economic growth (Schumpeter, 1934). The banking sector is also very often referred to as the backbone of the financial system. Therefore, as Levine (1998) points out, an efficient banking sector and the financial system affect, on the one hand, economic growth and, on the other, bank (financial intermediation) insolvencies could result in systemic crises and consequently negative implications on the economy (Kamarudin et al., 2016). An analysis of the content of the

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Top 100 Scopus articles identifies five basic themes related to profitability, productivity and efficiency of the banking sector: efficiency determinants, methodology, ownership form, financial crises and economies of scale (Ahmad, Naveed, Ahmad, and Butt, 2020). The authors of this study follow this trend by analysing most of the aspects of effectiveness mentioned above. It has been assumed that banks are exposed to various types of risk that affect their effectiveness. In previous studies, the links between risk and effectiveness were most often observed while focusing on periods of financial crises (Amild, Zhu, 2016).

A new research issue is assessing the level of banks' effectiveness during the COVID-19 pandemic. In order to examine the results and efficiency of banking sectors in individual countries, this study uses the non-parametric Data Envelopment Analysis (DEA) method. Many empirical studies have determined the effectiveness of banks in various countries (Bhatia et al., 2018, Sickles, Zelenyuk, 2019). As indicated (Ahmad, Naveed, Ahmad, Butt, 2020), the most frequently cited article on the topic of bank efficiency is "Problem loans and cost-effectiveness in commercial banks" by Berger and DeYoung (1997). The efficiency of banks has been described in European countries (Ayadi et al., 2015, Mirzaei, Moore, 2019, Al.-Gasaymeh, Samarah, 2020). The countries from Eastern and Central Europe were also studied (Pancurova, Lycosa, 2013, Grmanová, Ivanová, 2018). Lozano-Vivas et al. (2002) examine ten EU countries, Bergendahl (1998) focuses on Nordic countries, while Pasiouras (2008a) examines an international dataset. However, the research concerned only some of the banking sectors of the EU countries. To a minimal extent (Casu, Molyneux, 2003), hardly any studies assessed the overall efficiency and effectiveness of banking sectors in the EU-27. A study covering the banking sectors of all EU countries is necessary to establish a comprehensive assessment of the effectiveness of banking sectors in the EU, both before and during the pandemic. In order to fill this gap, this study aims to determine the level of effectiveness of the banking sectors of the 27 EU countries before and during the COVID-19 pandemic. Determining the classification of banking sectors according to efficiency and effectiveness will guide troubled banking sectors, the banking sectors of the countries that are the most efficient. The authors will verify the research hypothesis that the number of efficient banking sectors in the EU during the COVID-19 pandemic is lower than before the pandemic.

The individual chapters are organised as follows. Chapter 2 and chapter 3 contain the literature review, while chapter 2 discusses bank efficiency, and chapter 3 is a dedicated DEA description. Chapter 4 summarises the data and methodology used in this study. Chapter 5 presents the research results, and there is a brief discussion about the results of our research and other research in the literature on the subject. The last one, chapter 6, summarises the article.

2. Efficiency of banks - theoretical background

Before embarking on the empirical assessment of banking sector efficiency, it is worth looking at this issue in the theoretical context and from the perspective of the condition of the banking sector. Determining the essence of efficiency, as well as indicating and selecting the best methods of its measurement, depends on the context in which the concept of efficiency is applied. This term has numerous definitions and applications in the scientific literature; it is present, for example, in the theory of organization and economics. In the case of the theory of organization, there is the concept of the degree of achievement of goals and effectiveness (Shaw, 2009; Henri, 2004). Within the framework of economic theory, in the classical approach, the efficiency criterion was related to the relationship between effects/outputs and inputs/resources and was called resource allocation optimization. Economic efficiency is measured through cost analysis (Giokas, 2008). The efficiency criterion allows for assessing how well the market allocates resources. In this approach, the allocation was better when the production costs (inputs) were lower (Camanho, Dyson 2005).

The banking sector is one of the most complex sectors of the economy and one of the main sectors contributing to national well-being (taxtracker.eu/bank-profiles). As researchers point out, this sector plays a growing role in developing the financial system (Henriques et al., 2020). The assessment of financial institutions, which are

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banks, is critical to support the decision-making process, not only from the microeconomic perspective but also from the macroeconomic perspective (Fethi, Pasiouras, 2010). The concept of banks' effectiveness or the effectiveness of the banking system has been described in many ways. The efficiency of banks is determined by factors related to the macro-environment - e.g. fiscal policy, interest rates, and regulatory requirements (Brissimis et al., 2008). In a narrow sense, the effectiveness of banks depends on the adopted operating policy, e.g. granting loans on the bank's pricing policy, dividend policy, asset structure and quality (Casu, Molyneux, 2003).

Based on the financial literature on the issue of examining bank efficiency, a distinction is made (Perek, 2014): cost efficiency (which assesses how efficiently a bank manages its costs, to what extent a given bank's costs are close to those of the most efficient bank (Giokas, 2008a, Noulas et al., 2008); profit efficiency (which concerns the assessment of profit maximisation at specific prices and a certain amount of inputs and outputs, assessing how close a given bank's profit is to the highest profit generator with the same resources) (Coelli et al., 2005); technical efficiency (which is a relative measure, referring to other objects of the group under study (Coelli et al., 2005), assessing how effectively a bank manages costs). In other words, technical inefficiency is the excessive use of inputs to produce a given volume of output, i.e. according to Farrell it is the relationship between the productivity of a given object and the limit of its actual production capacity (1957); organisational efficiency (which assesses the degree to which objectives are achieved) (Shaw, 2009); financial efficiency (assessment of financial performance on the basis of financial statements and a set of indicators). Its determinants include capital, assets, profit (e.g. Haralayya, Aithal, 2021). These types are presented in diagram 1.

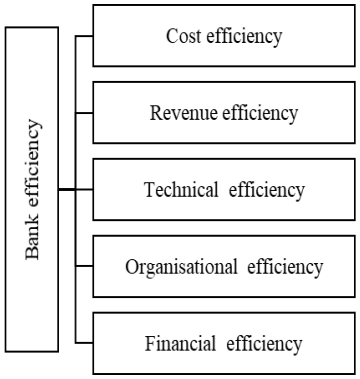


Diagram 1. Types of bank efficiency
Source: based on Perek, 2014

In economic practice, depending on the type of effectiveness, various methods are used to evaluate it: based on indicator analysis, parametric and non-parametric methods (Coelli et al., 2005). Parametric methods used to measure efficiency involve solving an optimisation problem. Econometric approaches use stochastic frontier models (functions). The problem in applying these methods is the identification of the inputs and outputs of banking institutions. Using the Sealey and Lindley approach, it was considered that the factors of production are human capital, financial capital and physical capital. On the other hand, the final effects of activities are those services with a higher value than the inputs incurred, i.e. loans and credits (Sealey, Lindley, 1977). The group of parametric methods includes the Thick Frontier Approach (TFA) and the Distribution-Free Approach (DFA). Parametric methods also include the Stochastic Frontier Approach (SFA). This method needs a specific functional form that assumes the shape of the efficient frontier and presupposes a specific efficiency distribution level. A significant limitation of this approach is that measured efficiency will be incorrect if assumptions are misspecified (Bauer et al., 1998). Parametric methods are used for cost and revenue efficiency analysis. In parametric methods, assumptions about the relationship between inputs and outputs are made. On the other hand, in non-parametric methods, a production function is defined and set against the best banks in a given period. In the next step, the

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relative remoteness of the remaining banks from the predetermined benchmark is assessed. In this case, the distance is a measure of the inefficiency of a given bank vis-à-vis the leader banks. DEA - Data Envelopment Analysis is often indicated among the non-parametric methods used to study the technical efficiency of banks. DEA is a benchmarking method that compares the studied entity's efficiency to the benchmark efficiency (Cook, Seiford, 2009).

3. DEA: a brief description

DEA is a non-parametric linear programming technique proposed by Charnes, Cooper, and Rhodes (1978). A mathematical programming technique DEA, aims to evaluate the efficiency with which a given decision-making unit converts its inputs into outputs. This method allows several inputs and outputs to be compared simultaneously. With the DEA method, it is possible to identify the efficient units in a given sample by limiting their productive capacity. The DEA method has several limitations. It is prone to measurement error and depends on the choice of variables representing inputs and outputs (Fethi, Pasiouras, 2010). Technical efficiency can be estimated under an input-oriented or output-oriented approach, but most studies use efficiency assessment under the input-oriented approach (Coelli et al., 2005). The analysis of the level of technical efficiency depends on the adopted inputs and outputs; with no strictly defined inputs and outputs in the literature, their choice depends on the purpose of the analysis (Kopinski, Porębski, 2018). The concept of the bank as an intermediary and producer is the most commonly used for this purpose. In these models, deposits have a dual character and can appear as inputs and effects of banking activities (Berger, Humphrey, 1997).

In the literature, there are between two and five approaches to the technology of modelling bank activities and the application of Best Practice Frontier theory concepts, with different perspectives and different choices for inputs and outputs (effects). Banks' perspectives are distinguished: production, intermediation, value-added, assets, and user costs (Berger, Humphrey, 1997). From the production perspective, a bank is likened to an industrial enterprise, to a Decision Making Unit (DMU) using physical and financial capital and labour for production. This approach is often used to analyse the efficiency of individual banks and often prevents sectoral analysis (Kenjegalieva, Simper, Weyman-Jones, 2009). The intermediation perspective assumes that banks as intermediaries convert savings into investments, i.e. they make cash available to customers for development. In this arrangement, inputs are deposits and other funds, together with labour or tangible assets, while outputs/products are loans and credits (Barth et al., 2013). From the value-added perspective, the bank is treated as an institution, a provider of financial services, generating income from the difference between the income from the products sold and the cost of producing those goods. In this case, inputs and outputs are determined by the bank's share of profits. From the asset perspective, as in the intermediation perspective, banks offer various types of deposits and investments, using deposits, labour and fixed assets. On the other hand, from the user cost perspective, outlays and effects are determined by their nature (Czechowska et al., 2022).

The DEA method, introduced to banking more than 40 years ago, has gained importance and becomes more popular (Yang, 2016). The DEA method applied to banks allows us to assess which banks were efficient, how their efficiency evolved in the analysed period, and also to develop benchmarking of the banks under study and identify the occurrence of differentiation. The strengths of DEA include the versatility of application vis-à-vis parametric methods, efficiency in dealing with complex production processes (Schaffnit et al., 1997), the possibility of evaluation with different inputs and different effects (Svitalkova, 2014), the possibility of individual analysis of each DMU and comparison with other DMUs, as well as the identification of inefficient units by indicating benchmarks (Aggelopoulos, Georgopoulos, 2017). Despite the incredible popularity of this method, its traditional approach is criticised for not considering the environment, in which the bank operates (Henriques et al., 2020). It can be considered that it is still a method in its formative stages. The current state of knowledge concerning the application of the DEA method is being extended to solve various problems, e.g. the lack of a uniform approach to the selection of variables that affect the assessment of efficiency, the analysis of the impact

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of changes in regulation or the market environment on bank efficiency, especially during the financial crisis or the COVID-19 pandemic. There are many unresolved issues in the literature concerning the application of this method as a measure of banking sector efficiency, e.g. the problem of qualifying deposits as inputs or outputs. There is a view in the literature that the DEA method can be used to complement the traditional methods of efficiency assessment while keeping in mind both the problems of input-effect selection and the drawbacks of this method (Iqbal, Lerme, 1997).

Assessing the efficiency of the banking system generates various problems. One is the link between the various regulatory burdens and their impact on efficiency. It is noteworthy that supervision and the number of different types of regulations applied to the banking system are increasing to improve the efficiency and resilience of the global financial system to a potential increase in risk. The issue of excessive regulation of the financial market, including banking, and its impact on the efficiency of the banking sector is not definitively resolved (Andries, Capraru, 2013, Roy, Kemme, 2020; Mukherjee et al., 2021). Summing up, the considerations on efficiency presented above, it can be claimed that the banking sector is very dynamic. It operates in a rapidly changing environment, which means that to assess its condition or efficiency, which is the basis for strategic decision-making, tools and instruments will be used, which are also subject to transformations and modifications.

4. Research objective and methodology

The health crisis caused by COVID-19 resulted in an economic crisis. The development of the pandemic had a significant impact on the maintenance of financial stability. The pandemic and the associated restrictions on the virus's spread have negatively affected banking customers' finances. A source of risk to the economic situation and the financial system's health was the uncertainty associated with the global economic situation. The pandemic led to many companies having to scale down and suspend their operations. Restrictions were put in place, consisting of a total lockdown. The outbreak caused a decline in activity, mainly in the service sector. Customers in the banking sector lost their jobs. The reduction in society's income during the pandemic increased concerns about household financial security. Among the public, the factors that built security were savings and the low scale of over-indebtedness. Customers without savings buffers were at a disadvantage. Measures directed at saving the economy were needed (Solarz, Waliszewski, 2020). Therefore, public anti-crisis support was directed at companies and borrowers (e.g. Report, 2020). The pandemic resulted in a significant increase in debt risk. After a major credit market collapse shortly after the outbreak of the pandemic, also due to the risk of deterioration of industries particularly vulnerable to the pandemic, the situation began to improve. Gradually, banks became optimistic about the credit market situation and eased credit requirements (Czechowska et al., 2020).

Due to the assumption of the completeness of the group researched with the DEA method, 27 banking sectors of EU countries were included in the study. Considering that during the last few years, there have been two significant events (the financial crisis of 2007 and COVID-19) affecting the economies of most countries, the years 2008-2020 were assumed for the research period. Therefore, the paper aims to determine the efficiency level of the banking sectors of the 27 countries at the time before and during the pandemic. The obtained results are significantly influenced by the adopted DEA model and the variables used in the study as inputs and outputs. There is a two-level division of DEA Models in the literature on the subject. The first criterion is the orientation of the model to inputs or outputs. The second level of model breakdown involves the approach to the effects of scale (Kosmaczewska, 2011). The basic approach (radial) to efficiency involves identifying proportional changes in all inputs or outputs (Guzik, 2009). The literature distinguishes non-radial efficiency (Russell efficiency), which consists in calculating unit efficiency indicators (for each input or effect, we obtain an efficiency index). Because of that, it is possible to indicate changes in individual inputs or outputs that should be introduced for the DMU to be effective in terms of a given input or output. The efficiency index for DMU is the average of the effectiveness indicators of individual inputs (or outputs) (Russell, 1985).

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In the study of the efficiency of banking sectors of the EU countries, an input-oriented non-radial DEA model with variable effects of the scale was used. Determining the efficiency of banking sectors required the selection of variables representing inputs and outputs. The research used data from Eurostat for monetary financial institutions other than the central bank (ESA 2010). The authors used the bank's approach as a producer and initially assumed:

1. Equity - equity determines the size of the bank's operations. An example of such dependence is that the amount of equity depends on the possibility of increasing specific components of the balance sheet, i.e. loans granted (Galbarczyk, 2009).
2. Value of debt securities issued by entities from the banking sector - the issue of securities constitutes a stable source of bank financing. It gives the issuer flexibility in determining the amount and term of the loan. The value of debt securities also affects the bank's lending activity and is a source of financing its operations (Węgrzyn, 2020).

The outputs are the value of the primary products offered by the banking sector:

1. The value of deposits placed in the banking sector - obtaining funds in the form of deposits enables the creation of credit money (Stola, 2013). On the one hand, the value of deposits can be described as the primary method of obtaining funds by the bank; on the other hand, it is the result of the bank's activities. For this reason, if the bank's role as a producer is adopted, the value of deposits is considered an effect.
2. Value of loans granted by entities from the banking sector - loans are an asset item in the balance sheet of banks and generate the highest profit among assets. The value of the loans granted is the primary effect of the bank's operations (Wiatrzyk, 2018).

The data adopted for the efficiency of banking sectors study carried out with the DEA method should meet several criteria. One is the low correlation between the inputs and the low correlation between the outputs. In order to determine the correlation between the adopted variables, the linear Pearson correlation was used. Based on the results obtained for the individual years of the 2008-2020 research period, the authors decided to exclude the variable covering the value of loans and advances granted to entities from the banking sector from the study.
The analysis of the results obtained from the applied model was carried out in two stages:

1. indication of effective and ineffective objects;
2. determination of the effectiveness concerning each input.

5. Results and discussion

Results

The study included the determination of the efficiency of the banking sectors of the EU countries in the period 2008-2020. The measure of relative technical effectiveness in DEA method is (Baran, 2007):

$$e_j = \frac{\sum_{r=1}^{R} \mu_r y_{rj}}{\sum_{p=1}^{P} v_p x_{pj}}$$

where:
e_j–effectiveness of object j;
μ_r–weight of the effect r;
v_p–weight of the input p.

The first stage of the research was to determine which banking sectors were effective. Efficient banking sectors have an index value of 1 in the input-oriented DEA model. Any banking sector with an index below 1 is ineffective. Table 1 shows the value of the average efficiency ratio for the banking sectors of the 27 surveyed countries. It should be noted that the results in the table below show the efficiency ratio at the end of a given year. The conducted analysis is not an analysis of the dynamics of changes in efficiency.

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Table 1. Efficiency indicators of the banking sectors of EU countries in period 2008-2020

Country of the banking sector	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	0,432	0,375	0,206	0,106	0,269	0,281	0,292	0,264	0,250	0,262	0,186	0,350	0,341
Belgium	1,000	1,000	0,422	0,299	0,563	0,479	0,457	0,473	0,349	0,280	0,221	0,350	0,356
Bulgaria	1,000	1,000	0,975	0,699	0,575	0,688	0,618	0,560	0,405	0,510	0,376	0,418	0,420
Croatia	0,496	1,000	1,000	0,701	1,000	0,781	0,749	0,770	0,418	0,670	0,403	0,358	0,416
Cyprus	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Czechia	0,572	0,642	0,491	0,329	0,545	0,480	0,452	0,431	0,309	0,363	0,276	0,395	0,343
Denmark	1,000	1,000	1,000	0,461	0,558	1,000	1,000	0,426	0,417	0,335	1,000	1,000	1,000
Estonia	0,417	1,000	1,000	1,000	0,500	0,500	0,500	0,500	1,000	0,468	0,278	0,250	0,243
Finland	0,423	0,419	0,321	0,160	0,516	0,511	0,533	0,445	0,280	0,476	0,129	0,242	0,234
France	0,685	0,497	0,352	0,195	0,500	0,459	0,478	0,472	0,330	0,295	0,305	0,489	1,000
Germany	0,569	0,553	0,360	0,157	0,465	0,502	0,467	1,000	0,425	0,388	0,281	0,462	0,374
Greece	1,000	1,000	1,000	1,000	0,714	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Hungary	0,494	0,425	0,399	0,256	0,476	0,433	0,534	0,440	0,290	0,271	0,268	0,232	0,268
Ireland	0,691	0,479	0,301	0,165	0,202	0,163	0,166	0,224	0,150	0,173	0,149	0,216	0,221
Italy	0,885	0,597	1,000	0,510	1,000	1,000	1,000	0,453	0,493	0,405	0,405	0,497	0,519
Latvia	1,000	1,000	0,699	0,465	0,580	0,514	0,522	0,521	0,324	0,363	0,374	0,369	0,351
Lithuania	1,000	0,782	0,529	0,420	0,553	0,799	1,000	1,000	0,500	0,500	0,500	0,500	0,500
Luxembourg	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Malta	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	0,500	0,500	0,500
Netherlands	0,950	1,000	1,000	0,335	0,527	0,634	1,000	0,501	0,438	0,322	0,214	0,363	0,279
Poland	0,408	0,401	0,405	0,359	0,382	0,333	0,382	0,438	0,312	0,293	0,322	0,434	0,576
Portugal	0,891	0,824	0,711	0,375	0,571	0,592	0,483	0,508	0,407	0,328	0,282	0,407	0,401
Romania	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Slovakia	1,000	1,000	1,000	0,444	1,000	1,000	1,000	0,475	0,341	0,390	0,359	0,454	0,428
Slovenia	0,639	0,599	0,429	0,217	0,828	0,496	0,446	0,474	0,323	0,387	0,387	0,378	0,403
Spain	1,000	0,659	0,673	0,314	0,554	0,443	0,347	0,405	0,314	0,257	0,235	0,402	0,485
Sweden	0,557	0,372	0,236	0,121	0,275	0,223	0,219	0,211	0,153	0,153	0,181	0,373	0,386
Number of effective banking sectors	**12**	**13**	**11**	**6**	**7**	**8**	**10**	**7**	**6**	**5**	**5**	**5**	**6**

Source: own study based on data from Eurostat (2022) database

According to the information from the table 1, most banking sectors were effective in 2008-2010. The banking sectors in Cyprus, Denmark, Greece, Luxembourg, Malta, Romania and Slovakia were effective in each of these years. In period 2011-2013, fewer banking sectors were effective (less than nine effective banking sectors). Probably at that time, the financial crisis had a negative effect on the efficiency of banking sectors. The banking sectors in Cyprus, Luxembourg, Malta and Romania were effective in each of these three years. In 2014, ten banking sectors were effective, which could have been related to the lower impact of the crisis on the situation in the banking sector. However, in each of the following years the number of effective banking sectors decreased: seven effective banking sectors in 2015; six effective banking sectors in 2016; five effective banking sectors each in period from 2017 to 2019. This could be related to an attempt to limit the effects of the crisis and to prevent

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further crises. In the EU, in the years following the onset of the financial crisis, legal acts were introduced to limit the uncontrolled growth of the financial sector and its impact on the economy. A smaller number of effective banking sectors after 2014 may be associated with the introduction of new legislative packages. Taking into account the onset of the pandemic, in 2020 (the latest available data), there was one more efficient banking sector than in 2017-2019. This means that the initial phase of the pandemic did not significantly affect the efficiency of the banking sectors of the EU countries. To sum up, three banking sectors (Cyprus, Luxembourg and Romania) were effective in each of the analyzed years. In Cyprus and Luxembourg, the banking sectors play an essential role and are the most important sectors of the economies of these countries. An interesting case is the banking sector in Romania, the effectiveness of which may result from the ability of Romanian credit institutions to absorb losses resulting from unforeseen market events, i.e. the financial crisis (Cichy, Puszer, 2016).

The second stage of the study is to indicate the effectiveness of banking sectors in terms of individual expenditures. A greater number of banking sectors achieved efficiency in terms of the value of equity in individual years than in the case of the average efficiency ratio. In the period 2008-2014, less than 12 analyzed banking sectors were effective only in 2011. From 2015, the number of effective banking sectors was equal to or less than ten. However, it should be noted that, as in the case of the average efficiency ratio, the number of effective banking sectors in the first year of the pandemic (nine effective banking sectors in 2020) was higher than in the previous year (seven effective banking sectors in 2019). This means that the pandemic has not influenced into fewer efficient banking sectors. In each of the analyzed years 2008-2020, four banking sectors were effective: those operating in Cyprus, Luxembourg, Romania and Malta.

The efficiency in terms of the value of issued debt securities in 2008-2020 was demonstrated for the same number of banking sectors as in the case of the average efficiency ratio. This means that the value of this input contributed to ineffectiveness of some banking sectors and a lower number of effective banking sectors. Due to this expenditure, as in the case of the average efficiency ratio, three banking sectors (the banking sector in Cyprus, Luxembourg and Romania) were effective. The greater number of efficient banking sectors in 2008-2010 may have been due to the lower value of issued securities. This could have been caused by the financial crisis and the decline in confidence in banking institutions. The performance of the banking sectors in the period 2015-2019 leading up to the pandemic may indicate an increase in the value of securities issued by banks. There could be several reasons for this. One of them is adapting to the legal acts defined by the EU to reduce the impact of the financial sector on the economy and reduce the likelihood of another financial crisis. On the other hand, during the pandemic, the value of securities issued by banks may have decreased due to the lower value of free cash at the disposal of other institutions (e.g. non-financial companies). At the same time, in 2020, compared to the previous year, there was one more efficient sector. This was because most enterprises and households decreased their propensity to take out loans. Enterprises were uncertain about their activities in the short term. Therefore, they were not willing to finance themselves with debt. On the other hand, they probably used free funds to finance current operations. This means that the lower value of securities issued by the banking sector (in this study of the input) took place with a simultaneous decline in lending (the value of loans is an output in this study). For this reason, only one more banking sector was effective than in 2019.

Discussion

The performance of banks and banking sectors has been the subject of many studies. In the source literature, the DEA method is often used to test effectiveness. Some authors compare the results obtained with the use of individual different DEA models, e.g. comparing the results from the CCR model with results from the BCC model (Chpradit et al., 2021). Others check how the variables adopted for the study affect the obtained results (Učkar, Petrović, 2021; Novickyte, Droždz, 2018). The literature includes studies covering the banking sectors of various countries (Doan Tuan, 2020) or selected banks operating in a given country (Hosszù, Dancsik, 2018; Akhtar et al., 2021). Research into the performance of banking sectors or banks covers a different period. Some

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cover the period after the 2007 financial crisis and before the pandemic (Cvetkoska et al., 2021), and others focus on a single year (San-Jose, 2018).

The research described in this article included the determination of the efficiency of banking sectors of the EU countries before and during the pandemic. The authors used the non-radial BCC input-oriented model. Moreover, the application of non-radial efficiency made it possible to indicate which outlays contributed to the achievement of efficiency or a lower / greater ineffectiveness of the banking sectors of the EU countries. An interesting approach to the issue of bank efficiency was adopted by Titko, Stankevičienė and Lāce (Titko et al., 2014). They studied Latvian banks efficiency using 14 alternative models with various combinations of inputs and outputs. As a result, they defined a set of inputs and outputs that best reflect the specificity of the Latvian banking sector and the effectiveness of its banks. The authors of this study focused on determining a set of variables that best describe the efficiency of Latvian banks using the output-oriented BCC model. In turn, Da Silva Fernandes F., Stasinakis Ch. and Bardarowa V. (Da Silva Fernandes et al., 2018) focused on examining changes in the efficiency of banks operating in GIIPS countries (Greece, Ireland, Italy, Portugal, Spain) in a period 2007-2014 using the Malmquist index. The selected decomposition of this index made it possible to indicate potential reasons for efficiency changes. The study was supplemented with Double Bootstrapped Truncated Regression, which allowed to determine whether changes in the financial situation of banks in the surveyed countries affect the level of their effectiveness in different ways. There are also studies similar in terms of the time range to that carried out in this article, e.g. study by Belas J. et al. (2019) was to determine the cost-effectiveness of the banking sectors of the EU Member States in the period 2008-2017. The authors also attempted to identify macroeconomic variables and variables describing the banking sector that affect cost effectiveness. It is difficult to compare the results presented by other authors with the results of this study. Each study differs in the research scope (other countries are taken into account, or the time trial does not cover the onset of COVID-19). Based on research made by other authors, the study of banking sector efficiency can be extended to include the determination of variables that best reflect the specificity of banking sectors in EU countries. It would also be possible to compare the results obtained from different DEA models. Studying the dynamics of changes in efficiency would also broaden the interpretation of the results. Especially taking into account the changes in efficiency resulting from external factors in 2020, they could indicate an indirect impact of the pandemic on the efficiency of the banking sectors under study.

6. Conclusions

The efficiency of banking sectors or banks is an important issue discussed in the literature. Both parametric and non-parametric methods are used to test their efficiency. Some authors focus on choosing the appropriate approach to understanding the functioning of the bank (producer or intermediary), or the variables that describe the inputs and outputs of banking sectors. Others focus on different types of effectiveness (e.g. cost-effectiveness) or extend the research to apply further research methods. This study attempts to examine the efficiency of the banking sectors of the EU countries before and during the pandemic. Due to data availability, the research period covered the period between 2008-2020. The study was conducted with the use of the non-radial BCC input-oriented model. The bank-as-producer approach was used in determining the inputs and outputs. Ultimately, the study used outputs in the form of the value of equity and the value of debt securities issued by banking institutions. On the other hand, the outputs were the value of deposits placed with banking institutions and the value of loans granted by these institutions. The research results show that most banking sectors were effective at the beginning of the financial crisis. From 2011, a maximum of eight banking sectors were efficient (except in 2014). In each of 2017-2019, five banking sectors were efficient. Interestingly, in the first year of the COVID-19 pandemic, six banking sectors were efficient. This means that the pandemic and restrictions did not significantly affect the number of effective banking sectors. Based on the obtained results, it should be concluded that the hypothesis that the number of efficient banking sectors in the EU during the COVID-19 pandemic is lower than before the pandemic has been verified negatively. In each of years 2008-2020, the banking sectors in three countries (Cyprus, Luxembourg, Romania) were effective. The efficiency of each input in non-radial efficiency

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makes it possible to indicate which inputs influenced a smaller number of effective banking sectors. In the case of this study, the effectiveness of the value of issued debt securities meant that the effectiveness reached a smaller number among the analyzed banking sectors. It should be remembered that the interpretation covers the number of effective banking sectors because the efficiency indicators should not be compared because the DEA method includes determining the effectiveness at a given moment.

The results obtained using the DEA method depend on many factors. The inputs and outputs adopted for the study are the most important ones. Variables were adopted in the study due to the role of the bank as a producer. Subsequent research should focus on finding a set of variables that reflect the specificity of the banking sectors of EU countries in different approaches to the role of the bank. What proves to be important is also the model adopted for the research. In this study, the BCC model was used, i.e. a model with variable scale effects. In future research, models can indicate the direction of changes in the effects of scale. It is worth supplementing the analysis of the effectiveness of researched banking sectors for the entire period of 2008-2020 with the determination of the dynamics of efficiency changes in these sectors. This would make it possible to indicate how the efficiency of banking sectors has changed from year to year. Moreover, each of the methods used can be developed through the use of other parametric and non-parametric methods, which would increase the interpretative possibilities of results.

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EVOLUTION OF SCIENTIFIC RESEARCH ON AUDIT QUALITY REPORTING IN THE GLOBAL ECONOMIC CONTEXT

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Abstract. The development of the economy and the capital markets has led to substantial changes over time, both in terms of audit reporting and determining the quality of the audit. The primary purpose of the present study is to conduct an empirical evaluation of the most relevant scientific publications, which target the topic of quality of reporting in audit, determining the dominant factors for quality assurance in auditing, as well as future research directions, both for other potential researchers and us. The study proposes a bibliometric analysis of the main articles encountered in SCOPUS and Web of Science databases, aiming to choose a sample of data to perform a meta-analysis. The obtained results certify that the audit report is the fundamental element in restoring the quality of the audit, followed by education, regulations and legislative changes and last but not least, by the steps taken by the audit team in carrying out missions to assure investment efficiency and to provide credibility for investors.

Keywords: quality in audit; bibliometric analysis; meta-analysis; audit report

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1. Introduction

Since the '80, themes regarding audit quality have been identified in the literature. Over the years, researchers worldwide have tried to identify the factors that determine quality in auditing. Therefore, the number of researchers concerned about this matter has increased considerably and the debated topics have diversified, developing the field of research and, at the same time, multiplying the factors characteristic of audit quality.

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In Romania, the Authority for Public Supervision of the Statutory Audit Activity (ASPAAS) is the competent authority in the public interest supervision of the statutory audit. It exercises its tasks according to the provisions of Law 162/2017. This body shall carry out regular inspections of the quality of audit engagements.

The concern of professional organisations to ensure high-quality audit engagements has intensified, trying over time to educate and make auditors and audit firms aware of the influencing factors they need to take into account when performing audit engagements. Norms and regulations have been changed and adapted to the economic changes. At the same time, it has been demonstrated on countless occasions that quality in audit is not only provided by norms but also by many factors. Wedemeyer (2010) points out the use of professional reasoning in decision-making, risk assessment, choosing and applying appropriate risk-based audit procedures and assessing audit evidence to identify their quality and adequacy so that the opinion is well founded. Mansouri et al. (2009) argue that users can only rely on an auditor's findings when they are confident that the auditor has acted independently, drawing conclusions based on objective evidence. Factors such as compliance with the standards in force, accounting rules, the code of ethics of accounting professionals, experience in the field, continuous professional development, rapid adaptability to new circumstances, professional scepticism, and morality have a tangible impact on the quality of auditing. Regardless of the factors, the auditor's correct reasoning and ethical actions can lead to a qualitative audit. For this, however, an auditor must have a high level of professional knowledge and skills and have assimilated the ethical behaviour imposed by professional and societal norms (Chersan, 2019). The consolidation of the company's image, as well as the increase of the reputation among customers and stakeholders, is done by adopting a socially responsible behaviour, a behaviour superior to ethical reasons, to which the solution of social and environmental problems can effectively contribute (Socoliuc et al., 2020).

The main purpose of the proposed research is to conduct an empirical evaluation of the most relevant scientific publications that target the topic of the quality of reporting in audit, determining the essential elements in describing the quality of reporting in audit, as well as future directions of research both for other potential researchers and for us. The main question to which this research is meant to answer is: What are the determining factors for ensuring the quality of audit reporting?

To achieve the goal, the following objectives are outlined:

- Selection and analysis of the leading scientific papers with the words quality audit reporting in their titles and themes published in the Web of Science database.
- Selection of the database and definition of the sample.
- Identifying the main items in connection with the pursued topic, forming clusters and determining the research directions.

Considering these above, we will try to mirror, in a more complete picture, the determinants of quality assurance in audit.

2. Literature review

Starting from the analysis of Gray and Ratzinger (2010) pursued the study of the perception of audit missions performed by "Big 4" auditors, both from the auditors' and users of audit reports' points of view. The analysis focused on group discussions which led to the following conclusion: stakeholders say that it is recommended for a company to use the services of an auditor who is part of the "Big 4" group, as they have more experience and expertise, interpret the standards in the same way and the deviations in the quality of assignments are thus reduced.

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The quality of the services offered by audit firms outside the group can report a difference compared to the firms in the "Big 4" group. Given their scale, these auditors have better access to technology, training and facilities (Khurana & Raman, 2004).

Auditors in large "Big 4" firms are considered to be more independent than those in smaller audit firms because they suffer a higher reputational risk if they are negligent, they are less based on the revenues of an individual customer, and hence, they are less likely to be influenced by a single client. Their higher income base exposes them to a higher risk of litigation (Palmrose, 1988). Based on the literature, we expect "Big 4" auditors to be less likely to experience allegations of audit deficiency (Alhababsah & Yekini, 2021). The study conducted by Choi et al. (2010) on a sample of client firms in the USA for over five years monitored whether the size of the audit firm is a relevant factor, distinct from the commitment that influences the quality of the audit. In his study, it has been shown that the size of the audit firm positively affects both the quality of the audit and the fees charged by them, supporting the opinion that they offer high-quality audits compared to small offices. Siminică et al. (2020) emphasise the positive relationship between the quality of external audits made by auditors working in the Big 4 group (Pricewaterhouse Coopers, KPMG, Ernst & Young and Deloitte) and the financial performance assessed in terms of the main financial performance indicators.

In the study by Feleaga et al. (2013), which looked at the impact of trust on the auditor's professional judgement, it was confirmed that the auditor's trust in an audit client increases with the age of the mandate. The results highlighted the fact that the auditors spend less and less time in conducting audit missions at these clients, being a relationship based on trust, compared to the audit missions carried out at new clients, at which the number of hours remains constant, and the professional scepticism is at a high level. The credibility of accounting information is the fundamental element in the decision-making process, positively influencing the activity of entities and their financial results (Grosu, 2009). Due to the changes, companies are forced to "think" and report in an integrated way. This refers to the fact that a company must provide financial and non-financial information about the related activity's strategy, performance and forecasts. In the study conducted by Cosmulese et al. (2019) on a sample of 180 companies listed on the Stock Exchange, it was demonstrated that such an approach leads to the mirroring of an indisputable image of companies on the regulated market, imposing the development of information transparency to be able to meet the expectations of stakeholders, thus encouraging the strengthening of mutual relations and the trust of investors.

Taking into account the public's perception of the real financial statements of the companies, rendered by the auditor's opinion in the audit report, the authors Sercu et al. (2006) argue that the famous financial scandals (Enron) determined the auditors to act more carefully in the analysis of the financial statements, the opinions with reservations appearing more and more often, concluding that the effects were positive, as the auditors began to be much stricter and rigorous to regain investors' confidence. Audit reporting is a complex activity, and the opinion expressed by the auditor makes an essential contribution to investors' decisions (Condos & Fülöp, 2015). In the research carried out by Gaynor et al. (2016), the link between the quality of financial reporting and the quality of the audit is highlighted, examining the impact of them on investors, as well as on their efficiency and effectiveness. The results note that quality reporting leads to higher efficiency of investments, mitigating the gaps between suppliers and managers. In addition, the quality of audit is given by the audits conducted by the Big 4 firms, which provide their clients with a positive image in front of investors, as well as a reduction in the gaps that may arise in different contexts (Shahzad et al., 2019).

The advancement of technology influences the work of the auditor and the work and actions of the personnel dealing with entities' accounting. Companies' use of innovative digital technologies (Industry 4.0, 5.0) leads to a new way of approaching things, contributing to the extent of social and organisational effects, affecting the operational and managerial economic processes (Căpușneanu et al., 2020). Auditors are increasingly using technologies to improve audit quality and keep pace with the development of the global economy. The study by

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Christ et al. (2021) demonstrated that using drones and software for automatic counting leads to increased quality in auditing and more transparent financial reporting. The authors evaluate the three dimensions of quality in auditing: effectiveness, efficiency and documentation quality. The study shows us that using advanced technology (Industry 5.0/drones) increases the efficiency and effectiveness of the professionals and decreases the time allocated to counting and conducting the inventory (681h to 19h), the error rates being reduced (0.15% to 0.03%) while providing quality audit documentation. The incidence of a positive image of the audit process is reflected in the trust it generates.

In comparison, the auditor's credibility for stakeholders and clients depends significantly on the trust that all external users ascribe to the financial statements, which have received an audit attestation. In the literature, the perception that external users form regarding the characteristics of a good audit is associated with the quality of the audit, credibility, image, reputation of the auditor, as well as his ethics. In order to assess the quality of the financial reporting, which directly impacts the decisions of the stakeholders, the study uses the audit opinion and the critical audit elements presented in the audit reports issued by the companies listed on the Bucharest Stock Exchange. An unqualified opinion, but with some insignificant observations, indicates the existence of transparency in financial reporting and compliance with an applicable financial reporting framework (ISA 700-IAASB). All other situations where the audit reports contain modified opinions are judged to affect the clarity of financial reporting. The extent to which the stakeholders can rely on an audit opinion depends on the audit's quality. Despite the significance of audit quality for the stability of capital markets, the investors, regulators and researchers persevere in debating the topic, defining the composition and measurement of audit quality (Bedard et al., 2010; DeFond & Zhang, 2014; Francis, 2011; Knechel et al., 2013; Botez & Melega, 2020).

2. Research methodology

This study aims to identify the direct and indirect links between variables directly connected to the pursued topic, respectively, "the quality of audit reporting." Thus, we initiated the research through a bibliometric analysis of the literature regarding the mentioned topic using the clusters method to obtain the desired results. In this study, the publications encountered on the Web of Science and SCOPUS research platforms were followed. The mission of evaluating important scientific publications is to identify determining factors for ensuring the quality of audit reporting and determining the less studied area so that future researchers and we can contribute to the homogenisation of the studied field.

Thus, the proposed work is based on empirical research on leading scientific publications. Regarding the research tools used, we can mention observation, induction, comparison, testing and evaluation. As databases used for data collection, we have the Web of Science and SCOPUS.

The stages of research will be tracked:

- To highlight the main items (terms) with which the topic is in connection, as well as the power of the links, the number of appearances and the evolution in time of the concepts, determining the directions of research by fields. Grouping items according to the strength of the links and defining the clusters, following their ranking and directing the research to the lowest rated clusters so that we can participate in the improvement of the targeted research field.
- Meta-analysis of the leading scientific publications based on the data obtained from the Web of Science research platform.
- Outlining the most important factors for assessing quality in auditing.

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3. Results and discussions

Alan Pritchard first used the name "bibliometric" in 1969 in his book, and through "Statistical Bibliography" or "Bibliometrics", the aim was to transmit and statistically count the flows from the literature in a particular field, materialised in articles, reviews, books or other materials used for the transmission of information (Sancho, 1990). Thus, bibliometric analysis is a statistical analysis of written publications that offers the possibility of obtaining a quantitative analysis of the academic literature, which is widely used by researchers (Grosu et al., 2022). Using this method, we could describe and evaluate the most relevant manuscripts, considering the journals' quality and the recorded citations, geographical location and identification of the years in which they were published, knowing the authors by country and the institutions they represent. It also allows the structuring, organising and managing of the database in an objective and systematic manner, offering a wide range of key concepts and research directions, as well as the possibility of observing the efforts of researchers in a certain area and the redirection of research to the less developed areas, so that we can contribute and develop to the field of study to make it as homogeneous and useful as possible for future researchers. The contribution of information discovered through the bibliometric analysis competes to substantiate the research directions (Pritchard, 1969).

Thus, we propose that through a quantitative analysis of the scientific papers having the topic "quality of audit reporting", published between 1975 and 2021 and using data extracted on August 6, 2021, from SCOPUS and Web of Science research platforms, to identify the main scientific publications by years of appearances, type of document, the field of research, an affiliation of articles, countries…etc., as well as after the journals in which they were published. Therefore, we could reach the purpose we aspire to: determining the research directions and the researchers' perception of the quality of the audit reporting, starting from the first scientific writing in the concerned field and following its evolution by years.

SCOPUS is an interdisciplinary database created by Elsevier, and it is often compared to Google Scholar, the former being more complete and more dependable, with over 20,000 publications (Bar-Ilan, 2007). Web of Science is one of the most important sources of scientific documentation worldwide. Its scientific publications are recognised as the authority appreciated worldwide for the ISI evaluation of scientific writings created in collaboration with the renowned Institute for Scientific Information in the USA/Philadelphia. In an online format, it provides researchers access to over 12,200 scientific journals, 160,000 scientific conferences and over 30,000 books from 256 disciplines*.

Therefore, in the first stage, the review of the literature was made by examining the Web of Science platform after the topic of quality of audit reporting (All fields). We obtained 6,205 scientific documents in which the topic was found, either in the title, summary, or keywords (see Table 1).

Table 1. The evolution of scientific publications by the topic "quality of audit reporting" in the Web of Science database

Period	No of scientific publications	The evolution in time of the interest of specialists in the field with the topic quality of audit reporting (Expressed as a percentage)
2011 - 2021	4.613	273,82 %
2000 - 2010	1.234	250 %
1989 - 1999	352	6.940 %
1978 - 1988	5	400 %
1975 - 1977	1	-
Total	**6.205**	-

Source: Own realisation, by Web of Science database

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As we can see in the table above, there is a progressive evolution from one period to another; thus, starting from 1975, the first scientific publication containing words on the topic in question was identified as being in the field of paediatrics. In the next period, 1978-1988, 5 scientific papers were inventoried, of which two were from Business Finance. Once the development of the auditor profession, the interest of researchers in the field began to intensify, remarking a growing interest in the subject because of the increasing number of articles being written on this subject. In the period of 1989-1999, 352 scientific documents were identified (an increase of 6,940% compared to the previous period), followed by the stage of the 2000-2010 years in which 1,234 scientific papers were clocked, this being an increase of 250%, compared to the last period. The maximisation of the interest of specialists in the field of the analysed topic was noted in the latest period (2011-2021) when there were 4,613 articles, with 273,82% more scientific papers compared to the previous period (see Figure 1).

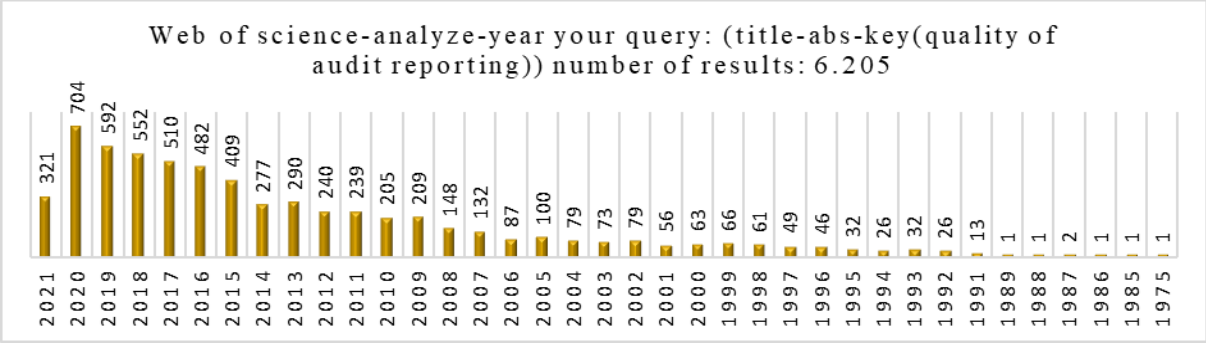


Figure 1. The evolution over time of scientific publications -Web of Science
Source: Own realisation, by Web of Science database

Accordingto the diagram above, due to the changes that occurred both in the global economy and the auditor profession, the publications have expanded from one publication in 1975 to over 704 publications recorded in 2020. Publications are diverse, from articles and reviews to articles captured from various books and other significant publications.

By going to the SCOPUS database by Article Title/Abstract/Keywords and sorting the documents by the words ***quality of audit reporting,*** we have identified 2,456 scientific papers (see Table 2), 152.64% fewer papers than those found on the Web of Science platform.

Table 2. The evolution of scientific publications according to the topic "quality of audit reporting" in the Scopus database

Period	No of scientific publications	The evolution in time of the interest of specialists in the field, with the topic quality of audit reporting (Expressed as a percentage)
2011 - 2021	1.632	166,66 %
2000 - 2010	612	251,72 %
1989 - 1999	174	480 %
1978 - 1988	30	275 %
1973 - 1977	8	-
Total	**2.456**	-

Source: Own realisation, by Scopus database

Here too, it is an upward trend of the interest of researchers in the field of the analysed topic; in recent years (2011-2021) being registered a significant increase in scientific publications in this area (see Figure 2), reflecting the importance of the chosen topic.

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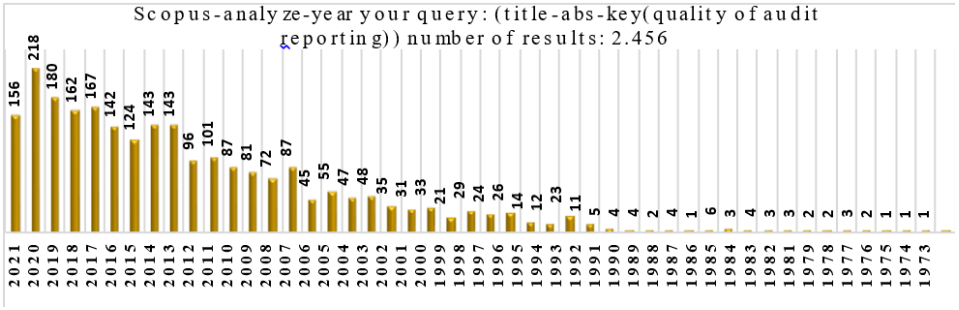


Figure 2. Evolution over time of scientific publications – Scopus
Source: Own realisation by Scopus database

Since the Web of Science platform is more complex and homogeneous, the research fields are much more diverse, and most of the scientific papers are also present in the SCOPUS platform, we will continue the bibliometric analysis focusing only on this the Web of Science platform. The database that we obtained is quite large; thus, we have selected the last ten years (2012-2021) and the domains of interest for this research which are: Business, Business Finance, Management, Economics, Public Administration, Ethics, Computer Science Information Systems, Green Sustainable Science Technology, Law, Telecommunications and Computer Science Cybernetics. The selection of the papers was done in a systematic and objective manner, considering the quality of the journals, as well as the targeted research segment. We obtained 1,570 scientific papers, sorting the selection by country, research areas, organisations involved and publication sources. The situation is set out below.

The United States of America, Australia, China and England are the countries that have contributed 61.019 % (958 scientific papers) to the development of the analysed field. Also among the countries with a substantial contribution are Malaysia, Canada, Spain, New Zealand, Taiwan and South Korea at a rate of 18,726%, representing 367 scientific manuscripts.

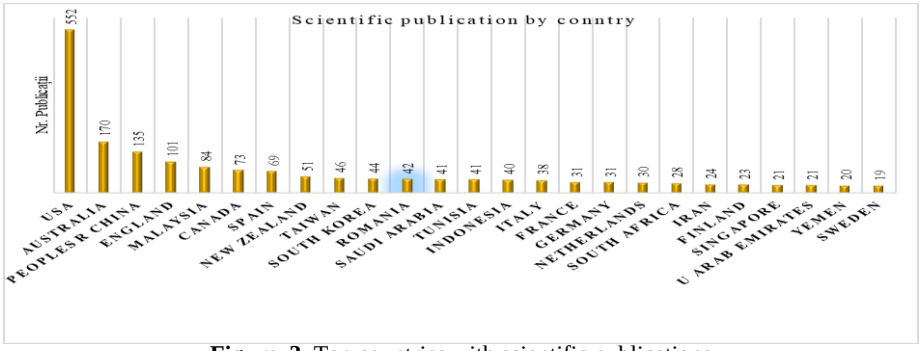


Figure 3. Top countries with scientific publications
Source: Own realisation, by Web of Science database

As for Romania, it participated with 2.675% in the approach of the quality of reporting in audit, the value that represents 42 documents that are globally recognised on the Web of Science research platform. We can point out that the attention of specialists in the field (Tiron, 2018; Istrate, 2019; Bunget, 2020) is moving in directions such as the quality of the made reports, the presented financial information and the audit report in which KAM (key audit aspects) are also included.

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Going back to the global level regarding the targeted topic and following the main selected research areas, we note that, at the top of the ranking, the Business Finance field is located, with a total of 1,223 scientific papers (which is 76.452%). Therefore, it is the most debated area of the topic researched, as is natural, given the place and role of auditors, who are at the heart of the relationship between companies and users of accounting information. Without their contribution, the financial reports of firms would have been called into question, or even more, would not have been recognised. The top five areas of research are: Management 17.302%, Business 11,868%, Economics 11,181%, Public Administration 2,561%, and Ethics 1,811%. The other areas, Law, Computer Science Information Systems, Green Sustainable Science Technology, Computer Science Interdisciplinary Applications and Telecommunications, account for 2,373%. The graphic representation according to the first six areas of research on the quality of audit reporting (Figure 4) shows us which is the field of high interest and at the same time the most affected by the quality of the audit carried out by the auditors.

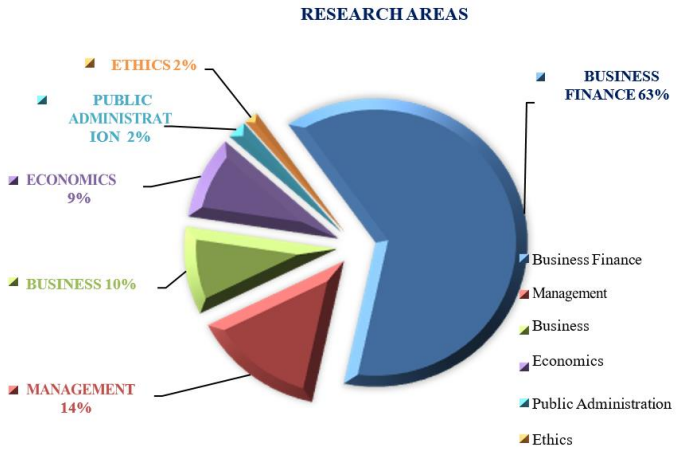


Figure 4. Representation of publications by research areas
Source: Own realisation, by Web of Science database

According to the tables and figures presented in the previous stage, we can see an upward growth outlined over time at a global level, specific information regarding the intensification of the effort made by the academic environment - and not only - to extend the research and their classifications to a higher level. Aiming at this dimension makes us turn our attention to the less debated components in these works to strengthen the existing research or, why not, to fill in the gaps so that the pursued results become as cohesive and helpful as possible for future readers.

To develop the quantitative debate of the scientific interest regarding the quality of the audit report, the VOS viewer software version 1.6.15 was used, which allows the analysis of the keywords from the content of the existing publications in the Web of Science database to extract and highlight the links between these keywords. The software offers the possibility of making a map, which illustrates the relations between the terms that appear most frequently in the scientific papers for which the platform was interrogated. Therefore, in the first stage, we have made an interdisciplinary map that includes the main keywords associated with the researched topic. VOS viewer lets us create a complete map of existing connections (Figure 5). The size of the "nodes" indicates the items most closely linked and used concerning the quality of reporting in an audit.

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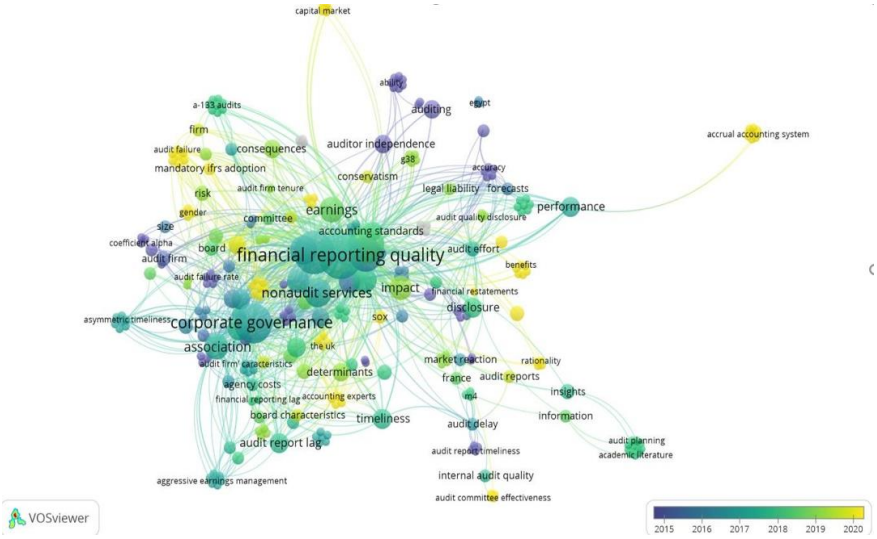


Figure 5. Links between the keywords of scientific publications 1975-2021
Source: Conceptualisation in VOS viewer, based on Web of Science data

There have been identified 288 terms (items), and next, we will follow the connection between the elements, namely, the co-occurrence links between the terms. A positive numerical value represents the power of links between terms - the higher the value, the stronger the connection. The strength of a relationship indicates the number of publications in which two words appear. Words are organised in groups (clusters) that do not overlap, which means that a term belongs to a single cluster. Between any pair (clusters) of words, there is a link. They receive attributes depicted by a number, a weight and an externalised score by numeric values. The weight of the cluster indicates the importance of the term, and on the map, they are represented more pronounced. The weight of the cluster is given by the links and their total power; in other words, the links of a term to another term represent the total power of the connections between the items. Thus, we obtained 78 terms (items) grouped into six clusters (see Figure 6).

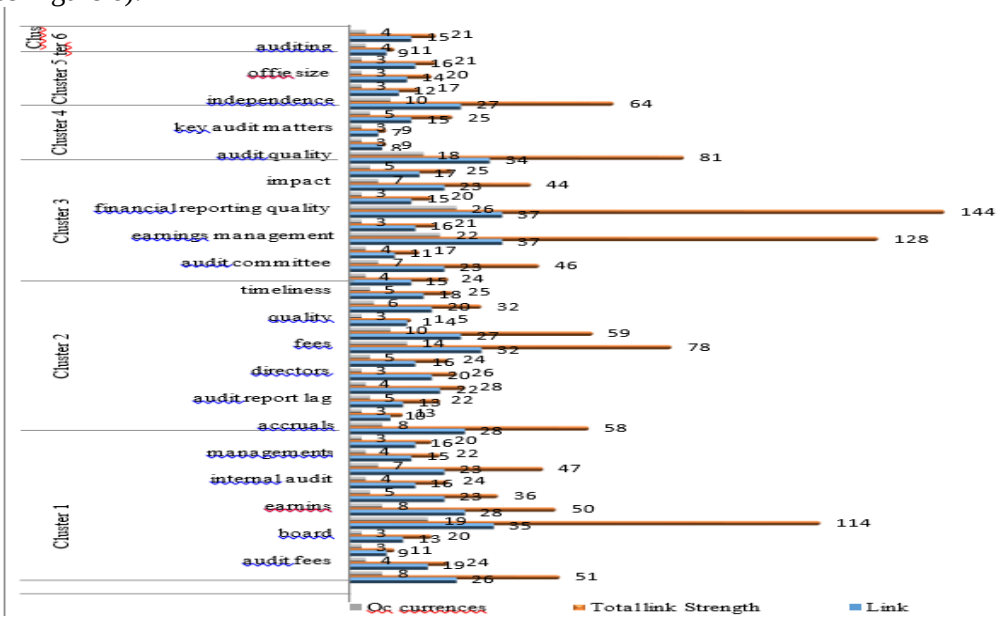


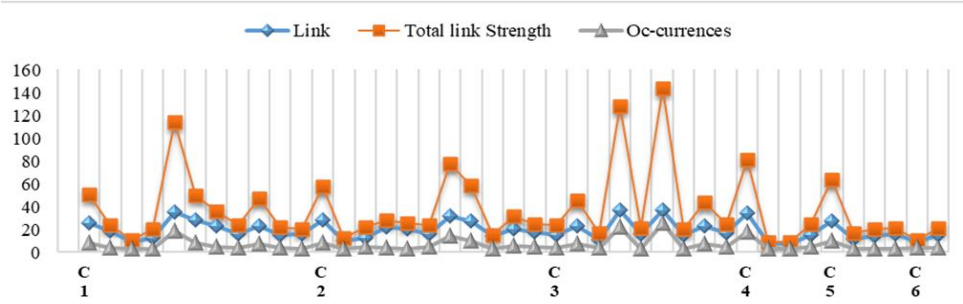
Figure 6. Grouping items by clusters
Source: Own creation according to data created in VOS viewer by Web of Science database

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Looking at the classification of items by link, total link strength, occurrences and the years of appearance, we can see which clusters with a higher and lower intensity are. Therefore, the first two clusters are composed of 11 items each, indicating a high intensity. In the next step, we find the 3rd cluster that has 9 items, meaning it also has consistency. The most relevant items from the first three clusters that have a connection with the target topic, the following link, Total link strength and occurrences are: corporate governance (35/114/19), fees (32/78/14), earning management (37/128/11) and financial reporting quality (37/144/26). A higher level of the power of links is noted, indicating the high presence of terms in various specialised publications. Going down in the cluster standings, the last three are of lower intensity, so cluster 4 has a total of 4 items, such as insights, key audit matters, performance and audit quality; cluster 5 also has four items, such as industry expertise, office size, restatements, independence and the last cluster has only two items: auditing, and auditor independence. As the main items in these groups, we can name audit quality (34/81/18), independence (27/64/10) and auditor independence (15/21/4).

Therefore, the intensity of the connections between the items and the fluctuations encountered are shownin the following figure (see Figure 7).

Figure 7. The power of links between items



Source: Own creation according to data created in VOS viewer by Web of Science database

Considering the goal we set for ourselves at the beginning of the study, namely the one to identify less developed niches in the research area, it is observed that the last three clusters are poorly founded, the main items in these groups (see Figures 6,7) being: audit quality, independence, auditing, insights, industry expertise, auditor independence, critical audit matters, office size, performance and auditing.

Further, we present a meta-analysis of the literature on "quality of audit reporting" from 2017 to 2022. A meta-analysis is a research tool that “allows us to review a field of research and determine the extent to which a particular result has been successfully replicated by various research” (Eden, 2002). This technique is based on a quantitative analysis of the results obtained from studies carried out in a particular field of research. The purpose of meta-analysis is to reach a "super-result" that could describe the intensity of the studied phenomenon in the general population (Leeuw & Hox, 2003). And, like any scientific research endeavour, we will start from our hypothesis, i.e., quality of audit reporting." Discussing the issue of hypotheses in a meta-analysis, Mullen (1989) confesses that this stage is decisive for the proper conduct of the entire activity.

Therefore, to deepen our quantitative research and bring it from the general to the private so that I would beable to achieve the proposed objective, I have reinitiated searching on research platforms, but this time with the following conditions: the pursued topic has to be included in the title and the subject of scientific publications, and the chosen period is 2017-2021. Therefore, we obtained 224 scientific documents (Web of Science 109 and Scopus 117). We have noticed that most of the scientific papers on the Web of Science are also present in SCOPUS; we will continue the research - as we did in the previous section - on the Web of Science platform, this research is considered more relevant and with a higher impact factor.

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Hence, on the Web of Science platform, we have identified 109 scientific papers, of which 73 are articles, 23 are summaries of conference meetings, 11 are procedural documents, 3 are editorial materials, are pre-access, one is a note, and another one is a review article. We can 2 see that the research fields have narrowed down, observing only areas such as Business, Business Finance, Management, Economics, Public Administration and Law, the years of publication of scientific papers being extended to 2021. We have selected 30 relevant articles (with the most citations) that focus on the quality of reporting in the audit.

The theme of quality of audit reporting is found from the perspective of internal and external auditors. The top 6 most cited articles from the created sample (see Figure 8) contains research referring to both perspectives. Still, the sample will be separated, as we are following only the articles referring to the quality of reporting in external/statutory audits.

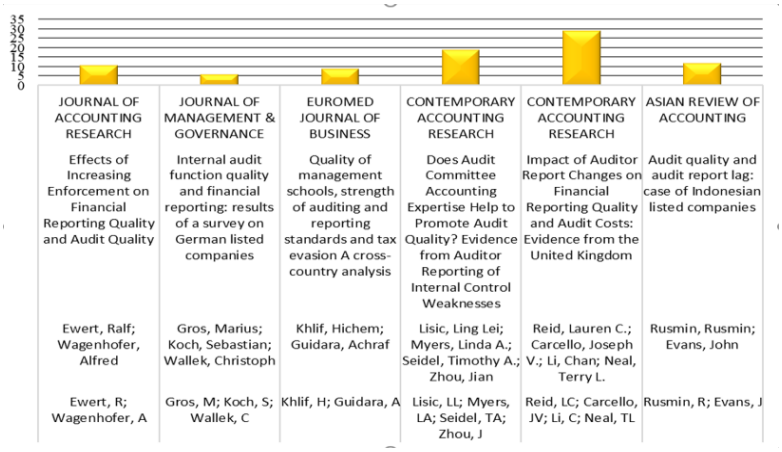


Figure 8. Top 6 most cited articles in the Web of Science regarding the topic quality of reporting in audit
Source: Web of Science database creation

In other words, the research presented by Reid et al. (2019) - which is at the top of citations - addresses the impact of the new audit reporting requirements on the quality of financial reporting, as well as on the costs incurred in the audit engagement. The study provides conclusive and timely evidence of the costs and benefits of the new audit reporting requirements applied to a relevant number of UK companies for over 2 years, highlighting those regulations that improve the quality of financial reporting with no consequences for the fees charged by auditors or on the duration of the assignment. However, it cannot be demonstrated whether these changes impacted the auditor's turnover. The auditors may have counted some additional costs related to the new standards, but these were not reflected in the fees of the audit clients nor did the deadlines set for the submission of the audit reports.

Moving on to the empirical study of Rusmin and Evans (2017) on data presented by listed companies on the Indonesian Stock Exchange from 2010 to 2011, where the connection between the auditor's experience and reputation with the quality of the audit was tracked and the gaps in the audit report encountered, respectively Big 4 auditors versus non-Big 4 auditors. Thus, a discrepancy is noted between audits conducted by firms/auditors that are part of the Big 4 group and those outside the ranking in terms of updating the audit report (qualitatively) and the speed and complexity of the executed missions (quantitatively). Besides, this study relates a statistical and significant relationship between the profitability of companies, audit complexity, audit risk and membership of the Big 4 group as regards the reporting gap in the audit. The data shows that non-Big 4 auditors have longer reporting delays than those in the Big 4 group, and financial performance is lower.

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In their analysis, Ewert and Wagenhofer (2019) present that the legislative changes and the increase in their application harm the audit quality and financial reporting. Quality in audit and financial reporting is given when managerial strategies and the auditor's strategies intersect, when they are balanced and depend on each other. The intensity of legislative changes increases the auditor's effort, and compliance with the application of the legislation only sometimes leads to a quality of financial reporting. Concluding that, to improve the quality of the audit and the quality of reporting, there is a need to consider the production risks, characteristics of the accounting system and the scope of the audit. Another empirical research, based on a sample of 137 countries (Reid et al., 2019), tells us about the link between the quality of higher education systems in modelling integrity behaviour and adaptability to tax systems, which complies with the rules of applicability of the legislation in force and are not associated with facts related to tax evasion. This paper aims to examine the relationship between the quality of management schools and tax evasion and to test whether the power of audit standards influences moderate reporting. These are just three of the most cited scientific papers (see Table 3) that address issues related to education, experience, reputation, and the new requirements for reporting the quality of audit reporting.

Table 3. Articles concerning the quality of reporting in statutory audit

Authors	**Article Title**	**KEYWORDS**	**Cit.**
Rusmin & Evans (2017)	Audit quality and audit report lag: case of Indonesian listed companies	Auditor reputation, auditor industry specialisation, audit report lag	12
Khlif & Guidara (2018)	Quality of management schools, the strength of auditingand reporting standards and tax evasion A cross-country analysis	Tax evasion, quality of management schools, strength of auditing, reporting quality standards	9
CPA Australia (2019)	Audit Quality, Compensation, Effectiveness of Regulation and Extended External Reporting	Assurance, corporate social responsibility, extended external reports	1
Albany (2019)	The impact of audit committee, CEO, and externalauditor quality on the quality of financial reporting	Quality of financial reporting, external audit, audit quality	4
Boolaky, Soobaroyen & Quick (2019)	The Perceptions and Determinants of Auditing andReporting Quality in the Asia-Pacific Region	IFRS adoption, accounting quality, standards	2
Ewert & Wagenhofer (2019)	Effects of Increasing Enforcement on FinancialReporting Quality and Audit Quality	Accounting standards, Financial reporting quality	11
Louis, Pearson, Robinson & Robinson (2019)	The Effects of the Extant Clauses Limiting AuditorLiability on Audit Fees and Overall Reporting Quality	Litigation, risk earnings, quality of financial reporting	1
Nadhir & Wardhani (2019)	The effect of audit quality and degree of international financial reporting standards (IFRS) convergence on the accrual earnings management inASEAN countries	Accounting standards, audit quality, financial reporting quality	3
Reid, Carcello, Li, Neal, & Francis (2019)	Impact of Auditor Report Changes on Financial Reporting Quality and Audit Costs: Evidence from the United Kingdom	Earnings quality, investor protection, BIG-4	29
Shahzad, Rehman, Hanif, Asim & Baig (2019)	The influence of financial reporting quality and auditquality on investment efficiency Evidence from Pakistan	Emerging markets, investment efficiency, financial reporting quality, audit quality	8
Bakheet (2020)	Quality Audit Template for Learning and TeachingProcess of the Self-Study Report for National Accreditation and Assurance, Saudi Arabia	Quality education, quality education auditing	1
Furqan, Wardhani, Martani,	The effect of audit findings and audit	Public services quality,	3

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& Setyaningrum (2020)	recommendation follow-up on the financial report and public service quality in Indonesia	Financial report quality, Audit findings	
Halibas, Mehtab, Al-Attili, Alo, Cordova & Cruz (2020)	A thematic analysis of the quality audit reports indeveloping a framework for assessing the achievement of the graduate attributes	Constructive alignment, graduate attributes, learning outcomes, outcome-based education	2
Kitiwong & Sarapaivanich (2020)	Consequences of the implementation of expanded audit reports with key audit matters (KAMs) on audit quality	Audit quality, financial restatements, key audit matters	3
Krishnan & Tanyi (2020)	Does Regulating Audit Pricing Enhance Audit Quality and the Timeliness of Audit Reporting? TheTexas Experience	Audit fees, Texas, audit quality, audit lag	2
Nguyen & Kend (2021)	The perceived impact of the KAM reforms on auditreports, audit quality and auditor work practices: stakeholders' perspectives	Audit quality, Audit reports, Key audit matters	1
Sutton (2021)	Impact of key audit matters (KAMs) reporting onaudit quality: evidence from Thailand	Key audit matters (KAMs) reporting, Audit quality, Thailand, Communication theory	1
Zeng, Zhang, Zhang & Zhang (2021)	Key Audit Matters Reports in China: Their Descriptions and Implications of Audit Quality	Key audit matters, critical audit matters, audit quality, content analysis	3

Source: Web of Science database creation

Summarising the authors' approaches, we can see that we have one publication each in 2017 and 2018, covering the quality of the audit and the gaps in the audit report, as well as the importance of education. In 2019, there have been written eight articles that aimed at associating the quality of the audit with terms such as education, the efficiency of regulations and numerous legislative changes, extensive reporting, the link between internal audit-CEO-statutory audit, auditor limited liability, convergence effect of IFRS, the impact of changes in the audit report and investment efficiency. The year 2020 brings us related topics with the word quality, such as education, recommendations of the auditor and the link between fees - quality - timeliness of the audit report. Also, in 2021 there are three articles, and they are all linked to the audit report, respectively, the impact of KAM on the reports and the quality of the audit. In other words, to be able to successfully outline the proposed research and find an answer to the question formulated at the beginning of the research, namely, What are the determining factors for ensuring the quality of audit reporting?, we can find the answer by grouping the keywords into five groups (see Figure 9).

As you can see, we grouped these factors by colour. The colour yellow represents the first group 1/Audit report, with an occurrence frequency of 9 per cent; the next group, 2/Education/orange, with 3 per cent, then group 3/ Legislative Regulations/ blue - 3 appearances, group 4 green/ Conducting the Audit Mission which was twice ticked the same as group 5/red/Stakeholders.

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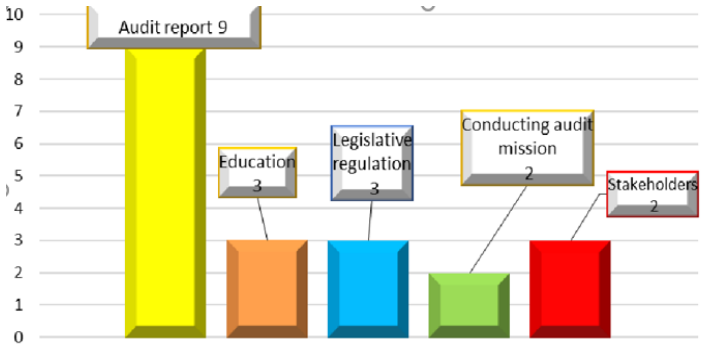


Figure 9. Frequency of determinants in assessing the quality of audit reporting
Source: Web of Science database creation

Hence, we noticed an association between the number of keywords with our topic, highlighting the importance of research. The most vital link of quality in auditing is the audit report. In other words, after accessing the Web of Science database after searching words *quality audit reporting*, for the 2017-2021 period, it resulted in 109 scientific publications that had the analysed terms in their title or topic.

There were selected the top 30 articles that have a high citation index. Following a qualitative analysis, it was noticed that 12 of the papers are in the field of internal audit. Thus, they were excluded from our analysis because the research aims to track the quality of the statutory audit. As a result, the remaining 18 articles out of 30 were analysed by the identified keywords, aiming at associating them with the term quality in the audit. There have been obtained five categories of terms with which the topic can be associated. Therefore, the audit report is the fundamental element in quality rendering in audit, followed by education and legislative changes, as well as by the steps taken by the audit team in carrying out the mission to provide credibility and efficiency for investors and stakeholders.

Conclusions

Considering the aim that we proposed at the beginning of the study, to identify less developed niches in audit reporting quality, it is observed that the last three clusters, resulting from the bibliometric analysis, are less explored. These include topics related to keywords such as: audit quality, auditor independence, industry expertise, key audit issues, audit office size and performance, which are emerging research themes. Therefore, we, as well as future researchers, can initiate research on issues related to the form and content of the audit report and elements related to auditor ethics and integrity to make a significant contribution to the audit reporting quality and to complement the databases queried. Therefore, audit quality assessment should focus more on the auditor's integrity and the content of the audit report.

At the same time, the results of the bibliometric analysis support the idea that communication is the primary determinant of the quality of reporting in the journal. Through effective communication, any audit team can achieve proper performance and develop innovative solutions that provide a competitive advantage to their company and clients. As a result, the audit report should present relevant information to users/stakeholders so that they can develop a strategy for action based on the information received. Effective communication and continuous improvement of communication skills should be encouraged to build lasting relationships that help customers create the value they seek.

According to the results of the bibliometric analysis, we can also conclude that two essential components render the determination of quality in auditing: the audit work must be carried out in a way that allows the

identification of possible dysfunctions in the way the client's financial statements are prepared, on the one hand, and secondly, the audit firm must continuously assess the quality control concerning the proper organisation and operation according to the rules, so that no possible threats to its integrity and objectivity can occur. Audit quality should be assessed in terms of the two components listed above.

The importance of the study is given by the current economic context, characterised by a marked instability in economic, political, energy and health terms, which accentuates the importance of quality in auditing. Communication in times of crisis is an essential element underpinning the relationship between businesses and stakeholders. The quality of audit information that businesses report gives value and integrity to companies, helping maintain investor interest.

The main limitation of the research is that the bibliometric analysis was based only on the two scientific databases, Scopus and Web of Science, which sometimes overlap, some articles that are indexed on Scopus may also be indexed on Web of Science and vice versa. At the same time, the use of the two databases has excluded a large proportion of articles which are not indexed in these databases. At the same time, the bibliometric analysis focused only on articles written in English, omitting articles written in other languages, which may provide relevant results to our study.

This research outlines the main research trends and highlights the emergence of research directions that are relevant to business and have been overlooked by researchers. This research can be used as a starting point for future audit quality analysis and assessment research.

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FOLLOW US, NOT? GENDER DIFFERENCES IN FINANCIAL LITERACY IN GLOBAL LEADER OF GENDER EQUALITY*

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Abstract. Gender differences in financial literacy are examined in this research. A considerable body of research suggests women are inferior to men when it comes to financial literacy. Various social factors (e.g., gender inequality) are typically attributed as antecedents of this reality. We set out to investigate whether gender differences in financial literacy are present in Iceland, the most gender-equal country in the world. If financial literacy is based on social norms and issues, gender differences in financial literacy should be less in countries like Iceland, where women are highly economically and otherwise empowered. Using a representative sample from the Icelandic population and controlling for a host of factors, we find women to be less financially literate than men despite substantial gender equality in Iceland.

Keywords: financial literacy; gender; Iceland

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1. Introduction

Women tend to be less financially literate than men (Lusari and Mitchell, 2008: Fonseca et al., 2012; Bucher-Koenen et al., 2017; Lusardi et al., 2010; Agnew and Harrison, 2015), which has generally been attributed to socially constructed issues, such as inequality (Bussey and Bandura, 1999; Agarwal et al., 2015; Lusardi, Mitchell and Curto, 2010). Suppose socially related issues are to explain the differences in financial literacy between men and women. In that case, the difference should be low or zero in the most gender-equal country in the world, Iceland.

Good financial literacy brings lifelong benefits to people in many forms (Guðjónsson, Jonsdottir, and Minelgaite, 2022), such as in retirement planning (Lusardi and Mitchell, 2007a, Lusardi and Mitchell, 2007c; Arenas de Mesa

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et al., 2008; Chan and Stevens, 2008; Hastings, Mitchell and Chyn, 2011; Bernheim and Garrett, 2003; Lusardi and Mitchell, 2014), mortgages (Moore, 2003; Campell, 2006; Stango and Zinman, 2009; Gerardi, Goette, and Meier, 2013), good credit card record (Mottola, 2013; Utkus and Young, 2011; Allgood and Walstad, 2013), avoiding costly financial traps, such as taking payday loans (Lusardi and Scheresberg, 2013; Ernst, Farris, and King, 2004; Agarwal, Skiba, and Tobacman, 2009; Bertland and Morse, 2011) and being defrauded (FINRA Investor Education Foundaation, 2006; Blanton, 2012).

However, general findings show that financial literacy is low, both among older (Lusardi and Mitchell 2011a;) and younger people (Mandell, 2008; Shim et al., 2010; Chen and Volpe, 1998; Le Baron et al., 2018; Chowa and Despard, 2014; Anderson and Card, 2015), and across countries (Lusardi and Mitchell 2014; Lusardi and Mitchell 2011c; van Rooij, Lusardi and Alessie, 2011).

Financial literacy does, however, differ demographically between various groups in societies. People with higher education perform better than the uneducated (Lusardi and Mitchell 2011c; Christelis, Jappelli, and Padula 2010; Lusardi 2012), and those who score highly in cognitive ability perform better than those who score lower (McArdle, Smith, and Willis, 2009; Lusardi, Mitchell, and Curto, 2010). Those who live in rural areas fair worse than those who live in cities (Klapper and Panos, 2011) and financial literacy may also be clustered with different regions (Beckmann 2013; Fornero and Monticone, 2011; Bumcrot, Lin, and Lusardi 2013). In addition, family background and parental education matter in terms of financial literacy (Lusardi, Mitchell, and Curto, 2010; Chiteji, and Stafford, 1999; Li, 2009; Shim et al., 2009; LeBaron et al., 2018) and finally, women are less financially literate than men (Lusardi, and Mitchell, 2008).

Chen and Volpe (2002) found women to have less knowledge about financial topics than men. Furthermore, they found women generally have less enthusiasm for, lower confidence in, and less willingness to learn about personal finance topics than men (Chen, Volpe, 2002). Other research demonstrates similar findings. Zissimopoulos, Karney, and Rauer (2008) found that less than 20% of middle-aged college-educated women could answer a fundamental compound interest question compared to about 35% of college-educated males of the same age.

Women are less financial literate than men in general in many studies around the globe (Bucher-Koenen et al., 2014; Lusardi et al., 2010; Falahati and Paim, 2011; Hung, Yoong, and Brown, 2012; Klapper, Lusardi, and Panos, 2013; Yu et al., 2015; Agnew and Harrison, 2015), both when they are old (Lusardi, Mitchell and Curto, 2014; Atkinson and Messey, 2012; Lusardi, 2011; Bucher- Koenen et al., 2014) and when they are young (Lusardi, Mitchell and Curto, 2010; Driva, Luhrmann and Winter, 2016; Becchetti, Caiazza, and Coviello, 2013, Butters, Asarta, and McCoy, 2012).

Women's low financial literacy results in bad credit card behaviour (Mottola, 2013; Allgood and Walstad, 2011; Allgood and Walstad, 2013) and they get worse credit terms in financial services than men (Alesina et al., 2013). Women also participate less in the stock market than men (van Rooij et al., 2011), a gender gap that diminishes when it is controlled for financial literacy (Almenberg and Dreber, 2015). Finally, low levels of financial literacy, particularly among women, helps to explain around 40% of wealth inequality within the USA (Lusardi, Michaud, & Mitchell, 2017).

While Chen and Volpe (2002) found financial literacy to be lower for younger women compared to younger men, it should be noted that women's social statuses have changed over time. For example, Lusardi and Mitchell (2008) found older women in the USA to have lower financial literacy skills than younger women.

Education, expectations of education, and social status within the family and society may all explain differences in financial literacy between genders (Bottazzi and Lusardi, 2020). For example, finance is considered a male-

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dominated field (Boggio et al., 2014), and maternal gender attitudes lead to girls performing worse in math than boys on PISA (Dossi et al., 2019). Daughters and sons learn differently from their parents when it comes to financial matters (Edwards, Allen, and Hayhoe, 2007; Jorgensen and Savla, 2010; Newcomb and Rabow, 1999), and a mother's background has a particular role in determining the financial literacy of girls, (Bottazzi and Lusardi , 2020). Interestingly, women catch up in terms of financial literacy as they approach widowhood (Hsu, 2011; Faff, Hallhan, and McKenzie, 2011).

Financial literacy is strongly related to sociodemographic characteristics and family financial sophistication, and boys from wealthy parents tend to do particularly well (Lusardi, Mitchell and Curto, 2010). Financial attitude, family influence, and peer group pressure influence the level of financial literacy among engineering students i.e., social pressure (Biony Thomas and Subhashree, 2020) and for highly educated individuals (academics), women are significantly more risk averse than men, but that changes when the individuals have better financial education (Hibbert, Lawrence and Prakash, 2013).

Social differences between different countries and ethnic groups within the same country may explain differences in financial literacy between men and women (Nicolini, Cude and Chatterjee, (2013). While women were found to be less financially literate in developed Western countries, in less developed countries, both women and men were just as financially illiterate (Lusardi and Mitchell, 2008). In former West Germany, women performed better in financial literacy than in former East Germany (Bucher-Koenen and Lusardi, 2011). Both men and women from poor households show low financial literacy, where perhaps social issues such as poverty are the reason for variations rather than gender (Agarwal et al., 2015). Finally, Finucane et al. (2000) found that risk-taking differed between women and men who were Caucasian, but there were no variations between the genders in other ethnic groups.

Since financial literacy differences between the genders is a social construction and varies among culture and countries (Lusardi and Mitchell, 2008; Bucher-Koenen and Lusardi, 2011; Nicolini, Cude and Chatterjee, 2013), and Iceland is often regarded as one of the, if not the most, gender equal countries in the world in various aspects (United Nation, World Economic Forum, 2020; Hausmann, et al., 2011; Olafsdottir, 2018; Economist, 2017; Georgetown Institute for Women, Peace and Security, 2017), we ask whether there is a difference in the financial literacy of Icelandic women and Icelandic men?

2. Method

A simple regression model is applied with similar variables to those used by Lusardi and Mitchel (2011), Mottola (2013), Agarwal et al., (2015) and Potrich (2018). The model is presented below.

$$FinLit = \alpha 0 + \beta 1Gen + \beta 2Edu + \beta 3Age + \beta 4Mar + \beta 5Inc + \varepsilon,$$

The dependent variable FinLit is knowledge of financial literacy. Our primary independent variable of interest Gen is gender and is constructed with the value 1 if the participant is male and 2 if she is a female. Education, Edu is our first control variable; in our case, we examine the difference between those who have a university education, both undergraduate degrees as well as graduate degrees (value 1) and those who do not have a university education (might have no- or other education, value 0). Our second control variable is age (Age), while our third control variable Mar, is marital status, relating to those who are married (marked no. 1) and those who are not (marked with 0). Our final control variable, Inc, is income. We divide income into two groups, those who get less than 300.000 ISK (average income) and those who receive above that amount.

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3. Data

Several questions that measure financial literacy were included in a survey made in cooperation with the Social Science Research Institute at the University of Iceland, with grades rated from 1(lowest possible outcome) to 7 (highest possible outcome).

We used questions from Atkinson and Messy (2012); Agarwal, Barva, Jacob and Varma (2015); Bora Deb (2017); and Greimel-Fuhrmann and Sigoner (2017). The questions were based on what Atkinson and Messy (2012) used when they studied financial literacy in OECD countries. An Icelandic translation was already available for these questions, based on previous research by Karlsson and Asgersdottir (2009). The demographical background questions were on gender, education, age, income, and marital status. The measurement used was a simple Likert scale. The participants were given grades for their financial literacy, where 7 was the highest possible outcome and 1 was the lowest.

To answer the research question, "Is there a gender difference in financial literacy in Iceland, the most gender-equal country in the world?" we employed a survey in a corporation with the Social Science Research Institute at the University of Iceland. The survey was randomly sent to 1,500 individuals in Iceland. The participants were 18 years or older and residents from all parts of the country. The sample was stratified by gender, age, and location within Iceland to represent the population as well as possible. 1,465 were reached out to, and 840 responded, amounting to 57%.

Financial literacy knowledge is our dependent variable; where we asked several questions that measure financial literacy, and the answers were graded from 1(lowest possible outcome) to 7 (highest possible outcome). The average grade was 5.07, and the standard deviation was 1.77.

The primary independent variable of interest, gender, is represented similarly between males, 49%, and females, 51% out of the total of 817 individuals. Our control variables were education, where 45% had finished university while 55% had not. Roughly 60% of the total sample had an average monthly income lower than 300.000 ISK, while 40% had an average monthly income of 300.000 ISK or more. Only 8% of the sample were married, and 92% were not. While this result may appear peculiar, it should be mentioned that large numbers of the population in Iceland live in a consensual union (Hagstofan, 2019). The descriptive statistics are listed here in Table 1 below.

Table 1. Descriptive Statistics

Variable				
Financial Literacy	Average (5,07)	St.dev (1,77)	Max (7)	Min (1)
Age	Average (49)	St.dev (15)	Max (90)	Min (19)
Gender	Men (49%)	Women (51%)		
Education	University (45%)	No university (55%)		
Income Average	Less than av. (60%)	More than av. (40%)		
Marital status	married (8%)	Not married (92%)		

Source: Authors

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4. Results

In this research, hierarchical multiple regression was used to assess the ability of the control measures (gender, education level, age, marital status, and income) to predict the level of financial literacy after controlling for the influence of education level, age, marital status, and income. Preliminary analyses were carried out to ensure no violation of the assumption of normality, homoscedasticity, linearity, and multicollinearity.

Education level, age, marital status, and income were entered at Step 1, explaining 11.60% of the variance in financial literacy. After the entry of the gender at Step 2, the total variance explained by the model as a whole was 15.5%, F (5, 723) = 26.53, p < 0.000. The control measures explained an additional 3.9% of the variance in financial literacy after controlling for education level, age, marital status and income, R square change = 0.039, F change (1, 723) = 32.952, p < 0.000. In the final model, three measures were statistically significant, education had the highest beta value (beta = 0.23, p < 0.000), gender had the second highest beta value (beta = -0.21, p < 0.000), and the third highest beta value was for income (beta = 0.15, p < 0.000). Age was insignificant, but marital status was marginally significant (beta = -0.06, p < 0.090). See Table 2.

Table 2. Regression results

Predictor variables	Regression 1	Regression 2
Age	0,053	0,042
Education	0,207***	0,234***
Marital Status	-0,084	-0,09*
Income	0,207***	0,150***
Gender		-0,206***
R^2		0,155
R^2 Change		0,039

Source: Authors

Concluding remarks

Women are less financially literate in developing countries (Lusari and Mitchell, 2008), developed countries (Fonseca et al, 2012; Chen and Volpe, 2002), and the most gender-equal country in the world, Iceland, as our results show. We argued that gender differences in financial literacy aligned with the social argumentation (Lusari and Mitchell, 2008; Chen and Volpe, 2002) used. Therefore, it came as a surprise to find that financial literacy was also lower for women in Iceland. The reason could be that although there is substantial gender equality in Iceland, there is still a difference in favour of men. Indeed, women are less financially literate in other quite gender-equal countries, such as the UK, Germany, and Norway (GGG, United Nation, World Economic Forum, 2020).

Another reason could be that gender differences in financial literacy have a biological rather than a social cause. In experiments made by Eckel and Grossman (2008), who found female students to be more risk averse than male students, and by Niederle and Vesterlund (2007), who found that women shy away from competition while men embrace it, the researchers argued that financial behaviour varied between the genders due to biological differences. Bucher-Koenen et al. (2017) identified a gender gap in financial literacy independent of socioeconomic background and cultural context, where young women, who have higher education and labour participation than young men, also show less financial literacy than men. In addition, those who are good in numeracy, cognitive abilities and mathematics are adept in financial literacy (Scheresberg, 2013; Haistings et al., 2013; Banks and Oldfield, 2007; Christelis et al., 2010; Skagerlund et al., 2018). In addition, Munoz-Murillo, Álvarez-Franco and Restrepo-Tobón (2020) found experimental evidence that when controlled for cognitive

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abilities, the role of gender in financial literacy vanished. Further such experiments could be conducted to explain whether there is a financial literacy difference between men and women; however, such research is time-consuming, expensive and could raise ethical and controversial questions.

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CODES OF ETHICS IN CZECH COMPANIES: PREVALENCE AND DIFFERENCES IN CREATION, EVALUATION AND AMENDMENT*

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Abstract. Over the long-term, companies, their managements and even employees have been facing increasing external demands from customers, business partners, as well as wider society, to behave ethically. At the same time, similar demands and requirements have been coming from within companies themselves in relation to performance management and employee motivation. These demands are placing greater emphasis on the need for ethical management and a code of ethics as the primary tool for promoting and enforcing the ethical conduct of an organisation, its management and employees. This paper focuses on the prevalence and role of codes of ethics in Czech companies, their goals and contents, the principles behind their creation and enforcement, as well as the main prerequisites for their efficacy. It is based on an extensive longitudinal analysis of a broad sample of 1,242 Czech companies of various sizes, the main aim of which was to determine the aforementioned and, in addition, whether those companies that have created codes of ethics, strengthen the consistency of their use by regularly evaluating and updating their contents.

Keywords: Code of Ethics; Prevalence; Creation; Evaluation; CSR

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1. Introduction

In the current knowledge global economy, the increasingly prevailing opinion is that the ethical management and socially responsible behaviour of companies, their managements and employees is the only possible, reasonable path to sustainable business development (Vochozka, et al., 2020; Novakova, et al., 2022; Sun et al., 2022). Many authors are even convinced that ethical management and socially responsible behaviour have a direct impact on the performance and prosperity of a business, especially in the medium- and long-term (Skýpalová & Kučerová, 2014; Seknička & Putnová, 2016; Vorobeva & Dana, 2021; Rowland et al., 2021). The reason for this is that the requirements for ethical business conduct have been growing over the long-term (Kaptein, 2017; Štefančík, et al., 2021; Vochozka, et al., 2021; Zakaria et al., 2021). These demands are not only coming from customers, business partners, interested groups and the wider social environment of companies, but also increasingly from employees (Belás et al., 2020). One of the reasons for this trend is the globalisation of national economies (Qin et al., 2022; Wu et al., 2022), which brings with it the need to unify the ethical rules of conduct that apply to individual subjects operating within multinational corporations, international business, and other economic relationships (Singh, 2011, Rowland, et al. 2021).

2. Theoretical background

A code of ethics, although not the only one, is usually the default ethical management tool within organisations (Wood & Rimmer, 2003; Xia et al., 2010; Hill & Rapp, 2014; Statler & Oliver, 2016). Its purpose is to clearly define and unequivocally declare, both externally and internally, the principles and rules of ethical behaviour that the company will adhere to and which stakeholders can therefore derive as the principles by which the organisation will govern its behaviour (Kaptein, 2017; Gavurova et al., 2017, 2020). In other words, the behaviour of its management and employees, especially those who act on behalf of the organisation and participate in its decision-making (Stevens, 2008; Pearson, 2015). The rules listed in the code of ethics, at the same time, usually also contain important principles of professional ("lege artis") practices that the organisation considers important, and therefore claims to obey (Valentine & Fleischman, 2002; Dobson, 2005; Přívara & Rievajová, 2021; Sahoo & Pradhan, 2021).

A code of ethics, as a management tool, is not only externally (or marketing) oriented (Farouk & Jabeen, 2016; Bhowmik et al., 2021). Establishing and following principles of ethical behaviour strengthens the professional identity of employees, facilitates the recruitment and retention of high-quality employees, in particular those who tend to be more sensitive to compliance with moral standards, and makes work in organisations generally more pleasant and efficient, therefore increasing employee satisfaction and productivity (Egels-Zanden & Lindholm, 2015; Dvorsky et al., 2021). This is partly due to the fact that the principles contained in a code of ethics do not only comprise the rules that the organisation requires its employees to follow (and apply in their evaluation and/or promotion), but also the principles by which the company itself is guided by in its dealings with them (Yu, 2008). The code of ethics of an organisation should therefore demonstrate reciprocity (Urban, 2014). It should also point out that its principles apply to all employees regardless of their position.

Within the context of globalisation, it can also be assumed that numerous ethical dilemmas can arise from intercultural differences. These need to be dealt with as part of business ethics, mainly through efforts to find a consensus in order to establish global ethical standards (Cihelková, 2014; Nakhle & Davoine, 2016; McLeod et al., 2016; Činčalová et al., 2021).

The efficacy of a code of ethics as a tool for managing the external and internal relations of an organisation is, however, not "automatic" (Singh, 2011; Ruiz-Lozano & Rios Berjillos Lara, 2016; Privara, 2022, 2022a). Efficacy is based on a number of prerequisites relating to contents, form, methods of creation, use and application, enforcement, etc. The importance of a code of ethics may also differ between companies due to the

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scope of their prevailing activities, size, industry in which they operate, market competition, etc. (Crowther & Seifi, 2014; Skýpalová & Kučerová, 2014; Pirozek et al., 2018; Grumstrup et al., 2021). These and other factors can, furthermore, interact with each other, as well with the main need for establishing a code, i.e. whether the code is mainly internally or externally oriented, or both (Su, 2014; Tkacova et al., 2017; Gavurova et al., 2018).

Content-wise, these factors require the orientation of the code of ethics to be correctly determined (Geva, 2006; Kabir, 2021; Přívara, 2021), with clear and unambiguous formulations, including for the tools by which the principles of the code will be enforced within an organisation. The form which a code of ethics takes is also of extreme importance. It should be clear so that all its users are able to understand it. According to Remišová (2011), a code of ethics should not be perceived as a legal document. In fact, a code of ethics should specifically point out the intention of an organisation to behave ethically with regards to all the moral, social or economic issues it encapsulates and to respect not only the current legal standards, but also wider social standards. A code of ethics should therefore be sufficiently concrete and up-to-date (and regularly updated). If it is binding, it should also be enforceable. The recent general trend with regards to the form or format of a code of ethics has been a move away from the traditional internal printed statement, which an employee usually confirms by affixing their signature to it, to a completely transparent and open digital document placed on a company´s intranet, or more and more often on the Internet, i.e., as a public document.

Interactive codes of ethics, which enable answers to be found to ethical questions or dilemmas in the form of frequently asked questions (FAQ), represent the most developed formal form of a code of ethics. A code of ethics is particularly effective if it extends the framework of the general ethical principles and proclamations of a company and is "tailored" to their specific needs (Cowton & Thomson, 2010). It should define the ethical principles relevant to the typical work situations or activities of the main professional groups within a company. It should closely identify the key ethical issues or dilemmas company employees face. In doing so, it should also formulate the principles, or even provide manuals, on the basis of which such dilemmas should be resolved. It should particularly focus on the issues employees might not be sure of being able to resolve appropriately. The studies of Belas et al. (2022) and Rafajac and Skare (2017) find support the necessity for more in-depth, organized assessments of the ethical dimensions of micro-CSR businesses at the individual or group level, taking into account various categorical lines.

The tools contributing to the development and enforcement of the ethical culture within an organisation can be divided into two groups (Trevino & Weaver, 2003). The first group consists primarily of conceptual tools for the development of a code of ethics (values, principles and individual rules). The second group consists of tools for supporting its enforcement (Adam & Rachman-Moore, 2004). This includes information for employees on the importance and principles of the code, an explanation of the ethical standards, training in the adherence to them, but also disciplinary measures that serve to enforce the provisions within it. Both groups contain procedures that are not always used in practice, although they are often tools that strongly influence the efficacy and/or the actual enforcement of a code of ethics within an organisation. The benefits of a code of ethics are therefore not only based on the clear definition of the ethical rules, but also often on the process of its creation (Basran & Webley, 2012). A code of ethics is usually more effective if it is the product of employee teamwork. This teamwork draws people together from various sections of an organisation to think about the ethical rules that should guide their behaviour, as well as about the commitments that their organisation should have to society as a whole. When preparing a code of ethics, it is therefore necessary to take into account who should participate in drafting it. Ideally, this process should include those employees that are most likely to be personally affected by the introduction of such a code. The aim is not only to uncover ethical dilemmas that those involved in drafting the code may otherwise not have realised exist or cannot comprehend, but also to support and motivate employees to adhere to the principles of the code once the code is created. For similar reasons, consultations with customers, suppliers and/or local authorities may also be useful in some cases. Decisions on how and how often a code of ethics should be revised or amended are also important issues that

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should be resolved during the preparation stage of a code of ethics. The correct solution to these "process" issues is often as important as the contents of the code itself.

The practical day-to-day implementation of a code of ethics is usually based on more tools or measures (Cichoblazinski et al., 2015). The internal and external publication of a code of ethics only gives face value to the implementation of the rules included in it. If not accompanied by enforcement tools, this "implementation" lacks efficacy and is often perceived as being more formal than real (Curtis & Williams, 2014). Additional tools for the implementation of a code of ethics include training programmes and the establishment of an ethics "hotline" (Statler & Oliver, 2016). The latter offers support to employees and managers on complicated ethical situations. What is even more effective is the incorporation of the principles defined in a code of ethics into a company´s directives and rules, in particular into those rules that either support the evaluation of employees or impose sanctions for non-adherence. In doing so, a code of ethics, and in particular the adherence to it, becomes one of the criteria for the continuous and regular assessment of employees and the performance of personnel activities and decision-making within an organisation. In promoting the application of a code of ethics, it is also important to confirm that its principles do not collide with other company rules or managerial practices (Garcia-Marza, 2017). In other words, the application of these practices does not force employees to proceed in a way that contradicts the principles defined in the code of ethics. An example of this would be when the unethical behaviour of an employee towards a customer is mistakenly strengthened by the way in which the employee is remunerated.

3. Research objective and methodology

This article not only focuses on the prevalence and the extent to which codes of ethics are used by companies in the Czech Republic, but also analyses the context of their creation, evaluation and adaptation over time according to main characteristics of a company. The following research questions were therefore formulated:

RQ1: To what extent has the use of a code of ethics changed in Czech companies between 2017 and 2021?
RQ2: What choice of strategy/method was selected for creating a code of ethics by Czech companies between 2017 and 2021?
RQ3: How regularly were codes of ethics evaluated/revised by Czech companies between 2017 and 2021?
RQ4: To what degree were proposed amendments from employees to codes of ethics accepted/integrated by Czech companies between 2017 and 2021?

The extensive quantitative questionnaire survey aimed at answering these questions was conducted at two-year intervals on a total sample set of 1,242 Czech companies, more specifically in 2017 (N=608), 2019 (N=126) and 2021 (N=507). From the methodological point of view, the questions relating to the use of a code of ethics, how/by whom it was prepared, on the modification thereof over time according to employee comments, and the frequency of evaluation/revision, were set as the dependent variables, with the characteristics of the company (size and scope of market activities) set as the independent variables. In terms of size, the companies were divided into four categories (micro – 1-9 employees; small – 10-49 employees; medium – 50-249 employees; large - more than 250 employees). In terms of scope of market activities, the companies were divided according to regional, national and international.

The dependent variables were categorised dichotomously (yes/no) for hypothesis testing in the case of the use of a code of ethics and the existence of the continuous evaluation/revision of the code of ethics, while sub-analyses tested other sub-options of responses in an uncategorised manner. Authorship of the code (the way it was generated) was analysed on the basis of four possible variants depending on the approach chosen for the creation of the code. The analyses were performed using IBM SPSS 24 software and the application of binary

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logistic and multinomial logistic regression, for which the overall model fit was tested and the results accepted at the 0.05 significance level. The results present hypothesis testing based on the Wald test. The respective trends are visualised through graphs created in Microsoft Excel 365.

4. Findings

Use codes of ethics

The results of the binary logistic regression for the variable whether a company utilises a code of ethics, revealed relationships between this variable and the survey year ($b=0.36$, $x^2=26.88$, $p<0.01$), scope of market activities ($b=0.54$, $x^2=20.37$, $p<0.01$) and company size ($b=0.85$, $x^2=136.46$, $p<0.01$).

Binary logistic regression was also applied to the question whether those companies that do not utilise a code of ethics miss it or not. Once again, the survey year ($b= -0.38$, $x^2=11.33$, $p<0.01$), scope of market activities ($b= -0.48$, $x^2=6.95$, $p<0.01$) and company size ($b=-0.59$, $x^2=26.10$, $p<0.01$) were found to be significant factors.

Choice of strategy/method for creating a code of ethics

The variable for the choice of strategy/method for creating a code of ethics included four options: a) adopted from another company; b) prepared by management; c) prepared by an external specialist; d) created on the basis of proposals from employees and company departments. For the multimodal logistic regression, variant a) was used as the reference category. A significant result was only found for prepared by management (variant b) in relation to company size ($b=0.43$, $x^2=6.28$, $p<0.05$). Stepwise analysis showed significant interactions for survey year in relation to company size ($b=0.13$, $x^2=5.75$, $p<0.05$) and survey year in relation to scope of market activities ($b=-0.16$, $x^2=4.87$, $p<0.05$) for codes of ethics prepared by management. The required significance level was also achieved by the interaction survey year in relation to company size ($b=0.14$, $x^2=4.98$, $p<0.05$) for codes of ethics prepared by an external specialist.

Periodicity of the evaluation/revision of a code of ethics

The results of the binary logistic regression for the variable whether the code of ethics is evaluated/revised regularly, revealed a significant relationship to company size ($b=0.40$, $x^2=10.82$, $p<0.01$). A partial analysis was conducted to test the three possible answers. The reference category for the multimodal logistic regression was the company does not evaluate/revise its code of ethics at all, with the partial variants being evaluates/revises irregularly and evaluates/revises regularly. Significant results were found for company size in relation to evaluates/revises irregularly ($b=0.25$, $x2=3.72$, $p<0.05$) and company size in relation to evaluates/revises regularly ($b=0.62$, $x2=19.53$, $p<0.01$).

Acceptance/integration of proposed amendments from employees to a code of ethics

The results of the binary logistic regression for the variable whether a company adapts their code of ethics on the basis of proposed amendments from employees, revealed survey year ($b=0.28$, $x^2=6.49$, $p<0.05$) and company size ($b=0.33$, $x^2=8.99$, $p<0.01$) to be significant factors. A partial analysis was conducted to test the three possible answers (no/partially/yes). The reference category for the multimodal logistic regression was that proposals for amendments to the code of ethics from employees are not accepted/integrated. A significant result was found for survey year in relation to partial acceptance/integration ($b=1.45$, $x2=57.73$, $p<0.01$), while for those companies that do accept amendments from employees, a significant result was found in relation to survey year ($b= -0.29$, $x^2=5.44$, $p<0.05$) and company size ($b=0.439$, $x^2=12.41$, $p<0.01$).

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Variable	Factors	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B) Lower	95% C.I. for EXP(B) Upper
Use of codes of ethics	Survey year	0.358	0.069	26.884	1	0.000	1.431	*1.250*	*1.638*
	Terr. activities	0.539	0.120	20.373	1	0.000	1.715	*1.357*	*2.168*
	Size	0.854	0.073	136.461	1	0.000	2.348	*2.035*	*2.710*
Acceptance/integration of amendments to codes of ethics	Survey year	0.283	0.111	6.489	1	0.011	1.327	*1.067*	*1.649*
	Size	0.333	0.111	8.986	1	0.003	1.395	*1.122*	*1.733*
Evaluation/revision of codes of ethics	Size	0.401	0.122	10.818	1	0.001	1.493	*1.176*	*1.896*

Table 1. The results of the binary logistic regression of the main significant effects
Source: own processing based on survey results

RQ1: ***To what extent has the use of a code of ethics changed in Czech companies between 2017 and 2021?***

The use of a code of ethics was proven significant from the point of view of the survey year. In 2017, 33.7% of the Czech companies that participated in the survey used a code of ethics, in 2019 this had risen to 38.1%, rising even further in 2021 to 47.9%. The effect of the scope of market activities and company size were also registered, with 17.5% of micro-companies, 30.4% of small companies, 43.1% of medium-sized companies, and 72.9% of large companies stating they used a code of ethics. More detailed information on the change in the use of codes of ethics is presented in Figure 1. A significant difference was found in the use of codes of ethics for the stated years (2017, 2019 and 2021) in small companies (x2=8.24, p=0.016) and medium-sized companies (x2=7.31, p=0.026). This was not the case for micro-companies and large companies.

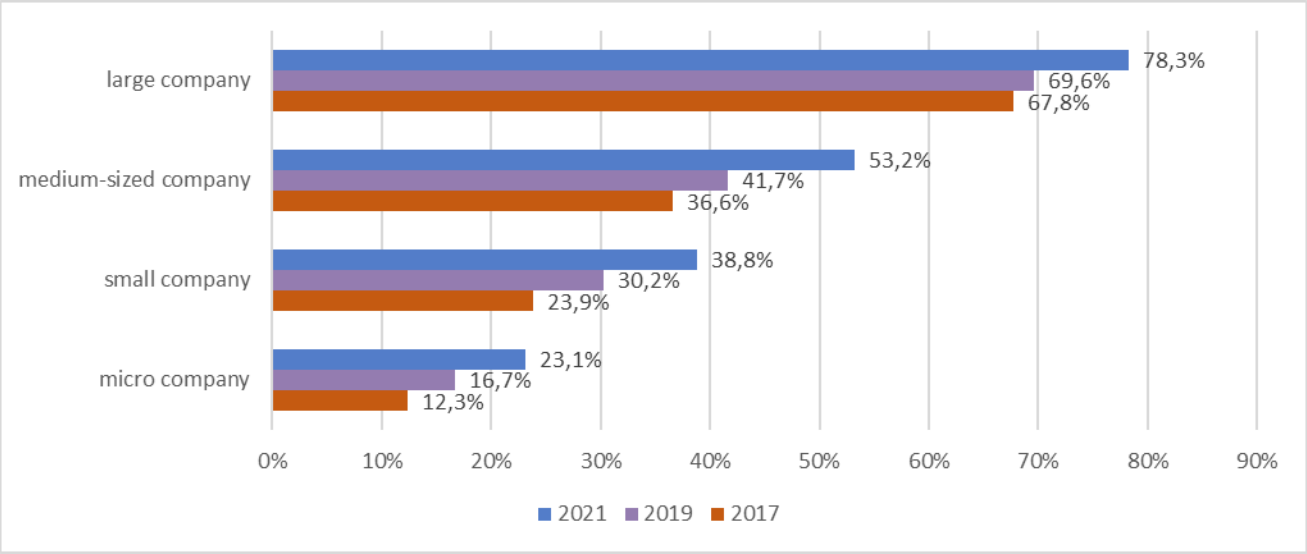


Figure 1. The use of codes of ethics over time according to company size
Source: own processing based on survey results

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RQ2: ***What choice of strategy/method was selected for creating a code of ethics by Czech companies between 2017 and 2021?***

The chosen strategy/method for the preparation of a code of ethics was proven significant from the point of view of company size. Prepared by management was selected most frequently, namely in 41.0% of micro-companies, 50.0% of small companies, 56.8% of medium-sized companies, and 65.8% of large companies. Codes of ethics created on the basis of proposals from employees and company departments came in second place only for micro companies, namely in 27.9% of the companies. More detailed information on the choice of strategy for the creation of codes of ethics is presented in Figure 2.

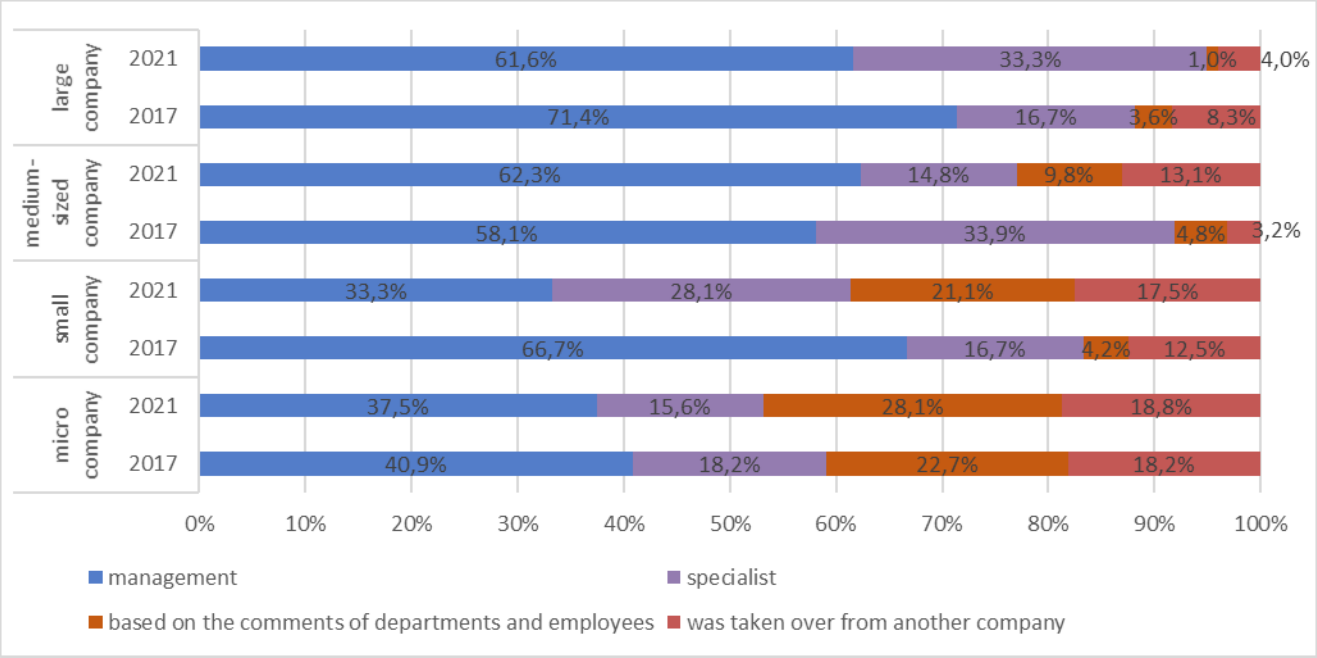


Figure 2. The choice of strategy/method for the creation of codes of ethics over time according to company size
Source: own processing based on survey results

RQ3: ***How regularly were codes of ethics evaluated/revised by Czech companies between 2017 and 2021?***
The evaluation/revision of a code of ethics was proven significant from the point of view of company size. 72.1% of micro companies, 72.4% of small companies, 84.8% of medium-sized companies, and 87.9% of large companies stated that they evaluate/revise their codes of ethics (whether regularly or irregularly). More detailed information on the periodicity of evaluation/revision is presented in Figure 3.

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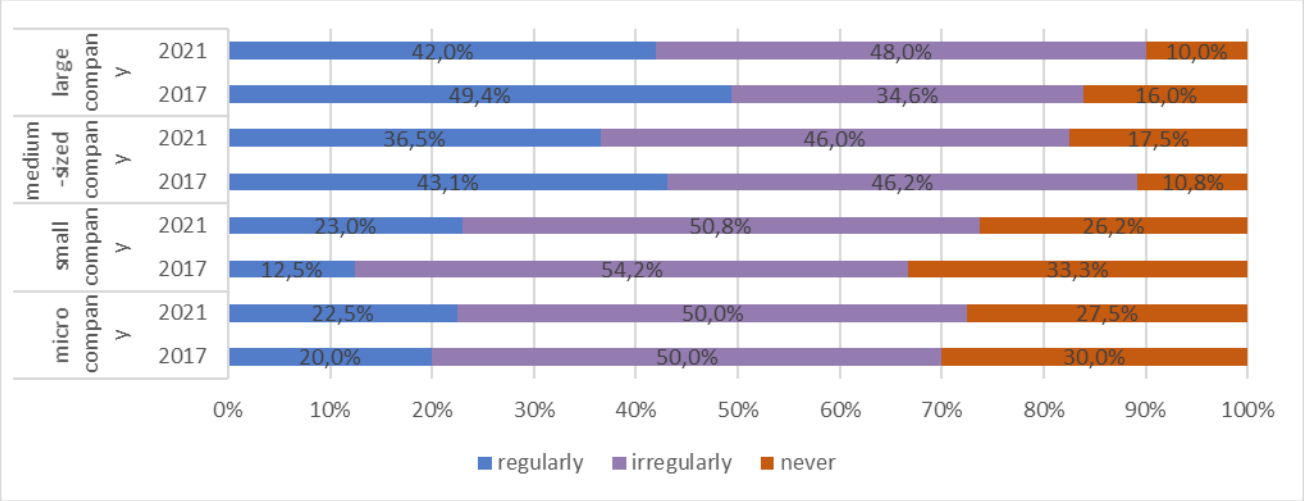


Figure 3. The periodicity of the evaluation/revision of codes of ethics over time according to company size
Source: own processing based on survey results

RQ4: ***To what degree were proposed amendments from employees accepted/integrated into codes of ethics by Czech companies between 2017 and 2021?***

The acceptance/integration of proposed amendments from employees into codes of ethics was proven significant from the point of view of company size and survey year. Among micro companies, comments were accepted/integrated in 68.8% of the companies, in 60.0% of small companies, 80.6% of medium-sized companies, and 80.7% of large companies. More detailed information in relation to survey year is presented in Figure 4.

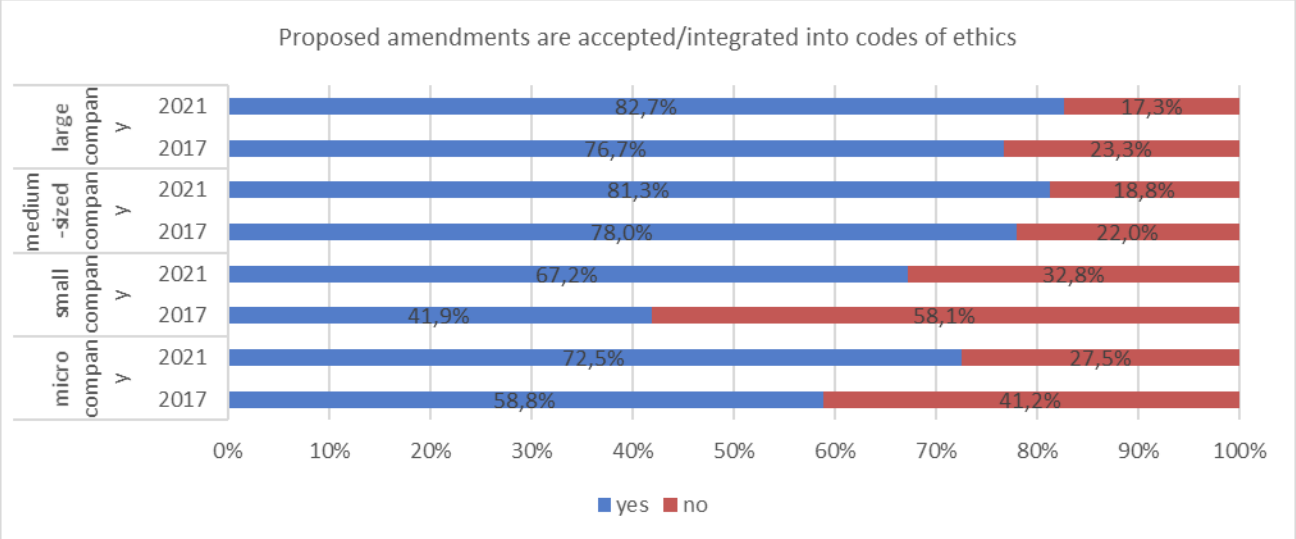


Figure 4. The acceptance/integration of proposed amendments into codes of ethics over time according to company size
Source: own processing based on survey results

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5. Conclusions and further discussion

On the basis of the results of the questionnaire surveys presented in this paper, it can be concluded that the implementation of a code of ethics is seen as a necessity by the majority of Czech companies, irrespective of company size. Although there was a statistically significant increase in the prevalence of codes of ethics by company size, this increase was found to be uneven across the size categories. As the data also show, the reasons for implementing a code of ethics vary accordingly.

The difference in the prevalence of codes of ethics between micro companies and small companies did not exceed 10%. The prevalence in medium-sized companies was more than 10% higher than for the group of micro companies. In the same vein, the prevalence of codes of ethics in large companies compared to medium-sized companies was 20% higher.

With regards to the need for a code of ethics, the main reason stated by the companies is to appropriately define their ethical principles, which they see as an important component of their efforts to strengthen their image and credibility in the eyes of their customers and the wider public, as well as to fight improper behaviour by their employees. A comparison of the reasons why companies of varying size implement codes of ethics showed that the needs of micro companies and large companies is driven by both internal and external needs, whereas in small and medium-sized companies this is purely driven by internal needs. The need to implement a code of ethics for purely external purposes played a negligible role for all company size categories.

A statistically significant increase in the prevalence of a code of ethics in relation to the scope of a company's market activities was another important finding. The survey results showed that the difference is up to 10% between those companies that operate regionally, nationally and internationally, whereby the difference is not higher than 20% between companies operating regionally and internationally. It may therefore be concluded that the increase in the prevalence of codes of ethics according to scope of market activities is demonstrable but not substantial.

A comparison of the results concerning the choice of strategy/method for the preparation of codes of ethics revealed that the dominant method across all company size categories was company management, with the highest percentage in large companies and the lowest percentage in micro companies. The preparation of codes of ethics by an external specialist followed at a relatively big distance for all company size categories, with the highest percentage in medium-sized companies and approximately the same percentage for all other company sizes. The method of taking over a code of ethics from another company was mainly applied by micro and small companies. The least frequently used method for preparing a code of ethics was that involving the participation of employees, which was quite a surprising and disturbing discovery. The only conclusions that can be drawn from this are that most companies with a code of ethics are missing out on the opportunity to utilise employees' experience, to encourage employees to better identify with the company's ethical management, and to strengthen the implementation thereof.

Last but not least, even though the issue was not at the forefront of the research, statistical tests also confirmed that the presence, or not, of a code of ethics has, so far, not had a major demonstrable influence on the financial results of the companies, irrespective of their size. However, even though this conclusion is based on borderline results, the contrary was proven for large companies. In this particular case, the difference between having and not having a code of ethics is considered significant. The conclusion can therefore be drawn that the proportion of profitable companies with a code of ethics in this category is higher than for those without. This question, however, deserves further study and elaboration.

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ASSESSMENT OF FINANCIAL HEALTH OF SERVICE SECTOR COMPANIES IN THE CENTRAL EUROPEAN REGION

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Abstract. The objective was to evaluate the financial development of the service sector affected by anti-pandemic measures against COVID-19, and to propose a strategy for the sector´s further development. To fulfil the objective, the following indicators were used: return on assets (or total capital), return on equity, return on sales, share of sales per employee, cash liquidity, current liquidity and total liquidity. Overall, the service sector in Central Europe can be assessed as being in good economic shape. In terms of profitability indicators, companies in the service sector in Central Europe are above the EU average. All can be summarized quite briefly. In the near future, the Czech Republic must address stabilization of return on sales (which is extremely volatile). Close attention must also be drawn to labour productivity, which is half the European Union average. Finally yet importantly, it is evident that companies use too many fixed assets. Slovakia, Hungary and Poland can be considered stable countries that were not harmed by the COVID-19 pandemic, or were able to quickly eliminate the consequences. They can thus focus on the overall improvement of financial health indicators and sustainable development. Germany, and particularly Austria, can be found at the top of the group. Companies in the service sector are very stable, well above average compared to the EU. However, a certain degree of caution can be observed in relation to them. They can be advised to reduce liquidity of companies, which nowadays works against profitability indicators.

Keywords: service sector; covid-19; financial indicators; strategy for further development

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1. Introduction

In recent years, increasing attention in world economies has been paid to the service sector (Farhati and Ortega-Argiles, 2018). Through an analysis of global data on the relationship between services, manufacturing and GDP, Dossani (2018) shows that the relationship of services to economic growth is complex and usually involves the consideration of the manufacturing sector. In the case of India, services and manufacturing grew somewhat unusually and independently for many years, with the independence being largely due to public policies that encouraged low value-added and capital-intensive manufacturing through protectionist policies. Halaskova et al.

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(2021) aimed to evaluate the level of fiscal decentralization of expenditures in selected categories of public services in European countries. Their results indicate differences in the degree of decentralization between European countries in providing specific public services, and reflect the form of financing of local public needs. These findings also show that the degree of decentralization of public services is determined to some extent by a respective country's history and geographical location, as well as different roles of sector-specific public policies.

Farhati and Ortega-Argiles (2018) analyse the service sector in Brazil, Russia, India, Indonesia and China (BRIIC), which are the five largest economies in the developing world today. They concluded that with regard to the BRIIC economies, final demand in other sectors did not increase output of services. Their results further suggest that in the BRIIC economies, final domestic demand was the main driver of services growth, accounting for more than 70% of the total effect across all economies. (Szczukocka, 2020) discussed certain transformation taking place in the service sector in Poland in relation to other European Union countries, and analysed internal changes in this sector. Her results show that the main determinant of the level of service sector development is not only its high share in three-sector structures, but also the internal changes observed in the sector itself. It was also found that the share of the service sector prevails in the structures of economies of highly developed countries.

There is a lot of research on the issue of health services – some proving that they are luxury goods, while others proving that health care benefits are a necessity (Ucieklak-Jez et al., 2018). Van Duijn et al. (2018) show that although cross-sectoral integration often focuses on social services and health care, other measures are frequently used as well. Integration can either be tailored to a specific target group or designed for communities in general. Although systems for monitoring and evaluating the integration of social services are often present, they have not been fully developed yet.

In the current business world, an increasing number of brands are competing for market share. As a result, company promotion has become more significant in order to reach target customers. Effective providing of financial services (FS) is driven by strategic application of each element of the marketing communication mix (MCM) in an organization (Frimpong, Hope, and Anane-Donkor, 2022; Fedorko, Bacik, and Gavurova 2018; Gavurova et al. 2020). Third sector organizations need to establish measures and criteria to classify their performance against set objectives in order to clearly demonstrate to their funders that their investment was used fairly and effectively (Tkacova et al. 2017; da Costa et al., 2018). Drobyazko et al. (2020) looked into the theoretical justification and development of methodological approaches and practical recommendations for modelling the assessment of financial stability of companies in the service sector. To assess the financial situation in the hotel industry, he used a visual interpretation of a neural network, a self-organizing Kohonen map model. Types of control maps were identified for each coefficient having significant impact on assessing the financial stability of companies in the service sector.

Alan and Koker (2021) argue that, similar to all industries and activities, the service sector has been affected by the COVID-19 pandemic (Wang et al., 2021; Skare and Riberio Soriano, 2022). The main categories of services that experienced an increase in brand orientation during the pandemic were logistics, cleaning, leisure activities, distance learning and teaching, and storage, while the negatively affected sectors were real estate, tourism, cultural services, and health and legal services (Periokaitė and Dobrovolskienė, 2021; Vasanicova et al., 2022). Xiang et al. (2021) assessed the impact of COVID-19 on the growth and sustainability of the service sector. A comprehensive review of COVID-19 impact on the service industry can be found in Chen, Xu, and Skare (2022), Al-Omoush et al. (2022). As global sectors and industries struggle to anchor themselves amid the pandemic, their paper focuses on sectors that have been hit hard by the epidemic and discusses strategies that different countries are adopting to sustain their economies, pointing out the essential role of information technology and digitization that support economies in their fight against the pandemic and help sustain them in crises (Belas et al., 2022). Gunay and Kurtulmuş (2021) examine the impact of COVID-19 social distancing on the service sector in the US. Results of four industry indices (hotels, entertainment, restaurants and airlines) indicate that conditional

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correlations between pairs of indices showed a substantial increase. Iterated Cumulative Sums of Squares (ICSS) tests in dynamic conditional correlations show that while the relationship between airlines and entertainment is unstable, restaurants and hotels show stable co-movement.

When considering tourism, the World Tourism Organization (UNWTO) reported that international arrivals fell by 65% in the first six months of 2020 and yet rose to a whopping 95.2% from April to June. The Telegraph reported that while tourism contributes to approximately 10% of global GDP (330 million jobs), some countries were affected more, for example Croatia, as 20% of its GDP comes from tourism (Ledsom b.r.). Only few industries have been hit as hard by the coronavirus pandemic as hospitality, hotels, restaurants and bars. Isolation and social distancing guidelines have taken their toll – nearly 16 000 restaurants in the U.S. have permanently closed, according to the latest Yelp Economic Average Report (Rosen, 2022).

The objective of this paper is to evaluate the financial development of the service sector affected by anti-pandemic measures against COVID-19, and to propose a strategy for the sector´s further development.
Financial indicators undergo gradual development and it is important to monitor them for better orientation and understanding of the financial situation in the entire service sector. Thus, the first research question is stated as follows:

RQ1: What was the development of financial indicators characterizing the financial health of the service sector in selected EU countries between 2012 and 2021?

However, it is not only important to evaluate the development of financial indicators, but also to look into the most suitable development strategy in relation to the service sector, since the service sector is very important for development of the economies of individual states. The second research question is therefore stated as follows:
RQ2: What is the most suitable development strategy for the service sector?

2. Literature review

Several indicators can be analysed to evaluate the effectiveness of services (Pedrosa et al., 2020; Phan et al., 2021). Bach-Mortensen and Montgomery (2018) claim that the third sector is becoming a more common provider of social and health services. Past research has shown that the third sector is under increasing pressure to evaluate its impact and performance from governments and other contracting authorities. The social services sector is one of the fastest growing industries, but has received little attention in the debate on corporate growth (Rajiani et al., 2018; Reitzinger and Pennerstorfer, 2021). Based on his analysis of economic indicators, particularly gross added value and employment rate, Szczukocka (2020) states that the determinant of the level of service development is not only its high share in three-sector structures, but also the internal changes observed in the sector itself. Da Costa et al. (2018) aimed to propose a performance measurement tool for third sector organizations, which was achieved through a systematic review, and their results showed a wide range of indicators that can be divided into 7 dimensions proposed in their study: economic/financial, control mechanisms, staff/volunteers, organizational effectiveness, service effectiveness, social effectiveness and legitimizing institutions.

The COVID-19 outbreak that emerged in late 2019 has had significant and ongoing global impact (Jones, 2021). Ma et al. (2021) aimed to explore transient output dynamics of the service sector using stochastic kernel analyses. Their results show that the Global North will continue to make more progress, while output capacity in many countries in the Global South is struggling to reach the global average. On the basis of analysing 563 Italian third sector entities (ETS), Corvo et al. (2022) aimed to explore the current state and extent of potential changes in collaboration between organizations belonging to the third sector and the Italian public administration system in response to the emerging COVID-19 situation. Their findings revealed that the COVID-19 pandemic has affected internal operational and functioning mechanisms of organizations operating in the third sector.

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Panno (2019) argues that the traditional financial indicators include relevant net profits, profitability ratios such as return on investment and return on sales, revenue per available room, occupancy rate and some cost-effectiveness ratios, while there is a great use of non-financial metrics such as customer satisfaction, number of complaints, number of new and repeat customers, competence and skills of employees.

Paul et al. (2021) cites banks as an example, as for each of them it is necessary to constantly monitor its efficiency by tracking relevant issues such as non-performing assets, capital risk-weighted asset ratio, number of companies per employee, return on assets (ROA) and profit per employee. Wushe and Shenje (2019) adopted a quantitative research design and showed that antecedents of employee engagement, such as effective leadership, training and career development, reward and incentive programs, organizational policies and procedures, have significantly influenced employee engagement in the public sector. Jedlicka and Jedlicka (2019) chose cluster analysis as their research method and were able to subsequently state that companies from the service sector use more tax planning than companies from other sectors.

Jandaghi et al. (2021) showed that variables such as EBIT to total sales, equity ratio, current ratio, cash ratio and debt ratio are the most effective factors in forecasting the health of companies.

Verstraete, Aghezzaf, and Desmet (2020) examined the use of leading macroeconomic indicators in the tactical sales forecasting process, and created a forecasting framework that automatically selects relevant variables and predicts future sales. The analysis performed showed that the proposed framework achieves a reduction of the average absolute percentage error by 54.5% compared to the naive forecasting method.

Zayas-Mateo and Martinez-Lorente (2021) analysed a set of 179 ISO 9001:2008 certified companies and 154 non-certified companies, as well as accounting data on net sales and operating income (EBIT: earnings before interest and taxes) from 2004 to 2012. Companies from the industrial and service sectors showed mixed results. Certified industrial companies achieved better results than their non-certified counterparts. (Kumar Sharma, 2018) dealt with determinants of capital structure, where nine firm-level explanatory variables (profitability – EBIT margin, return on assets, revenue volatility, debt-free tax shield, tangibility, size, growth, debt service age ratio, and tax shield) were selected and regressed against relevant measures of capital structure. The findings showed that profitability, size, age, debt service capacity growth and tax shield variables are significant determinants at the firm level. Experimental results according to Matenda et al. (2021) show that ratios of earnings before interest and taxes (EBIT) to total assets, bank debt to total assets, EBIT to total liabilities, receivables to net sales and ratios of current assets minus current liabilities to total assets, age of firms, real growth rate of gross domestic product, and inflation rate are strong determinants of the probability of insolvency of Zimbabwean private firms.
According to Al Ajlouni (2017), liquidity is one of the most critical issues that financial management of business firms must consider in order to meet their financial obligations. Analysing indicators of the structure of balance sheet assets and liabilities must result in the evaluation of return on business capital, percentage of working capital and inventories on total assets, state of receivables and cash instalments of supplies, as well as the evaluation of financial policy and aspects related to stability and financial autonomy (Andreica 2006).

The following indicators appear to be the most suitable for fulfilling the objective of this paper: return on assets (or total capital), return on equity, return on sales, share of sales per employee, cash liquidity, current liquidity and total liquidity.

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3. Methods

Data for studying the service sector´s financial health will be taken from the Amadeus database. Specifically, there will be data related to companies in the service sector according to NACE, hence including the following: 09 – Mining support service activities, 39 – Remediation activities and other waste management services, 56 – Food and beverage service activities, 63 – Information service activities, 66 – Activities auxiliary to financial services and insurance activities, 79 – Travel agency, tour operator reservation service and related activities, 81 – Services to buildings and landscape activities, 96 – Other personal service activities. The service sector in the Czech Republic, Slovakia, Poland, Hungary, Germany and Austria will be monitored from the year 2012 to the year 2021, and the corresponding results will also be compared with regard to the European Union in the period under review. All companies listed in the database will be included in calculations provided there are necessary data available in terms of selected financial indicators for calculations in a given year.
Prior to performing the analysis, an indicator of the economic strength of an observed country in the form of gross domestic product per inhabitant (capita) will be illustrated. The data will be taken from the Wolframalpha database.
To obtain data required for answering the first research question above, the following indicators were selected as part of the research: return on assets (or total capital), return on equity, return on sales, share of sales per employee, cash liquidity, current liquidity and total liquidity.

Return on assets will be derived from the following formula:

$$ROA = \frac{EBIT}{A} \cdot 100, \quad (1)$$

where ROA represents return on assets expressed in percentages,
EBIT represents earnings before interest and taxes,
A represents assets.

Owing to the indicator and depending on the viewpoint, it will be possible to obtain information on how all assets and company resources are evaluated in the service sector.
Return on equity will be derived from the following formula:

$$ROE = \frac{EAT}{E} \cdot 100, \quad (2)$$

where ROE represents return on equity expressed in percentages,
EAT represents earnings after taxes,
E represents equity.

ROE will clarify certain attractiveness of the service sector for investors wishing to allocate their resources over a long period of time and buy shares in companies offering services.
The third profitability indicator involves return on sales:

$$ROS = \frac{EAT}{S} \cdot 100, \quad (3)$$

where ROS represents return on sales expressed in percentages,
S represents sales.

Return on sales determines what share of sales is constituted after tax. Management and owners request ideally the highest possible values in the case of profitability indicators.
Labour productivity indicator will be included as well:

$$S/EMP = \frac{S}{EMP}, \quad (4)$$

where EMP represents the number of employees.

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The above indicator reveals how much (in thousands of Euros) one service sector employee generates in terms of sales. In this case, company management also requests ideally the highest possible value.
Additionally, three liquidity indicators were included in the evaluation. First, cash liquidity (CL) will be presented:

$$CL = \frac{current\ financial\ assets}{current\ liabilities}. \quad (5)$$

The above indicator provides information on what cash resources are available to companies in the service sector and how they are able to pay their obligations. If their value is too low, companies run the risk of not being able to meet their obligations. On the contrary, in the case of high values, companies will generate too large implicit costs.
Then, current liquidity (CL) will be calculated:

$$CL = \frac{current\ assets - \text{inventories}}{current\ liabilities}. \quad (6)$$

In this case, it is assumed that receivables, considered to be very liquid, can also be used to pay off liabilities. Optimal values, not maximum or minimum, are sought here.
Lastly, total liquidity will be used:

$$Total\ liquidity = \frac{\text{current assets}}{\text{current liabilities}}. \quad (7)$$

Here, it is assumed that all current assets (including inventories) can be quickly converted into money and the money can be used to pay company obligations. Even in this case, optimal values, not maximum or minimum, are sought.
For each monitored country and indicator under review, the Winsorized mean will be calculated according to the following formula:

$$\overline{x_w}(\vartheta) = \frac{1}{n}\left[(M+1)\left(x_{(M+1)} + x_{(n-M)}\right) + \sum_{i=M+2}^{n-M-1} x_{(i)}\right] \quad (8)$$

where x represents statistics in the i order,
n represents the number of sample values.
Using a causal analysis, the above second research question will then respond to weaknesses identified in relation to the results of the first research question. The output will comprise recommendations for companies in the service sector.

4. Results

The map below in Figure 1 shows gross domestic product per capita (expressed in Euros) for the year 2020, specifically in the Czech Republic, Germany, Austria, Slovakia, Hungary and Poland.

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Figure 1. Gross domestic product per capita in Euros for the year 2020
Source: Wolframalfa.com

GDP is depicted on the map with the use of colours, where the smallest GDP is shown in yellow, and then the rule is that the darker the colour, the greater the GDP is. Compared to the other countries on the GDP map, Hungary and Poland clearly have the smallest GDP, i.e., under EUR 20 000. They are followed by Slovakia, where the GDP reaches around EUR 20 000, and the Czech Republic slightly exceeding EUR 20 000. The best GDP can be observed in Germany and Austria (i.e., around EUR 45 000).

The graph below in Figure 2 shows gross domestic product per capita (expressed in Euros) from the year 2012 to the year 2020.

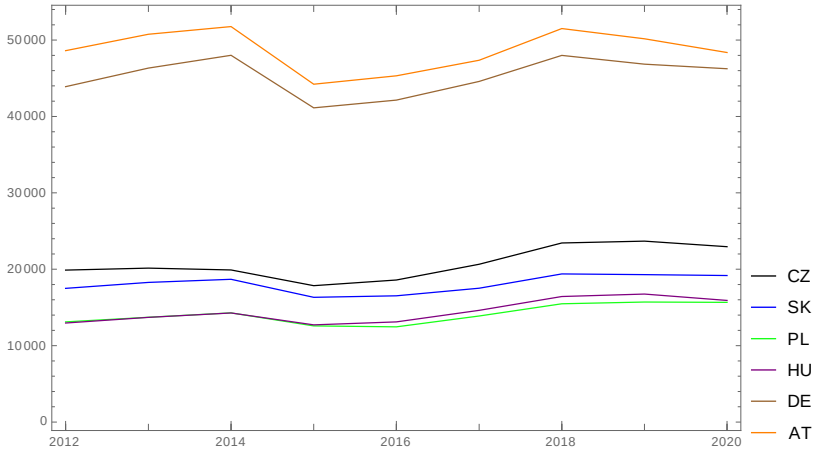


Figure 2. Gross domestic product per capita in Euros between 2012 and 2020
Source: Wolframalfa.com

Individual years are shown on the X-axis and amounts in EUR are shown on the Y-axis. The curves of individual countries are colour-coded and involve the same countries as in the previous Figure. Austria clearly has the highest GDP (i.e. above EUR 50 000). It is followed by Germany with a similar-looking curve, where the average GDP is between EUR 40 000 and EUR 50 000. Other countries do not reach such figures, with the Czech Republic being third and also being the only one of the remaining countries to reach over EUR 20 000. The Czech Republic is followed by Slovakia hovering slightly below EUR 20 000. Hungary and Poland finish last, their curves are almost the same except for minor fluctuations.

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4.1 Financial health of the service sector in selected EU countries between 2012 and 2021

The map below in Figure 3 shows return on assets (expressed in percentages) for the year 2021.



Figure 3. Return on assets in percentages for the year 2021

Source: Authors according to the Amadeus database.

Again, involved are the same countries as in Figure 1 above. A similar rule regarding colours will also apply here, i.e., the darker the colour, the greater the return on assets is. Slovakia clearly has the lowest return on assets (slightly below 8%), followed by Germany together with the Czech Republic (approximately 8%). Hungary is next to last, together with Poland, where return on assets reached over 10%. The best of the entire map is Austria, which managed to reach a value of over 14%.

Figure 4 shows a graph representing return on assets development (expressed in percentages) from the year 2012 to the year 2021.

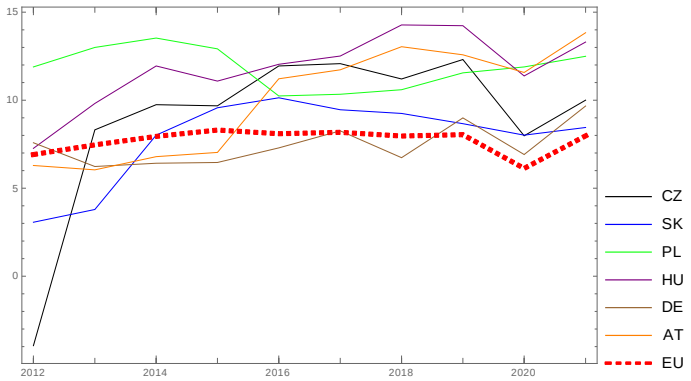


Figure 4. Return on assets in percentages between 2012 and 2021

Source: Authors according to the Amadeus database.

Percentages are shown on the vertical axis and individual years are shown on the horizontal axis. The same countries as in the previous Figures will be regarded again, with the EU being added here as well. The countries

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are mutually distinguished by means of coloured curves. None of the curves can be said to be constant. On the contrary, they are all very variable (unless counting the Czech Republic) and range from 3 % to 14%. The biggest leap can be observed in relation to the Czech Republic, which managed to move from a negative value to approximately 13% (2019). The highest return on assets was achieved by Hungary. The curve showing the EU is the most constant one moving between 7% and 8% all the time. The only dip occurred in 2020, when it reached 6%.

The map below in Figure 5 shows return on equity (expressed in percentages) for the year 2021.



Figure 5. Return on equity in percentages for the year 2021
Source: Authors according to the Amadeus database.

The principle of the map is still similar, i.e., the darker the colour, the greater the return on equity is. The Czech Republic clearly has the highest return on equity (around 175%). It is followed by Germany, where the percentages should be around 90%. Austria comes in third with 40.56%. The remaining countries (Poland, Slovakia and Hungary) have their return on equity below 30%.

In Figure 6, it is possible to observe return on equity (expressed in percentages) from the year 2012 to the year 2021.

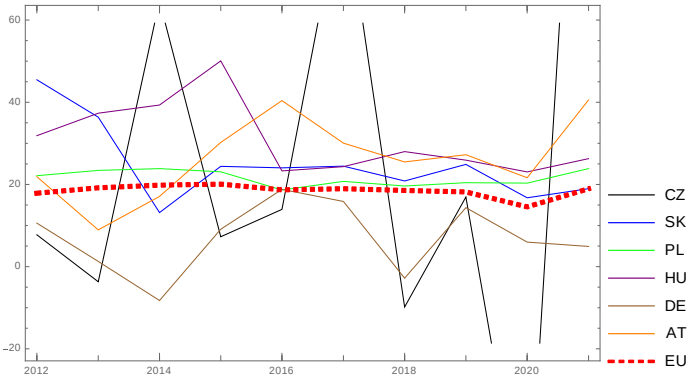


Figure 6. Return on equity expressed in percentages between 2012 and 2021
Source: Authors according to the Amadeus database

As regards the Y-axis, it illustrates return on equity in percentages, whereas the X-axis captures individual years (2012-2021). Individual countries are marked with the use of curves that are different from each other in colour, with the curve representing the EU being red and dashed. It may be gathered that none of the curves except the

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one showing the EU is constant. The curve belonging to the Czech Republic reaches the greatest extremes. However, when excluding the Czech Republic, then the minimum of all curves is around - 10% (Germany, 2014), whilst the maximum of the entire graph is 50% (Hungary, 2015). The curve showing the EU, which can be considered constant, achieves a value of around 20% from 2012 to 2019, with the only smaller dip occurring in 2020, but compared to the other curves it is negligible.
The map below in Figure 7 illustrates return on sales (expressed in percentages) in individual countries for the year 2021.



Figure 7. Return on sales in percentages for the year 2021
Source: Authors according to the Amadeus database

The Czech Republic clearly shows the lowest Return on Sales. As the only one of the countries under review, it is highlighted in yellow, which means that Return on Sales is about -17 %. In other countries, the situation is slightly better, namely Slovakia and Germany reach the values of 3 – 5 %; Return on Sales in Poland is slightly above 9%; in Austria, Return on Sales is by nearly 2 % higher than in Poland. The highest Return on Sales is recorded in Hungary, reaching the value above 15 %.

The graph in Figure 8 show Return on Sales in percentage for the years 2012–2021. The countries are the same as in the previous figures.

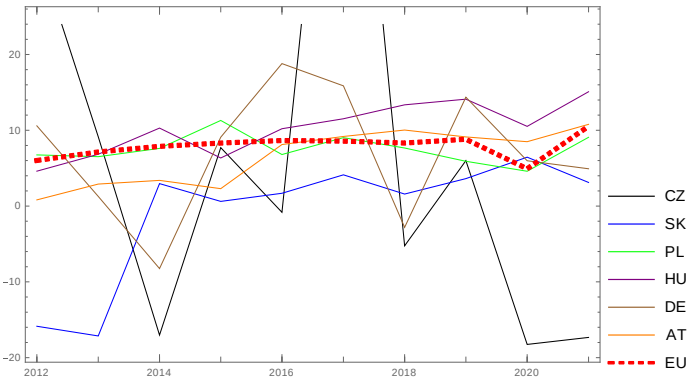


Figure 8. Return on Sales (in percentage) in the years 2012-2021
Source: Author according to Amadeus

The Y-axis shows Return on Sales in percentage; the X-axis presents the individual years (2012-2021). Return on Sales is represented using curves market with different colours. Neither of the curves can be considered constant; however, the smallest fluctuations can be seen in the case of the curve representing the EU, which remained quite

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stably at 6 – 9 % between 2012 and 2019. In 2020, it fell to nearly 5 % but started to grow again in 2021, reaching more than 10 %. The greatest extremes are reached in the case of the curve representing the Czech Republic. But if the Czech Republic is left aside, the minimum of all curves is -17 % (Slovakia, 2013) and maximum 18.8 % (Germany, 2016).

The map in Figure 9 shows the sales (in thousand Euro) per employee in individual countries in 2021.



Figure 9. Sales (in thousand Euro) per employee in 2021
Source: Author according to Amadeus

The lowest sales per employee was recorded in the case of Hungary (EUR 113,42 k). Hungry is followed by the Czech Republic, where sales reach the amount of EUR 117,18 k. Poland and Slovakia show similar values, with Poland reaching the volume of sales per employee of 177,94 k. In Slovakia, the amount was by 14,5 k Euro higher. The next country is Austria, where the amount was 222,42 k Euro. The highest sales were achieved in Germany, where the amount was more than 2 times higher than in the case of Austria.

The graph in Figure 10 shows sales per employee (in thousand Euro) in the years 2012–2021. The countries are the same as in the previous figures.

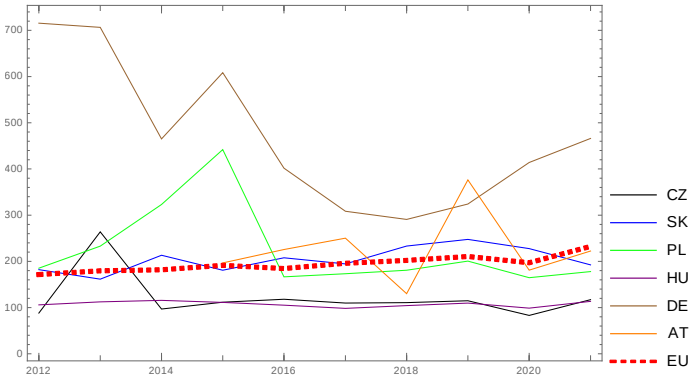


Figure 10. Sales per employee (in thousand Euro) in the years 2012-2021
Source: Author according to Amadeus

The Y-axis shows the sales per employee in thousand Euro; the X-axis shows the individual years (2012-2021). The sales per employee are represented by means of graphs marked with different colors. Only 2 of the curves can

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be described as nearly constant, with the curve that represents Hungary showing the smallest fluctuations. The values in the case of Hungary vary quite reliably between 98,28 and 115,54 thousand Euro. Another nearly constant curve represents the EU, whose values range between 171,48 and 232,37 thousand Euro. The greatest extremes can be seen in the case of Germany, with the minimum values being 290,78 thousand Euro (2018) and maximum 715,57 thousand Euro (2012), which is also the maximum value in the whole graph. The minimum value for the whole graph was recorded in the case of the Czech Republic, where the value reaches 83,08 thousand Euro (2020). The map in Figure 11 shows cash liquidity in 2021.



Figure 11. Cash liquidity in 2021
Source: Author according to Amadeus

The situation in Poland, the Czech Republic, Slovakia and Hungary is the worst, with the values ranging from 2,17 to 5,53. The values for Germany are higher, specifically 40,20. The highest values were recorded in Austria, reaching more than 2 times higher values of cash liquidity than Germany, specifically 101,34.

Graph in Figure 12 shows the development of cash liquidity in the years 2012-2021.

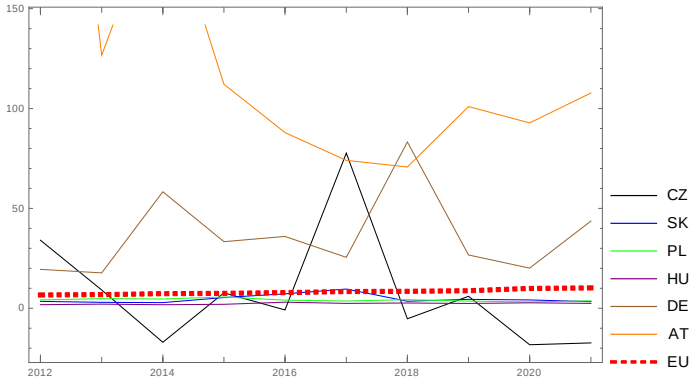


Figure 12. Cash liquidity in the years 2012-2021
Source: Author according to Amadeus

Cash liquidity is represented by means of curves marked with different colours. The Y-axis shows liquidity, while the X-axis present given years (2012-2021). The highest values of cash liquidity within the whole graph are recorded in Austria, which, however, also showed a significant fall between 2015 and 2019, specifically from the value of 353,06 to 66,04. Another country where the curve is not constant is Germany, with the minimum value of 16,82 in 2013 and maximum in 2018 (83,18). Similar trend can be seen in the case of the Czech Republic, which,

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however, reaches lower values. The EU, Poland, Slovakia, and Hungary have nearly constant curves, with the average value being about 4.

The map in Figure 13 shows the current liquidity in the year 2021.



Figure 13. Current liquidity in 2021
Source: Author according to Amadeus

Poland, the Czech Republic, Slovakia, and Hungary show the lowest values, ranging from 2,44 to 5,64. The situation in Germany is slightly better, with the values reaching about 43,67. Austria then shows the highest results, with the values of cash liquidity being twice as high than in Germany, specifically 107,8.
Graph in figure 14 shows the trend of current liquidity in the years 2012-2021

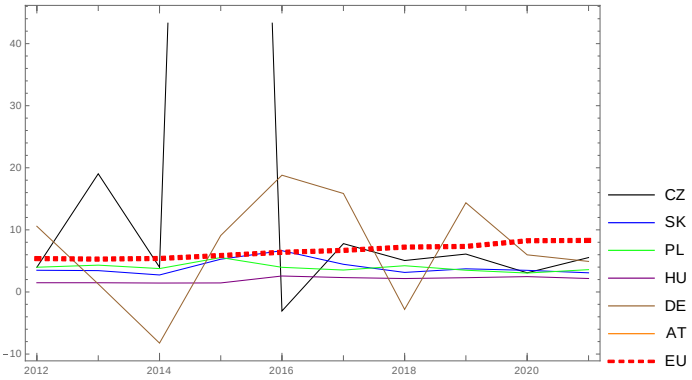


Figure 14. Current liquidity in the years 2012-2021
Source: Author according to Amadeus

Current liquidity is represented in the form of curves, which are marked with different colours. The Y-axis shows liquidity; the X-axis presents a given year (2012-2021). Individual countries can be divided into two groups where the first one will include countries that are rather constant, i.e., Hungary, Poland, Slovakia, and the EU. These countries, as well as the whole EU, range between 0 and 10. The second group includes countries that show greater extremes, i.e., the Czech Republic and Germany. The first of the countries started at the value of 4,14 in 2012, then showed an increase to 19,23, which was followed by a fall to 4,15. In 2015, the curve grew sharply to 305,46, but fell again and reached negative values. In the next years, it fluctuated between 0 and 10.

The map in Figure 15 shows the total liquidity in the year 2021.

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Figure 15. Total liquidity in the year 2021
Source: Author according to Amadeus

The lowest values of the total liquidity in the whole map can be seen in the case of Slovakia and Hungary, with the specific values being 0,82 for Slovakia and 0,87 for Hungary. These countries are followed by Poland, with the value reaching 1,63. The situation is slightly better in the Czech Republic where the total liquidity is more than 2,5 times as high than in Poland. Germany shows the second-best values of total liquidity, specifically 10,26. The best values were recorded in Austria, which shows 4 times as high total liquidity values than Germany, specifically 43,89.
Figure 16 shows a graph that represents the development of the total liquidity in the years 2012-2021.

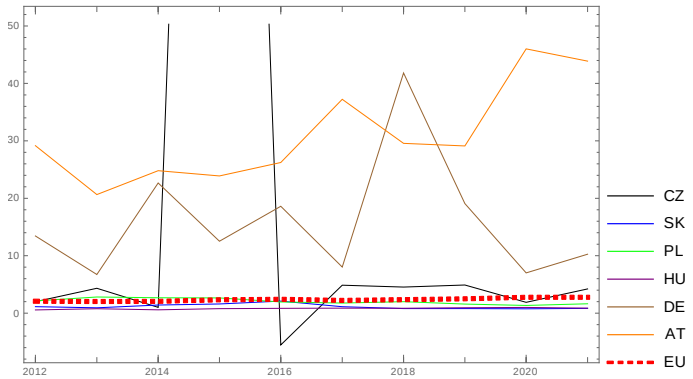


Figure 16. Total liquidity in the years 2012-2021
Source: Author according to Amadeus

Total liquidity is represented by means of curves marked with different colours. The Y-axis shows liquidity; the X-axis a specific year (2012-2021). Individual countries under review can be divided into two groups. The first group includes countries that show rather constant values, i.e., Hungary, Poland, Slovakia, and the EU. The values of the above countries, as well as the whole EU, range between 0 and 3. The second group contains the countries that show various extremes, i.e., the Czech Republic, Germany, and Austria. The Czech Republic started at the value of 1,88 in 2012. Over the next three years, the values rocketed to the value of 286,36, which was, however, followed by a fall to negative values, specifically -5,54. In 2021, the final value was 4,22. The values of total liquidity in Germany changed every year, showing both increase and decrease. The only year for which this statement is not valid for the year 2019. In that year, the curve fell for the second time in a row.

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5. Discussion

RQ1: What was the trend of financial rations characterising the financial health of the service sector in the selected EU countries between 2012 and 2021?
The results can be summarized according to the development of individual ratios and the relationships between individual ratios.

The Czech Republic is characterised by a relatively high appreciation of assets. However, other indicators show rather a poor condition of the service sector for the whole monitored period. The level of Return on Sales and sales per one employee in the sector can be considered alarming. Return on Sales show relatively large fluctuations. In the last years of the monitored period, the values are significantly below zero, slightly above -20 %. Sales per employee in the service sector are at the level reaching 50 % of the EU average values. Nevertheless, Czech companies show relatively stable liquidity, facing an increased business risk at the time when the country was hit by the COVID-19 pandemic. During the pandemic, a lot of companies operating in the service sector went bankrupt and a lot of employees left the sector. Unfortunately, this did not result in increasing the productivity of the remaining employees. At the same time, Czech companies need to consider the reduction or elimination of operationally unnecessary assets.

The values of the monitored indicators for the Slovak Republic are closer to the EU average than the values of the Czech Republic. The only exception was the beginning of the monitored period in the case of Return on Sales. Slovakia can be considered a country where the service sector is stable in the long run and business risk is relatively low. The country did very well with the consequences of the COVID-19 pandemic and the measures taken did not have any significant negative effect on the Slovak service sector.

Poland shows similar values and should be evaluated approximately in the same way as Slovakia. The service sector is stable and has not been affected by the COVID-19 pandemic. As a stable sector, it can focus on the long-term sustainable development.

Hungary reaches above-average, or rather above-average values of all monitored indicators. The only exception is the volume of sales per employee in the service sector. As in the case of the Czech Republic, the values reach 50 % of the EU values. This means that the Hungarian service sector is stable in the long run and subjects to minimal business risk. However, it shall be added that the productivity is not high and attention should be paid to its increase. Hungary was not negatively affected by the COVID-19 in terms of the service sector.

Germany benefits from high GDP per capita that has been generated in the long run. Profitability ratios are not very high; however, Germany shows a long-term high liquidity and reduces business risks of companies operating in the service sector to the expense of profitability. It can be stated that the German service sector has not been affected by the pandemic, either. Its performance is close to the EU average values.

Austria appears to be the winner in terms of the performance and characteristics of the companies in service sector in Central Europe. The profitability ratios always achieve very high values. The companies generate high sales per employee and maintain high liquidity. Moreover, Austria shows the highest GDP per capita of all monitored countries.

RQ2: What is the most suitable strategy for the development of the service sector?
Based on the results and ongoing discussion, the future strategy in the service sector in the countries under review can be formulated.
Companies in the Czech Republic should focus their attention on the sale of operationally unnecessary assets. They are also recommended to reduce the number of employees or increase the volume of sales. If the assumption

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remains that the companies have satisfied the demand, layoffs are the solution. At the same time, the companies should stabilize sales, probably by stabilizing the prices of their outputs.

Slovak companies are in good condition on average. They can focus on gradual increasing (it can be just moderate) of all profitability ratios, sales per employee, and liquidity.

Companies in Poland are in good condition on average. They can also focus on gradual increasing (it can be just moderate) of all profitability ratios, sales per employee, and liquidity. The priority should be focus on increasing labour productivity in the sector.

On average, Hungarian companies are also in good condition. However, it is necessary for them to focus on labor productivity and reduce the number of employees in the sector so that they at least reach the EU average values.
Companies in the German service sector are also in good condition. The companies should try to lower their liquidity and thus improve the Return on Assets and Return on Equity.

Austrian companies show an excellent condition. However, certain shortcomings can be seen in excessively high liquidity. As in Germany, they are recommended to reduce their liquidity and thus improve their Return on Asset and Return on Equity.

Conclusions

The goal of the paper was to evaluate the financial development of the service sector affected by the anti-pandemic measures adopted to stop the spread of COVID-19 and propose the strategy for further development of this sector.

The goal of the paper was achieved. Overall, the service sector in Central Europe can be evaluated as being in good condition. The values of profitability ratios of the companies operating in Central Europe are above the EU average. The values of other ratios are lower, but the average in total is close to the average of the EU. The sample included countries with excellent results, such as Austria, as well as countries with relatively worse results for the companies in the service sector, such as the Czech Republic. The findings can be summarized relatively briefly as follows: In the near future, the Czech Republic should focus on the stabilization of its Return on Sales (which shows extreme fluctuations). Great attention needs to be paid to labour productivity, which achieves 50 % of the EU average. Also, the companies clearly use too many fixed assets. Slovakia, Hungary and Poland can be considered stable countries that were not affected by the COVID-19 pandemic or were able to eliminate the consequences very fast. They can thus focus on the overall improvement of the financial health indicators and sustainable development. Germany and mainly Austria can be considered the winners in the monitored group of countries. The companies operating in the service sector are very stable, even above-average in comparison with the EU. However, there can be seen certain caution. Therefore, these countries can also improve their balance in the service sector. They can be recommended to reduce the liquidity of companies, which now works against profitability ratios.

The limitations of the research are clearly in the sample of companies. A non-representative sample of companies might have been used, or there might have been values incorrectly entered in the Amadeus database. However, there is a noticeable benefit for benchmarking of the monitored sector.

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ALTERNATIVE COSTS OF EQUITY OF COAL MINING COMPANIES TAKING INTO ACCOUNT A CONTEXT OF THE RUSSIAN INVASION INTO UKRAINE

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Abstract. The aim of work was to evaluate the alternative costs of equity of mining companies in the Czech Republic from 2011 to 2021 and to predict the development of costs structure of equity in the following five years. The calculation of Capital Asset Pricing Model (CAMP) model was selected to deal with the issue of alternative costs of equity in the monitored period and multi-layer perceptron networks were selected for the prediction of development. The achieved results clearly demonstrate the ratio of capital structure and its prediction in the future. The research is useful for energy enterprises and a possibility to use it in another sector is obvious.

Keywords: alternative costs; debt capital; CAMP; neural networks

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JEL Classifications: E37, D24, L72

1. Introduction

The military conflict caused by Russia already began in 2014 by fighting over the control of Crimea and it incites the current incident. Russia is critically dependent on the income from gas export to Ukraine and the European Union, Ukrainian energy deposits and pipelines are potentially a direct competitive threat to Russian energy export (Johannesson & Clowes, 2022). The current situation in Russia and Ukraine is enhanced by the events from two previous years of pandemic and the consequences are the oscillations of economy in the whole world influencing all segments (Dutta & Saikia, 2022). There occurs a documentation of negative relation between the Ukraine-Russian war and the profits of global share markets (Boungou & Yatie, 2022). Not only does the war enormously affect the global supplies of natural gas, but also food industry, which results in the rise of food prices, supply chains, it affects production processes and dealing with import and the logistics of import from Ukraine (Jagtap et al., 2022). The military conflict therefore results in increased monitoring and analysing fuel supplies. The current crisis affects the issues of intensive research and the possibilities of alternative fuel supplies, including independence from other countries, oil supply and necessary raw materials. For example, biofuels may

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become clean and affordable energy in the post-war era (Esfandabadi et al., 2022). The lack of natural gas brings about the revaluation of other possible energy sources, as the limitation of gas supplies from Russia results in the rise in demand for other sources of energy and heat, the value of which increases (Halser & Paraschiv, 2022). This situation is also relevant to mining companies as the price of energy influences every entity in the world and therefore it is important to determine two key factors, i.e. the overall demand for a product and final consumption (Baratsas et al., 2021; Polishchuk et al. 2021; Hyránek et al. 2021).

The prices in the international coal trade depend on the largest coal exporters and users (Guo et al, 2021; Pitukhina & Urbański, 2021; Škare et al., 2021; Přívara, 2021). A small change in coal mining significantly affects the volume of trade in the international market. The European market has not set the trends in the international coal markets for many years, but it is influenced by general trends (Stala-Szlugaj & Grudzinski, 2021; Ulewicz et al. 2022; Čermáková et al. 2022). The price of coal deviates three times from the basic price ant it is determined by the beginning and the end of certain events, such as oil price shocks and financial recession (Khan et al., 2021; Přívara, 2019a, 2019b; Kabir, 2021). Therefore, mining companies face significant changes. The structure of sources of mining companies is reflected in the ability of the company to fulfil the golden and the silver rule of balance sheet. The degree of the return of company assets differs and it is influenced by the oscillation of coal prices in various phases of market and by the ability to pay off debts (Sierpinska, 2021; Grumstrup et al., 2021; Vaněk et al. 2021). The current situation is a mere imaginary acceleration of the sequence of events with exploitable sources, which is going to happen in the near future, and the present measures will be manifested. Coal will remain the main source of energy in the country in compliance with the state energy policy despite the increase of using nuclear energy and natural gas (Cablik et al., 2019; Sahoo & Pradhan, 2021; Magdich et al., 2021). The slowdown of global economy and the change of global value chains is necessary in the long-term horizon with regard to the results of historic approaches. It is important to avoid historic dangerous paths that could result in unnecessary outcomes (Mariotti, 2022; Masood et al., 2017). The risks of economic cycle also influence the speed of adapting the capital structure of society (Korzh et al., 2017; Štefančík et al., 2021; Qin et al., 2021; Škare and Porada-Rochon, 2022). Adapting is slower in the presence of macroeconomic risk and companies adjust their capital structure faster than in developed countries (Mursalim et al., 2017; Gan et al., 2021; Belas et al., 2019). The digital methods of managing financial resources optimise a capital structure and increase the value of company (Panfilova et al., 2019; Krajčík, 2021; Bilan et al., 2017). The complexity of capital structure relates to the need for debt capital: an access to debt markets and capacity for additional loans. Each of these derivates bears a unique influence on the complexity of the structure (Orlova et al., 2020; Gavurova et al., 2017, 2020). The achieved results may be useful for all experts who deal with the own costs of companies, alternative costs of equity, mining companies, CAMP method and neural networks.

The aim of research is to evaluate the alternative costs of equity of mining companies in the Czech Republic from 2011 to 2021 with regard to coronavirus crisis, the war between Russia and Ukraine and the prediction of developing the costs structure of equity in the following five years.

Capital structure is a dynamic process that changes in time in dependence on variables that influence the overall development of economy, specific sector or society (Nenu et al., 2018; Privara et al., 2018). Optimal capital structure is a key presumption of business activities and it is a hard task to determine it as there is not a universal model of the structure (Belas et al., 2018). In accordance with the findings (Mohd Azhari et al., 2022; Přívara & Rievajová, 2021; Vorobeva & Dana, 2021) among publically traded companies, the maximal debt was higher before the COVID-19 period, the short term debts negligibly decreased in the course of pandemic, however, the long term debts increased negligibly.
RQ1: How did the costs structure of equity develop in mining companies operating in the Czech Republic from 2011 to 2021?

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The current situation of post-COVID period and the development of military conflict bring about the adaptation of capital structures in business environment. The risks of economic cycle influence the speed of adapting the capital structure of company. The adjustment of capital structure is slower in the presence of a macroeconomic risk. Companies adjust their capital structure in good macroeconomic states faster in contrast to bad economic countries (Gan et al., 2021).
RQ2: What is the way of developing the structure of own costs in mining companies in next 5 years?

2. Literature Review

An entity should have a flexible structure or should have the possibility to borrow funds if needed (Savina, 2020). (Martati et al., 2018) state that the ratio of indebtedness and debt to equity influences the profitability of manufacturing companies. The calculations carried out by Royer (2019) show that the rate of return on equity leads to higher costs of equity and confirm that the costs of equity are higher than debt capital. The precise value of return on equity cannot be determined because some parameters need to be estimated and can include errors in measurements (Situm, 2021). Business valuation methods usually explicitly do not include the effects that the costs of company bankruptcy could have on the costs of capital. Kambourova et al. (2019) argue that the aim is to demonstrate the resulting financial vulnerability by adjusting capital costs using various methods. One of the methods is the calculation of weighted average costs of capital. The values of average weighted costs of capital can change depending on the structure of investment resources, revenues, and profitability (Bunkovsky & Yastrebinsky, 2018). This method is used to determine the value of the overall capital structure of a company, and is particularly suitable for choosing a healthy investment project. Rodica et al. (2019) performed an analysis of the neutrality of financial policy and average costs using linear regression model where the dependent variable is WACC and independent variable is the financial structure that represents financial influence. In the research on calculating WACC, Kubenka (2020) uses various methods for their determining and CAMP where the key method is the result of the calculation of weighted average costs. The standard model of valuation of capital assets is not valid if the risk-free asset ceases to exist or if the barrier-free borrowing and lending rates differ (Mondal & Selvaraju, 2019). In this consumption-based model, the value premium grows non-linearly with the degree of discounting and affects the cross-section of returns (Hens & Schindler, 2020). If the company has zero hedging costs, it uses the contingent capital asset valuation model (Hasler & Martineau, b.r.,2022). For determining the value of investment capital, Potashnik et al. (2018) used the model of valuation of capital assets and Hamada equation with regard to financial risks and risks associated with investment decisions. This model enables to assess the risk factor of financial assets based on their correlation with market portfolio using beta coefficient. The method assumes the relationship of the static risk and revenue. The estimated risks are time-varying and are not stable over time (Nurjannah et al., 2018). The CAPM model assumes that investors are risk averse (Levy, 2022), which is also confirmed by (Mohanty, 2019). The performance of the CAPM seems to be quite sensitive to the selected weight matrix (Shi, 2022). In developed countries, the CAPM model is the most commonly used model for determining the costs of equity; on the other hand, there is no consensus concerning the selection of the most suitable model that would be easily applicable for estimating the costs of equity (Momcilovic et al., 2017). The decision on investment and consumption in several periods exposes a company to time-varying risks related to economic cycles and market volatility. Based on the method of capital asset valuation, (Barinov et al., 2020) conclude that macroeconomic factors significantly influence the revenues of insurers.

In economic practice, there are several models and methods used for the quantification of costs of equity. Depicting the most suitable evaluation method can be achieved by using comparative analysis of the costs of equity using present and past market information. If uncertainty prevails, financial anomalies increase the complexity of financial decisions. The use of mathematical programming can reduce the degree of complexity in planning both internal and external financing and investing (Eldomiaty et al., 2018). The causal effect of arbitrage limits on asset pricing anomalies using SHO regulation program is weakened for portfolios created using pilot

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stocks (Chu et al., 2020). Gao et al. (2019) examine the validity and utility of hybrid valuation models that generalize residual income valuation model. The authors state that the internal value of hybrid models are more precise and the implied costs of equity better capture the systematic risks and expected returns. Baines & Hager (2020) come up with the statement that any model of stock market must consider geographic inequalities and ongoing national diversities in the capital development. Estimating the future probability distribution of the time series considering its history is the key factor for optimizing business processes. (Salinas et al., 2020) propose a method based on training auto-regressive neural network model on a large number of related time series.

Vidya & Prabheesh (2020) conducted research on predicted future development of trade using the analysis of business networks and artificial neural networks. In their comparative analysis of methods for empirical asset valuation, Gu et al.(2020) measure risk premium of assets, identifying decision trees and neural networks as the most efficient methods and trace their predictive gains, which enable non-linear predictor interactions not considered in other methods. Ratih (2021) agrees that the method of neural networks is more efficient, even when accounting for the transction costs. Recurrent neural networks are becoming popular not only due to their accuracy but they can be used even for non-expert users, since they are robust, effective, and automatic (Hewamalage et al., 2021). Algorithms based on machine and deep learning represent new approaches in solving problems related to time series forecasting. These methods provide more accurate results than conventional regression-based modelling. LSTM layer is suitable for modelling time information on irregular trends of time series components. The proposed method achieves nearly perfect prediction output (Kim & Cho, 2019). Multivariate time series data forecasting has a number of valuable applications. However, this is hindered by complex and non-linear interdependencies between time series and time steps. For accurate prediction, it is essential to model the long-term dependency on time series data, which can be achieved through recurrent neural networks with attention mechanisms (Shih et al., 2019). Qualitative content analysis is a research method performed either in inductive or deductive way. The inductive approach is based on the data collected in order to be able to start the research. The deductive (directed) approach is based on the existing theory to set up the categories that guide the research (Kibiswa, 2019). The method of qualitative analysis of data from content analysis is applicable in analysing a wide range of data sources including textual, image and audio datasets (Kleinheksel et al., 2020). Research methods and analytical approaches supporting research must constantly respond to changes in research methods and technologies of data collection and data analysis in current research frameworks (Serafini & Reid, b.r. 2019). Anastasiei & Georgescu (2020) argue that automated qualitative analysis is dependent on the accuracy of the tool used, which can be verified using manual qualitative analysis. On the basis of data collected in the form of internal company statements, annual reports and final balance sheets of companies, internal documents of a company are analysed and subsequently evaluated and compared across the whole industry. The most suitable method of predicting the development of costs is time series forecasting, whose task is to predict the future values of a given sequence using historical data (Sagheer & Kotb, 2019).

Teo et al. (2022) carry out the testing of network scheme feasibility using a three-layer deep neural network for achieving maximum accuracy. Paul & Sarkar (2018) compare the results of the most commonly used multilayer perceptron and multilayer convolutional neural network. Deep convolutional neural network is universal if the depth of the neural network is sufficient (Zhou, 2020). A data-driven prediction can be achieved by the combination of deep convolutional neural network and deep multilayer perceptron (MLP) (Sekar et al., 2019).

Content analysis will be used for data collection and analysis for both research questions. In order to be able to respond the first research question, CAPM will be used. The second formulated research question will be answered using multilayer perceptron neural networks.

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3. Methodological approach

3.1 Data

Data on risk-free rate of return or risk-free values for the monitored period 2011–2021 are available on the websites of the Czech National Bank, specifically in the database of time series ARAD, yield on ten-year government bond (ČNB,2022). Data on beta coefficient will be obtained from Excel in Damodaran data, section archived data, European section Levered and Unlevered Betas by Industry for individual years. To obtain the values of risk premium, Damodaran online data will be used as well, specifically data item: Risk Premium for Other Markets for specific monitored period (Adamodar, 2022). For the purposes of predicting time series, Excel file will be created containing monthly time data from January 2022 to December 2026.

3.2 Methods

The data will be processed using the calculation of the CAPM model according to the formula below (Levy et al., 1999):

$$E(r_i)=R_f+\beta_i\,(E(R_m)-R_f) \quad (1)$$

where $E(r_i)$ represents the expected return rate of the i-th investment instrument,
R_f risk-free rate of return,
β_i beta coefficient of i-th instrument considering systematic risk,
$E(R_m)$ expected rate of return of the market portfolio.

The result will be calculated according to the above formula for each month of the monitored period. The individual resulting values will then be graphically represented in order to provide a faster and clear overview of the development of the monitored changes. This method thus enables obtaining answer to the first research question.

MLP is one of the most commonly used type of neural networks. It is a network with one or more hidden layers of neurons between the input and the output layer. The neuron in the input layer sends the signal to all neurons of the hidden layer. The outputs of the hidden layers transmitted to the inputs of each neuron in the higher layers and are multiplied by relevant weights. The output of the k-th neuron in an n-th hidden or output layer of multilayer neural network can be calculated as follows:

$$y_k^n = f\left(w_{0,k}^n + \sum_{i=1}^{m} y_i^{n-1} \,.\, x\, w_{i,k}^n\right) \quad (2)$$

where $f(x)$ represents the transfer function in neuron,
$w_{0,k}^n$ bias in neuron,
m number of weights of neurons.

For processing the data to answer the second research question, program Mathematica, version 13.1 will be used. The data analysis will be performed using the method of neural networks, specifically time series analysis. The first variable is the date; the second variable are the results of $E(r_i)$ calculated using CAPM. The dataset is then imported into the program using functions Drop and Flatten with the specified input data. In the program, only the values in the first place in the table are displayed in the first step (a). This is followed by another command: display the values from the second place (b). In the third step, these values are combined using the function Thread (a→b). Based on these three steps, the program displays the individual months assigned to the individual values of $E(r_i)$ from Excel.

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In the next step, the second Excel file with one prepared variable, future data from 1 January 2022 to 31 December 2026 in monthly intervals, is imported. Other commands entered using the functions Predict, NeuralNetwork, PerformanceGoal, and data prediction will generate multilayer perceptron networks, which will show the prediction of the future development of $E(r_i)$ in the next 5 years and thus provide the answer to the second research question.

4. Results

4.1 CAPM

Figure 1 shows an overview of values in the past monitored period 2011-2021.

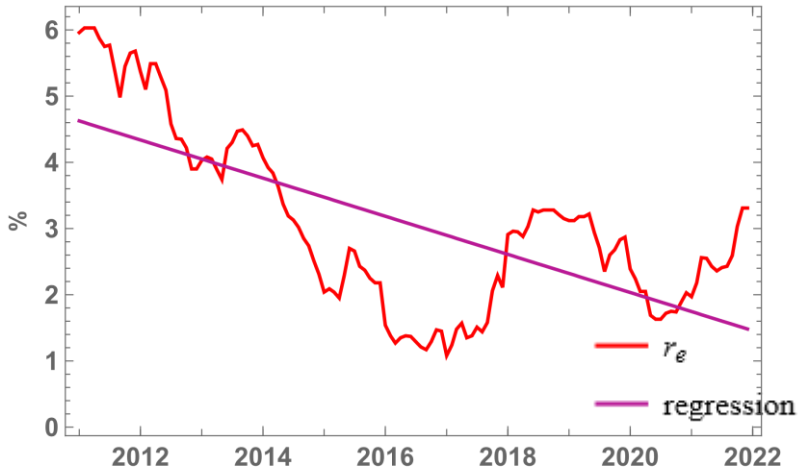


Figure 1. Values until 2021

Source: Authors

The x-axis shows the time values from 2011 to 2022. The y-axis shows the values from 0 to 6. This limit is suitable and sufficient for the purposes of this research. The course is thus given by individual values obtained by substituting individual results from the above formula for the calculation of CAPM from the above resources. It can be also seen that the individual values change over time, showing an upward or downward trend. The cross-section of the image is represented by a line with a downward trend.

4.2 MLP

Figure 2 shows the values of predicted future development of the values of alternative costs of equity.

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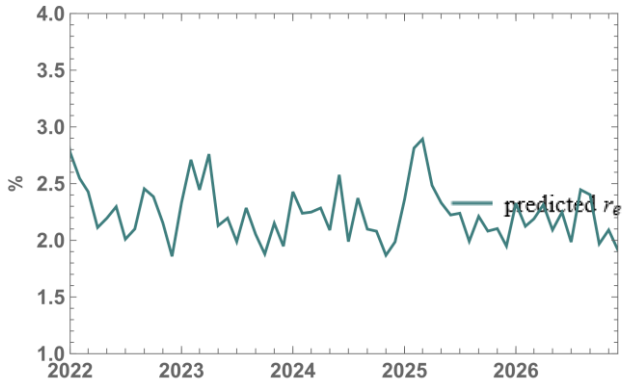


Figure 2. Prediction of future development

Source: Authors

The x-axis represents the years 2022-2026, while the y-axis sows the values from 1 to 4, which is sufficient for this purpose. Individual values are interlinked according to the predefined rules. Furthermore, on the basis of the calculations, it can be concluded that the course will change but will not achieve values higher than 4 and will not contain any other extreme values.

In Figure 3, Figures 1 and 2 are combined into one timeline.

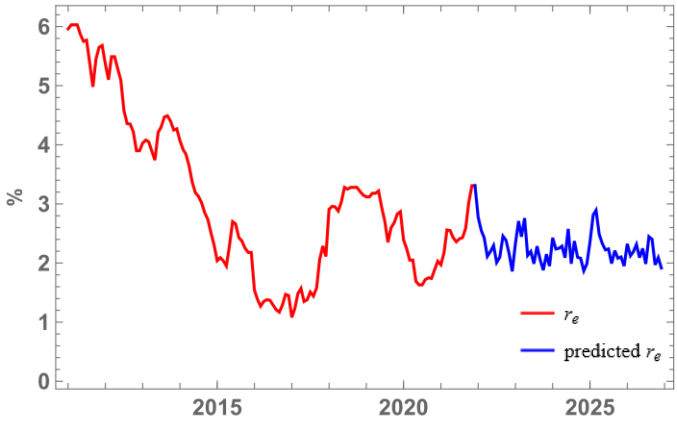


Figure 3. Development of alternative costs of equity until 2026

Source: Authors

The future prediction shows a half of the period for which the preceding values were analysed. Yet, it shows that the values will be more stable, without major fluctuations, but as pronounced as in the first part of the analysed period.

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5. Discussion of results

RQ1: How did the costs structure of equity develop in mining companies operating in the Czech Republic from 2011 to 2021?

At the beginning of the monitored period, the share of alternative costs of equity accounted for about 57.19 % of the total costs of equity. Over the years, the individual values changed and fluctuated significantly, not only as a result of the economic situation in the Czech Republic and in the world. At the end of the monitored period, the values were significantly lower than at its beginning, with a 26.54 decrease. The minimum value in the monitored period was recorded in the first month of the year 2017, achieving 10.77 %, while the maximum value of the alternative costs of equity was 60.34 % recorded in March 2011. The biggest difference was thus 49.57 %. The overall average value of percentage share of alternative costs of equity for the monitored period was thus 30.56 %. According to Momcilovic et al. (2017), CAPM is one of the best methods for calculating alternative costs of equity, which is also confirmed by the results obtained within this research. This approach can be used for the mining industry but also for any selected sector in the Czech Republic and abroad, but only provided that the necessary input data for the calculation are available and traceable.

RQ2: What is the way of developing the structure of own costs in mining companies in next 5 years?

Based on the obtained results for the past monitored period 2011-2021, using neural networks, it is possible to predict the possible future development. The monitored development was for the half of the period than the previous one. Due to the uncertainty concerning the war conflict between Ukraine and Russia and other circumstances, it is impossible to predict the future development precisely. Prediction thus do not always correspond to the actual development. In terms of forecasting the development of costs of equity, Sagheer & Kotb (2019) state that time series forecasting is one of the best methods to predict the values for given sequences using historical data, which can be also confirmed based on the results obtained within this research. Sekar et al (2019) predict the future development of values using neural networks and deep multilayer perceptron, which also proved to be useful for the purposes of the research submitted. As stated by Siami-Namini et al. (2019), this method provides more accurate results than conventional regression-based modelling. Based on the results of the calculations performed for the purposes of the research, this conclusion can be also confirmed. Individual predictions, however, cannot be perceived as certain, as other unexpected circumstances and factors can emerge that could disrupt the course of the development, as confirmed in the past years. This forecasting method can be used for predicting the development of costs of equity, but can be used for any other time series with a given history in the analysed time series.

6. Conclusions

The goal of the research was to evaluate the alternative costs of equity in mining companies in the Czech Republic between 2011-2021 with regard to the COVID-19 pandemic and the conflict between Russia and Ukraine, as well as to forecast the development of the structure of costs of equity in the next five years. The goal was achieved using the method of capital asset valuation, CAPM, while the development was predicted using time series and multilayer neural networks. The goal was thus achieved. The discussion of results indicates that even when considering the events in the past two years, when the world was facing the global COVID-19 pandemic, the structure of alternative costs of equity of mining companies has not been significantly affected. It has been found that it is not possible to determine the ideal capital structure, as it changes over the years for every company or the whole industry. In general, it can be stated that it is recommendable to use debt capital rather than equity to certain extent. The risk the company takes through its capital structure is different for every industry and changes over time. The degree to which it is recommendable to used debt capital can be determined by tax shield and accounting rules.

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Forecasting the structure of equity of a company is useful mainly for company owners and investors (not only) in energy companies. The expected capital structure of energy companies in the future indicates that the structure of the costs of equity will fluctuate depending slightly on external factors. It is also necessary to consider the extreme values of individual companies, which might slightly distort the data in the overall overview of companies.

In the monitored period, equity of energy companies achieved the highest values at the beginning of the year 2011 until 2016 when it showed the lowest values. In this period, the companies could use the possibility of financing through debt capital rather than through equity. Between 2017 and 2019, the values fluctuated again, with an initial increase in the value of equity. In this period, the companies used financing through debt capital. An important thing is not to exceed a specific amount of debt capital, otherwise the profit of energy companies becomes risky. In the year 2020, owners of energy companies use debt capital to a larger extent, which is profitable and acceptable for them in this monitored period. At the beginning of 2021, the values of equity grow again, and the companies should prefer debt capital to equity. The values grow until the end of the year. Major fluctuations were assumed in the years 2020-2022 due to the COVID-19 pandemic. In 2025, it is expected that the values of equity will be higher than in the remaining years of the monitored period. Therefore, the companies should prefer debt capital over equity. For investors, forecasting the development of capital structure is of great importance. Indebtedness of energy companies grows in individual years, which indicates a suitable investment opportunity. According to the prediction, the year 2025 will be the least favourable year for investment decisions concerning investment in companies. The comparison of other years of the monitored period shows that the second least favourable period for investments is the first half of the year 2023. In 2024 and 2026, the values slightly fluctuate and it cannot be excluded that the investment will be inefficient.

No regularity or cycle is observed in the monitored or predicted period. Energy companies try to avoid heavy indebtedness in order to be able to maintain their stable position in the market. Overall, from the perspective of energy companies´ owners, the development of their capital structure in the Czech Republic is evaluated as positive.

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IMPACT OF SELECTED FINANCIAL INDICATORS ON A COMPANY'S REPUTATION*

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Abstract. This article discusses the financial indicators of selected companies and their impact on the reputation score. In the literature, we encounter the connection between financial indicators and reputation; therefore, the article chooses several financial indicators and compares them with the increase or decrease of reputation scores over the past years. The result is an analysis of selected indicators and their impact on the change in the reputation score. The results will help to understand the impact and create a prerequisite for further analyses of the impact on the reputation score from the point of view of financial management.

Keywords: financial management; financial indicators; corporate reputation; board size

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JEL Classifications: M14, M21, M30

1. Introduction

In today's competitive environment, organisations are interested in intangible assets to survive, differentiate themselves and gain a competitive advantage. One of these intangible assets is corporate reputation, which is important to businesses due to its ability to influence all stakeholders (Deniz, 2020). Corporate reputation is companies' most valuable asset because it allows them to gain competitive advantages leading to sustainable performance (Ghuslan et al., 2021). Corporate reputation is decisive in the case of supportive or repulsive behaviour of stakeholders and is, therefore, one of the most valuable intangible resources of businesses (Baumgartner, Ernst, & Fischer, 2022). In today's business, companies must be responsible not only to their shareholders but also to wider stakeholders, in which employees, customers, investors, suppliers, the local community and the natural environment are most affected (Berber et al., 2020; Gavurova et al., 2018). Although

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not the only driver of reputation, financial performance is important to the corporate reputation score. In the RepTrak system, financial performance is one of seven factors of corporate reputation (along with workplace, leadership, headquarters and others). How stakeholders perceive a business's financial performance is critical in building corporate perception. It ultimately helps sustain the business while driving its economy, talent acquisition and retention, customer loyalty, and more (Cho, 2019). The question of corporate reputation management in the time of accelerated digitisation has been an essential topic in the research of academics and practitioners for more than a decade (Pollák & Markovič, 2022). Due to digital transformation, enterprises have to pay more attention to the quality of products, image and external reputation (Sun et al., 2022). The COVID-19 pandemic significantly affected the creation of added value within national economies. The ongoing pandemic crisis greatly affected the world economy (Vochozka et al., 2021; Novakova et al., 2022). The crisis's negative effects affected the production and service sectors, where some segments were fatally affected (Straková et al., 2021).

Global and local crises continue to destabilise stakeholders' trust in businesses, and they must therefore find a long-term solution to the problem of declining trust (Stravinskienė, Matulevičienė & Hopenienė, 2021; Olah et al., 2021). Investors' priorities have changed, especially in light of accounting irregularities and corporate scandals. The reputation of several large companies has suffered from problems with the quality of their financial reporting, sometimes due to misreporting of earnings or poor transparency. Extensive research on the financial costs and risks associated with businesses being the target of litigation suggests that litigation negatively affects corporate reputation (Hadani, 2021). Markets also react negatively to notifications of violations, especially in the case of lawsuits (Unsal & Brodmann, 2021). In the worst cases, allegations of fraud or insider trading have destroyed the reputations of well-established companies and their boards. Investors' attention is no longer just on performance and what will drive future growth – but also on integrity, ethics and competence in how a company is run. This research aims to evaluate the established hypotheses, namely:

Hypothesis No. 1:
H0: There is no significant relationship between the gross profit delta and the change in RepTrak ranking of the selected subjects.
H1: There is a significant relationship between the gross profit delta and the change in RepTrak ranking of the selected subjects.
Hypothesis No. 2:
H0: There is no significant relationship between the delta of research and development costs and the change in RepTrak ranking of the selected entities.
H1: There is a significant relationship between the delta of research and development costs and the change in RepTrak ranking of the selected entities.

2. Theoretical background

Reputation has been an important risk issue for companies worldwide in recent years. Based on Deloitte's global survey, the reputational risk was identified as the main strategic business risk in 2014, as well as the 2015 AON Global Risk Management Survey and the 2016 Allianz Risk Barometer Survey, which found that that loss of reputation is one of the biggest risks for business managers. Furthermore, the importance of corporate reputation is confirmed by the fact that more than 25 per cent of the company's market value and the total market capitalisation of the S&P 500 companies are represented by corporate reputation (Vig, Dumičić, & Klopotan, 2017). Company reputation and reputation risk are increasingly relevant for companies, which is also due to their importance for the company's value. There is much empirical evidence regarding the relationship between reputational events, corporate reputation, and corporate financial performance, taking stakeholder behaviour into account (Škare & Golja, 2012; Streimkiene et al., 2021). Barić (2017) claims that the quality of the relationship between a company and its shareholders is a fundamental factor that affects a business's success in differentiating

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itself from competitors and creating a sustainable competitive advantage. A good company reputation can help companies adapt to market demand, attract investment and motivate workers. It works to differentiate its services and products in the market. Several empirical studies have recognised a clear relationship between corporate reputation and performance. Cocis, Batrancea and Tulai (2021) investigated how corporate reputation is perceived in the eyes of investors based on the equity and financial performance of selected airlines on a sample of 22 airlines, nineteen of which are listed in the World Airline Awards 2018 based on satisfied customers and three are listed in Fortune and have the best corporate reputation in the airline industry. They analysed the period of 2016-2018 to rank airlines based on financial indicators through the TOPSIS method and also to determine whether companies included in the Fortune ranking would maintain a similar ranking. After considering financial performance and balance indicators, the airlines in question maintained a similar ranking within the TOPSIS ranking, and also that airlines with good financial performance and balance had a good reputation in the eyes of investors. Orozco, Vargas and Galindo-Dorado (2018) sought to examine the relationship between board size, financial performance, and corporate reputation within the top companies ranked by the Business Monitor of Corporate Reputation - MERCO in Colombia. To classify enterprises based on performance and control variables, they performed correlations and cluster analysis on a cross-sectional sample of 84 large enterprises in Colombia between 2008-2012. They only took into account large companies listed on the MERCO stock exchange; therefore, based on this, the results can only be generalised to top companies within Colombia. They state that the optimal size of the board, based on the OECD's guide to good corporate governance practice, consists of five to nine key members, and that the board structure has a direct impact on the company's reputation and financial performance and must be carefully analysed by shareholders so that its size is balanced based on the expected results and characteristics of the company, such as family ownership, export activities or stock market standards. Castilla-Polo et al. (2018) state that corporate reputation is rarely applied within cooperatives. Therefore, they decided to analyse the consequences of reputation on their performance, focusing on olive oil cooperatives within Spain, where the need for differentiation makes them crucial subjects of study. They used the structural equation and the partial least squares technique to test empirically a theoretical model that links reputation and cooperation to performance in bivariate and multivariate ways. On the one hand, they considered that the reputation of the cooperative is reflected in four variables, namely in innovation, certified systems, social responsibility and in awards. On the other hand, they considered both financial and non-financial aspects of performance to take into account the specific nature of cooperative societies. Within the results obtained on a representative sample of the sector, specifically on a sample of 76 cooperatives within Spain, they state that reputation was among the four variables that were included in the model, well approximated and indeed directly and positively related to the performance of the cooperative and that for cooperative managers it is possible reputation, as a new key performance indicator to use even in the case of an immediate need for differentiation of this industry. Thus, the company's reputation is an intangible resource that is difficult for competitors to imitate and can be effectively transformed into a competitive advantage that is beneficial to the company's performance. Özbay (2018) claims that in today's business world, expectations of high profitability from the past have been replaced by the advantage of sustainable competition and that the boundaries of businesses and their impact on society have been dramatically expanded as a result of the development of information technology and globalisation, which in turn has led to an increase in society's expectations from businesses. For this reason, investors expect companies to be sensitive to social issues in addition to high financial performance (Belas et al. 2019, 2022). Over the years, the corporate reputation issue has been discussed within many disciplines. In most of these cases, corporate reputation is considered a strategic asset and leads to increased financial performance and sustainable competition, while financial performance is, in many cases, considered a part of corporate reputation (Olah et al. 2021; Gavurova et al. 2020). Based on a panel regression analysis of the data, he tested the relationship between corporate reputation and its market value, reaching results consistent with previous studies, namely that companies highly recognised also have a high market value. Gangi, Daniele and Varrone (2020) set out to answer two related questions, namely whether corporate environmental policy affects the company's corporate reputation and whether this link also affects profitability. They found that environmental product innovation and environmental commitment are antecedents of corporate reputation and that corporate reputation positively affects profitability. Environmental

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responsibility and green corporate practices are specialised assets increasing the value of intangible assets, namely corporate reputation. This impact is the missing link between sustainable development and the company's financial performance. Commitment to the environment and corporate reputation protect the company's competitiveness, respectively, as an insurance policy. Kludacz-Alessandri and Cygańska (2021) state that one of the main drivers of a company's reputation is its social responsibility and that, based on many studies, it can be said that a company's social responsibility can positively influence its financial performance and vice versa. The relationship between a company's financial performance and social responsibility depends on the type of industry in which it operates. Only a small amount of research related to the energy sector has been conducted in the field (Wang et al., 2022; Lu et al., 2021; Guo et al., 2022). As a basis for empirical research, they used the theory of unused resources, which claims that the cause of a company's social performance is its financial performance and analysed whether the company's financial performance affects the acceptance of corporate social responsibility within the energy sector companies. They specifically examined the relationship between selected indicators of financial performance and the adoption of corporate social responsibility, and based on the analysis of an international sample of 219 companies from 32 countries for the year 2020, and they tracked statistically significant relationships between financial performance and the implementation of the social responsibility strategy of energy companies. Based on the results, they claim that return on assets (ROA) and profitability before interest and taxes (EBIT) were significantly higher among companies that implemented a social responsibility strategy. The ratio of enterprise value to earnings before interest, taxes, depreciation, and amortisation (EV EBITDA) was lower among companies that adopted social responsibility. That return on equity (ROE), beta, and EBITDA per share was not confirmed to correlate with the adoption of corporate social responsibility. Zaby and Pohl (2019) identified factors that are related to reputational risk for banks, emphasising the development of an indicator-based reputation assessment model based on a survey of credit institutions in Germany and Switzerland during the financial crisis, particularly affected by appropriately emerging risks, which are partially influenced by it to this day. The level of reputation can be considered a time-dynamic phenomenon, developing mainly depending on the changes within the reputation factors and depending on the expectations of the groups of stakeholders, and the given control parameter can be determined through reputation index points (RIP). Effective management of reputational risk can help prevent future negative side effects from banks facing difficulties from society or taxpayers.

3. Research objective and methodology

For this research, we have selected a sample of the top 10 subjects according to the RepTrak Global report 2021, which will be analysed based on the available information. To determine individual financial indicators, we will use the annual reports of the given entities. Financial indicators used in the research:

- Gross profit
- Research and development (R&D) costs

We will compare these financial indicators with the shift on the Reptrak Global Report 2020 scale, and also compare the reputation score delta. We will transfer all data to tables and graphs. We will use the PSPP program - the CrossTables method (Kendall's Tau C) to evaluate these hypotheses.

4. Results and discussion

Externally, the company's financial indicators are used mainly to identify the health or the ability to repay its obligations. Individual accounting contexts can reveal several factors and thus show an overall view of management and management as such. We know from the literature that companies with good reputations show positive indicators from the view of investment opportunities. We select 10 companies with the best reputation according to RepTrak for 2020. We also compare the reputation index for 2019, but we keep the order according to 2020.

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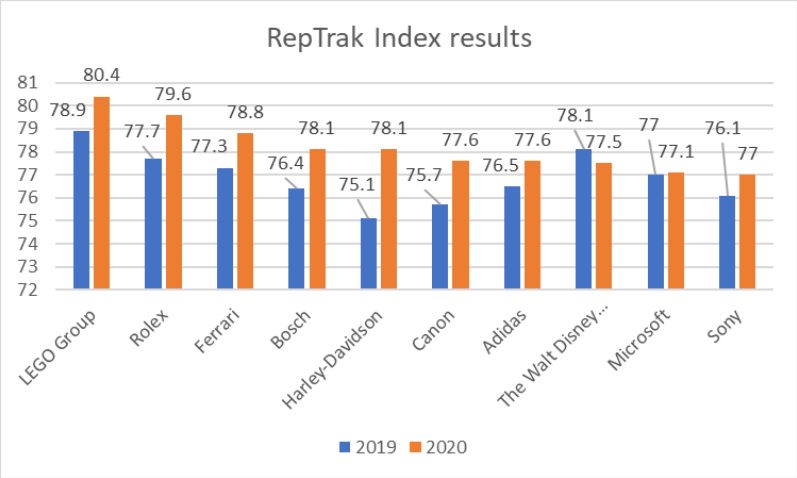


Figure 1. RepTrak Global Index

Source: Own processing based on RepTrak Global Report 2020 and 2021

In Figure 1, we observe that the difference in results for 2020 between the company with the best reputation score and the top 10 is 3.4 points. A decimal number represents a relatively small difference between each position. This slight shift in the level of the RepTrak index is a significant jump in external reputation.

We determined selected indicators for individual companies on the defined sample while we entered the data into individual tables. The first financial indicator is gross profit. According to the annual reports of separate entities, we found the gross profit for 2019 and 2020. Using the percentage share, we calculated the change compared to the previous year. We marked a positive result in green and a negative result in red. The data are displayed graphically in table 1.

Table 1. Gross profit (in millions) and its percentage change

Company	Gross profit 2020	Gross profit 2019	% Change
LEGO Group	4,087.63	3,541.40	15.42
Rolex	n/a	n/a	n/a
Ferrari	2,026.00	2,197.00	-7.78
Bosch	551.60	652.02	-15.40
Harley-Davidson	1,372.00	1,922.00	-28.62
Canon	12,933.00	14,812.00	-12.69
Adidas	9,855.00	12,293.00	-19.83
The Walt Disney Company	21,508.00	27,546.00	-21.92
Microsoft	96,937.00	82,933.00	16.89
Sony	34,480.00	34,310.00	0.50

Source: Own processing based on Annual reports

Companies such as Microsoft and Lego Group recorded the most significant increase. On the contrary, Harley-Davidson and The Walt Disney Company had the most significant declines. We see a substantial difference in investments, which is also reflected in individual entities' product lines and the portfolio's selling price. Since it is irrelevant to compare individual amounts, we will focus on the percentage change in the given periods. We will use this data in the following analysis.

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Subsequently, we are interested in another financial indicator, namely the development and research costs. This figure is responsible for the total costs spent on the company's development, mainly the portfolio's improvement. Reputation is influenced by the quality of the product or service, so we are interested in how companies approach these facts. We have created an overview of individual companies and their costs for development and research. The data are shown in table 2.

Table 2. Development and research costs (in millions) and its percentage change

Company	R&D costs 2020	R&D costs 2019	% Change
LEGO Group (mil. DKK)	937.00	768.00	22.01
Rolex	n/a	n/a	n/a
Ferrari (mil. EUR)	707.00	699.00	1.14
Bosch (mil. EUR)	5,890.00	6,079.00	-3.11
Harley-Davidson	n/a	n/a	n/a
Canon (mil. YEN)	272,312.00	298,503.00	-8.77
Adidas (mil. EUR)	983.00	1,031.00	-4.66
The Walt Disney Company	n/a	n/a	n/a
Microsoft (mil. USD)	19,269.00	16,876.00	14.18
Sony (mil. YEN)	525.20	499.30	5.19

Source: Own processing based on Annual reports

To the data from the analysis, we also added the percentage ratio for 2020. Here we find out the increase or decrease for this indicator. Individual results will be used in further research. Another indicator that needs to be determined is the decrease or increase of individual placements over the monitored period. For this purpose, we analyse the position of individual companies in the RepTrak Global Report ranking. The data are shown in table 3.

Here we see that the scores of individual subjects are increasing year-on-year. The only subject of the Walt Disney Company deteriorated by 0.6 points year-on-year, which brought the expected drop in the ranking to 8th place. It is interesting to see the competition between companies from the point of view of the increase in the reputation score. Even if it grows year-on-year, it is not an automatic guarantee of a higher position in the ranking.

Table 3. Individual entity ranking and RepTrak 2021 RepTrak scores and their 2020 delta

Company	Ranking 2020	Rep. score 2020	Ranking 2019	Rep. score 2019	Δ Ranking	Δ Score
LEGO Group	1	80.4	1	78.9	0	1.5
Rolex	2	79.6	3	77.7	1	1.9
Ferrari	3	78.8	4	77.3	1	1.5
Bosch	4	78.1	9	76.4	5	1.7
Harley-Davidson	5	78.1	20	75.1	15	3.0
Canon	6	77.6	14	75.7	8	1.9
Adidas	7	77.6	8	76.5	1	1.1
The Walt Disney Company	8	77.5	2	78.1	-6	-0.6
Microsoft	9	77.1	5	77.0	-4	0.1
Sony	10	77.0	11	76.1	1	0.9

Source: Own processing based on RepTrak Global Report 2020 and 2021

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Based on these findings, we entered the individual data into the PSPP program, where the resulting Kendall's Tau-C analysis revealed (see Table 4 below):

Table 4. Statistical result of Kendall's Tau C test (% change in gross profit and Δ Placement)

Symmetric measures.

Category	Statistic	Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Ordinal by Ordinal	Kendall's tau-c	-.37	.34	-1.11	
N of Valid Cases		9			

Source: Own processing, where: r_k = -0.37 (0.34)

In this case, there is no significant relationship between the company's gross profit change and its position in the RapTrak ranking. Therefore, we accept the null hypothesis (H0). We used the same procedure for changes in development and research costs. The results are interpreted as follows (Table 5):

Table 5. Statistical result of the Kendall's Tau C test (% change in R&D costs and Δ Locations)

Symmetric measures.

Category	Statistic	Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Ordinal by Ordinal	Kendall's tau-c	-.71	.14	-4.95	
N of Valid Cases		7			

Source: Own processing, where: r_k = -0.71 (0.14)

Also, in this case, there is no significant dependence between the change in the company's research and development costs and its position in the RapTrak ranking. Therefore, we accept the null hypothesis (H0).

Conclusions

Based on the facts found, it can be assumed that a change in gross profit, or a change in R&D costs will not affect the company's reputation score. In this case, it should be noted that the sample is tiny, and the given facts need to be analysed on a larger data package. In addition, this sample gives us only a partial view of the changes since the changes used to cover only two years. This research opened questions for further monitoring financial indicators and their impact on reputation scores. Space is being created for extensive research into the company's financial indicators and their effect on its reputation. Reputation as a company asset is still a new value in the era of vast possibilities of online business and customer interaction. Financial management will still be needed for reputation scores as well. The question remains as to how it can specifically influence the external reputation.

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PREVENTION OF PROCRASTINATION AT WORK THROUGH MOTIVATION ENHANCEMENT IN SMALL AND MEDIUM ENTERPRISES IN SLOVAKIA*

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Abstract. Human resources are the backbone of well-functioning SMEs, similar to other businesses. It requires commitment, work, and specific leadership, driven by creative work, flexibility, and effective time management. Small and medium-sized enterprises are the driving force of the European economy, as they contribute to job creation and economic growth and ensure social stability. This study investigates the relationship between work motivation and procrastination among office employees in SMEs. The PAWS (Procrastination at Work Scale) and WEIMS (Work Extrinsic and Intrinsic Motivation Scale) standard questionnaires were filled out by office employees in Slovak SMEs to collect data. This quantitative approach enhanced our understanding of work motivation and procrastination and provided useful empirical data for minimising its negative impacts. A total of 153 self-completed Likert questionnaires were distributed and analysed using SAS. Pearson's correlation coefficient results showed a strong and significant negative relationship between intrinsic work motivation and work procrastination. The results show if the managers in SMEs examine the interaction between individuals and their environment, they can reveal what motivates the employees and thus reduce the frequency of procrastination.

Keywords: small and medium business management; business environment; human resource management; employee

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JEL Classifications: M10, L26, O15

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1. Introduction

From a quantitative point of view, the term small and medium-sized enterprises are present in all sectors of the economy if they do not exceed a specific size. Since terms indicating size are used to name small and medium-sized enterprises, economists have decided to categorise them based on quantitative, measurable indicators.

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(Hatten, 2011; Mura, Krchova, & Chovanova Supekova, 2021). According to Schmidt et al. from Grant Thornton International (2021), leaders must replace the traditional operation-focused model with a more flexible approach. A new leadership model will allow companies to develop in the post-pandemic environment. During a crisis, managers play a crucial role in responding to employees' needs and dealing with anxiety, stress, and the resulting aversion to work tasks. Scientific studies examining the problems caused by the impact of the pandemic from the perspective of experts in the field of human resource management have identified issues, e.g., management of employee morale, motivation, and work engagement (Caligiuri et al., 2020). The presented contribution aims to examine the impact of work motivation on the level of procrastination in daily work activities among employees in SMEs. We define the current state of the issue within the dimensions of work motivation and the types of work procrastination. We analyse the modern phenomena associated with digital overload, its consequences after the pandemic, and the possibilities of improving this situation using the acquired knowledge. The presented ideas are supported by quantitative research conducted on a group of administrative employees of small and medium-sized enterprises in Slovakia. The research was conducted in the form of an electronic questionnaire survey. Based on the respondents' answers, reference points can be proposed for elaborating an effective company policy, the aim of which is to reduce the procrastination tendencies of employees working for small and medium-sized enterprises and increase their motivation.

2. Theoretical background

Work motivation is an integral part of the work environment. To achieve goals, employees have to experience a feeling of work satisfaction, be proud of work performance and do a job they like. A motivated person focuses on self-evaluation of his abilities, which is related to the result of the activity. There is also a direct relationship with a desire to succeed. This means that the greater the desire to succeed, the greater the motivation to perform. However, the opposite is also true. The greater the fear of failure, the lower the motivation to act (Reinberg and Ashkenazi, 2008). Self-determination theory (SDT) distinguishes between different dimensions of motivation in terms of different goals or reasons that lead to actions (Deci & Ryan, 1985).

The most fundamental difference is recognised between extrinsic (i.e., doing something because it leads to an outcome) and intrinsic motivation (i.e., doing something because it is inherently interesting or enjoyable). Compared to extrinsic motivation, intrinsic motivation has emerged as a more critical phenomenon for scientists (the individual's thinking and perception systematically determine, i.e., the natural source of success) (Ryan & Deci, 2000; Klingsieck, 2013). Many academics have concluded that intrinsic motivation is fundamental in terms of the detailed description of factors in the work environment. Intrinsic motivation is an individual's tendency to engage in a task that they find comfortably challenging, satisfying, and interesting (Hon, 2012). The earlier research on motivation concludes that individuals with a high level of intrinsic motivation are more likely to be cognitively flexible, curious, open to using unconventional approaches to decision-making, and open to new knowledge (Hon, 2012; Mura et al., 2021). In addition, intrinsically motivated employees tend to perform better in the work environment. They are more effective in achieving goals, happier and more satisfied than their colleagues (Koestner et al., 2008). Employees with high motivation to achieve success tend to be more attracted to work environments (Mura & Horváth, 2015), where there is a personal responsibility for attaining challenging, but achievable goals, and consequently prefer feedback on their overall performance. Power-oriented employees might be more attracted to work environments where they can influence the activities and think of others. These individuals are also attracted by achieving group or organisational goals (Stahl & Harrell, 1983). In a work environment, these employees may try to gain a reputation and status to gain satisfaction from exerting their influence (McClelland, 1985). Deci and Ryan (1985, 2000, 2002) assumed that autonomous forms of motivation have many benefits, notably more remarkable persistence and resilience to work problems, better performance, better interpersonal relationships, and greater subjective well-being. A positive attitude and work environment can significantly reduce unnecessary workplace activities such as procrastination. They expressed this idea in the Self-

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Determination Theory subscale, where they present the so-called motivational continuum (Fig. 1), which forms the basis of investigating workplace motivation.

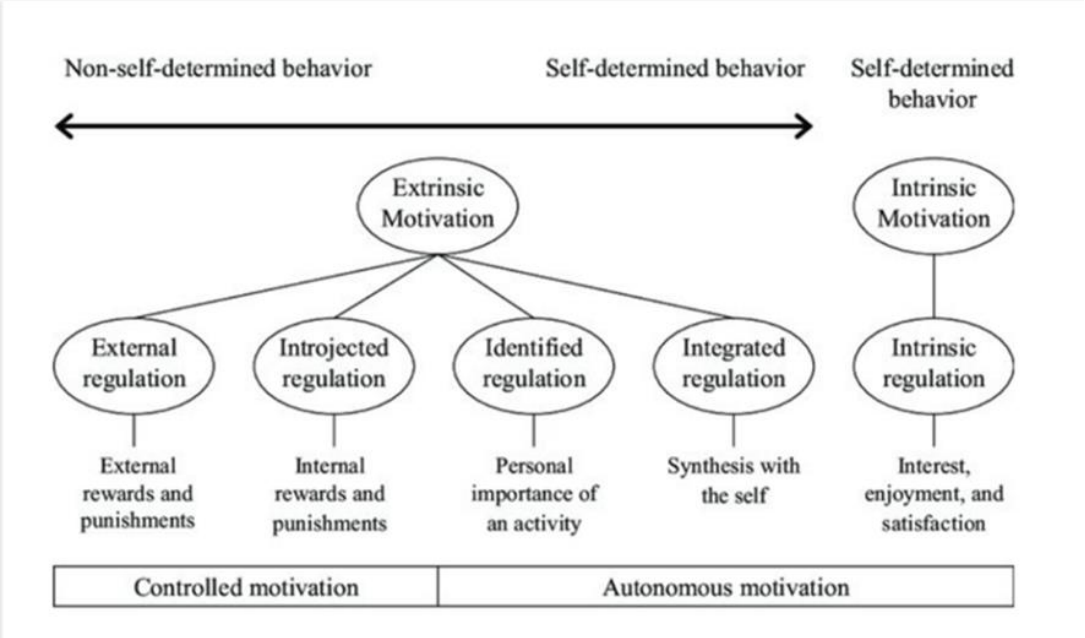


Figure 1. Self-Determination Theory

Source: van Beek et al. (2011)

- At the right end of the continuum is intrinsic motivation. Intrinsically motivated behaviour is the prototype of autonomous or self-determined behaviour since this behaviour is performed voluntarily (Ryan & Deci, 2002).
- Another type of extrinsic motivation is introjected regulation. The individual partly internalises the regulation but is not accepted it as his own. This behaviour is performed under pressure to avoid guilt and shame and achieve a sense of self-worth. According to SDT, behaviour is entirely controlling and has an externally perceived locus of causality (Deci & Ryan, 2002).
- Identified regulation is a more autonomous or self-regulated type of extrinsic motivation. An individual values a regulation or goal and consciously specifies themselves with it. According to SDT, identified regulation has an internal perceived locus of causality (Deci & Ryan, 2000; Ryan & Deci, 2000a, 2002).
- Integrated regulation is the most autonomous type of external motivation. The individual identifies themselves with the importance of behaviour and evaluates and aligns the regulation with their values, goals, and needs that are already part of the self (Ryan & Deci, 2002, p. 18). The individual fully accepts the regulation. External regulation is fully internalised into self-regulation and results in self-determined extrinsic motivation (Deci & Ryan, 2000).
- The minor autonomous sort of motivation is external regulation. It is a classic example of extrinsic motivation, in which people's actions are controlled by external factors, e.g., material goods or punishment.

When integrated motives drive the individual's behaviour, it is performed voluntarily to achieve personally essential outcomes because the activity is inherently interesting or enjoyable. Behaviour is committed to achieving a self-contained result, where the value of the outcome is well integrated with the self. According to

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SDT, integrated regulation has an internal perceived locus of causality (Deci & Ryan, 2002). On the other hand, without a motivator, negative work habits may occur. Procrastination in the workplace refers to the deliberate postponement of work activities that must be completed, which has far-reaching consequences for employees' lives and organisational development. Investigating the causes of procrastination at work is crucial since it provides theoretical knowledge and practical advice on effectively avoiding these problems (Bolden and Fillauer, 2019). This insight is, therefore, essential for managers, who should choose the most effective tools to fight procrastination, focusing on the specifics of the phenomena. Procrastination is sometimes referred to as a modern-day plague, with a prevalence rate of 20–25 per cent among the population. Employees in administration procrastinate about 1.3 hours per day, which is probably underestimated (D'Abate and Eddy, 2007). However, procrastination nowadays is also caused by modern technologies at workplaces, such as digital overload of employees, so-called digital distraction, or technostress. Technostress is a psychophysiological condition characterised by high levels of stress-sensitive hormones and cognitive symptoms such as poor concentration, irritability, and memory impairment. There is evidence that information overload from the use of mobile phones and other devices can increase negative emotions such as anger and anxiety (Torre et al., 2020; Szeiner et al.; Clare et al., 2020).

More than 95% of procrastinators want to eliminate this harmful behaviour at work. Considering the high costs and adverse effects of procrastination, understanding this behaviour will help us to minimise or eliminate it in workplaces (Metin et al., 2016). Available studies suggest that procrastination is a prevalent behaviour at work, which is also influenced by personality factors, such as high neuroticism and low conscientiousness or situational factors, e.g., limited role relevance, limited autonomy, and ineffective feedback. In addition, it is associated with high levels of stress and boredom, reduced workload, and performance (Metin et al., 2018).

Procrastination in the workplace is characterised by two dimensions, represented in Figure 2, namely soldiering and cyberslacking:

- **Soldiering** is a type of offline procrastination in the workplace that hinders work activities by making the employee prioritise non-work tasks without malicious intent. Long coffee breaks, employees, avoiding planning and daydreaming during work are typical examples of offline procrastination. However, a new way of procrastination at the workplace has also emerged with the increased use of mobile technologies.
- **Cyberslacking** (online procrastination) is using the Internet or mobile devices for personal purposes during working hours. While the Internet often allows employees to get work done faster and safer than before, it also makes it easier for them to use the Internet for personal purposes, resulting in high financial costs associated with less time spent on work. Cyberslacking is challenging to observe and measure compared to offline procrastination because employees may appear to be working (sitting in the office looking at a computer screen). At the same time, they are engaged in non-work activities (e.g., face-to-face communication) or checking social networks and websites (Vitak, 2011).

Online procrastination in the workplace can be a negligible phenomenon. It might take only a few minutes (e.g., checking personal emails and shopping online), or it can require much more time (e.g., playing gambling games, watching movies, and constantly chatting on social media platforms), which can significantly reduce employee productivity. According to research, the rate of cyberslacking in the workplace is about 60-80%, which leads to about 30-40% decrease in productivity. Previous research has examined the factors that cause cyberslacking in the workplace, including poor organisation and information overload. Similarly, the adverse effects of cyberslacking in the workplace have been explored, such as time wasted, loss of productivity, a distraction from work-related activities, violation of organisational norms and culture, and threats to the security of email systems and networks (Nusrat, 2021).

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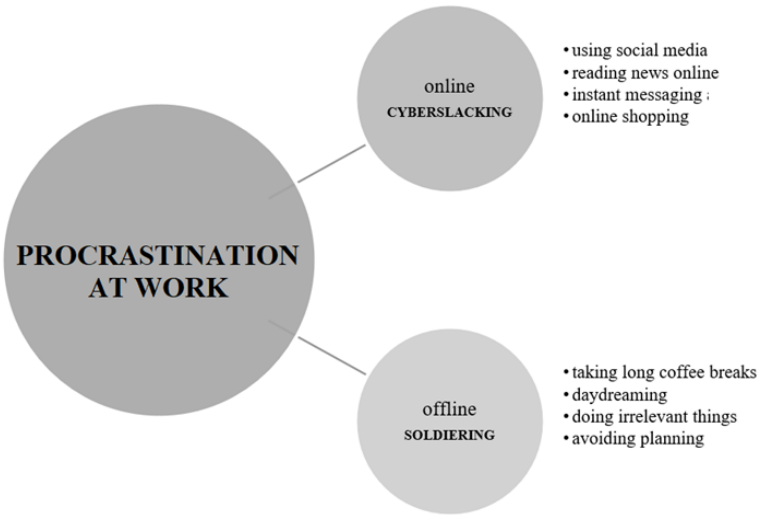


Figure 2. Procrastination at work

Source: van Beek et al. (2011); Authors' processing according to Metin et al. (2016).

3. Research objective and methodology

This research study is crucial for SMEs because employee productivity and efficiency are the main pillars of accomplishing company goals. Furthermore, based on the literature, there is little information about how work motivation and procrastination are interrelated. Therefore, this study aims to evaluate the relationship between motivation and procrastination. Considering all the empirical research studies presented in the literature review, it is clear that this issue still needs to be addressed in Slovak SMEs.In conducting this quantified statistical analysis, the following statistical hypothesis was established: *H_1: There is a statistically significant relationship between individual types of motivation and employees' procrastination in small and medium enterprises.*

The presented research was conducted with the participation of administrative employees of small and medium-sized enterprises in Slovakia. We used an online data collection method based on CAWI questionnaire - computer-assisted web interviewing. The questionnaire aimed to determine the relationship between work motivation and procrastination. An electronic questionnaire was sent to 153 employees. The sample of respondents consisted of 47.1% men and 52.1% women between 18 and 60. The freely available Google Forms application was used to create and distribute the questionnaire, while SAS software was used to process the results. Employees' procrastination was measured using the 12-item standardised work procrastination scale (PAWS; Metin et al., 2016). The Procrastination at Work Scale (PAWS) consists of two dimensions, soldiering - offline procrastination (intentionally slowing down work so that the employee avoids a full day's work, e.g., longer coffee breaks) and cyberslacking - online procrastination (using the Internet or mobile devices for personal purposes during work). The offline procrastination dimension is assessed by 8 items on the work procrastination scale, such as "I take a long coffee break at work".

The dimension of online procrastination is measured by 3 items: "I shop online during working hours". The work motivation scale was attached to the work procrastination scale (PAWS). The double-sided translated Czech version of the WEIMS – Work Extrinsic and Intrinsic Motivation Scale presented by Smahaj and Cakirpaloglu (2015) was distributed (Smahaj et al., 2015). The presented scale was originally proposed by the authors Tremblay et al. (2009). It consists of 18 items, divided into six subscales: internal motivation, integrated regulation, identified regulation, introjected regulation, external regulation and amotivation. This scale is based on the theoretical foundations of the theory of self-determination, which has three parts: internal motivation, external

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motivation and amotivation (Ryan and Deci, 2000). The items are scored on a 7-point Likert scale, where 1 - "does not correspond at all" to 7 - "absolutely corresponds", where respondents determine the reason for staying in their current job.

4. Results and discussion

Cyberslacking or online procrastination gained popularity because of the increased use of workplace technology. Since cyberslacking is harder to measure than soldiering, as it can seem like work, web browsing, instant chatting, and other time-wasting activities are widespread in today's offices during working hours. As a result, cyberslacking causes employees to waste time and become less involved in their work, which lowers their productivity. To provide a complete and balanced view of procrastination among office workers in Slovakia, we present the data regarding questions related to online procrastination. During the data analysis, a significant frequency of Instant messaging during working hours was noticed (Fig. 3). 49% of employees in SMEs reported that they use Instant Messaging at work for personal purposes once a week or more, which means a couple of times a week or daily.

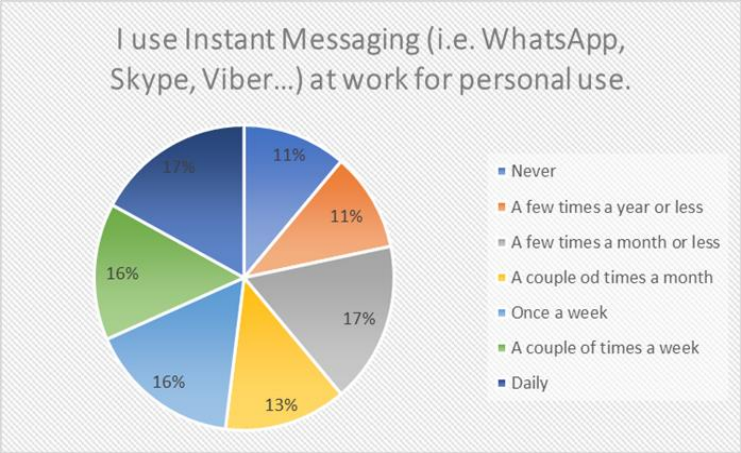


Figure 3. Frequency of Instant Messaging at work

Source: Authors' processing based on primary research

Regarding the next question, 17% of the respondents claimed to spend time on social media once a week. 18% reported that they use social media platforms during working hours a couple of times a week, and 14% claimed to use them daily (Fig. 4).

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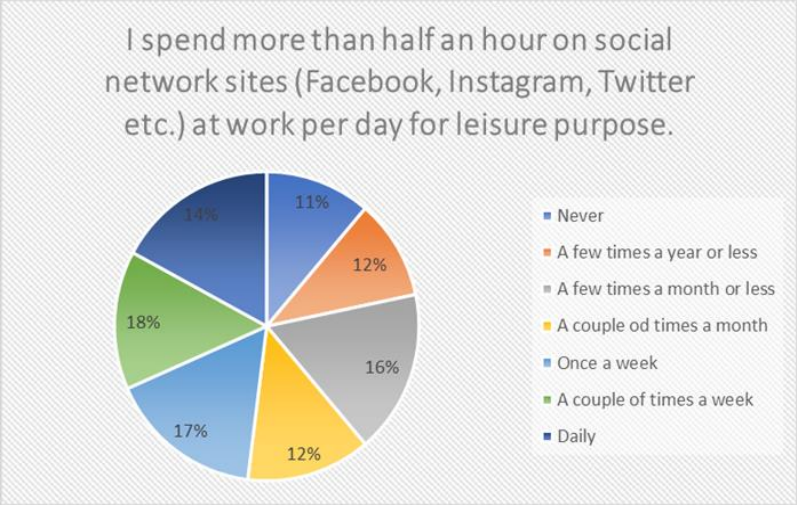


Figure 4. Frequency of social media use at work

Source: Authors' processing based on primary research

This behaviour can be explained by the term "escapism," defined by Griffits (2000) as behaviour that might arise when a person uses social media to escape from fear, despair, and other challenges in real life. Procrastination may occasionally be a factor in such escape. Some people avoid or delay dealing with issues like money, loneliness, or stress by pretending to be in a different, frequently imaginary digital environment (Warmelink et. al., 2009; Griffiths, 2000; Priyanshi et al.,2017). However, reading the news online appears to be another common kind of internet procrastination at work. In total, 37% of the respondents said they read news online at work a couple of times a week or daily (Fig. 5).

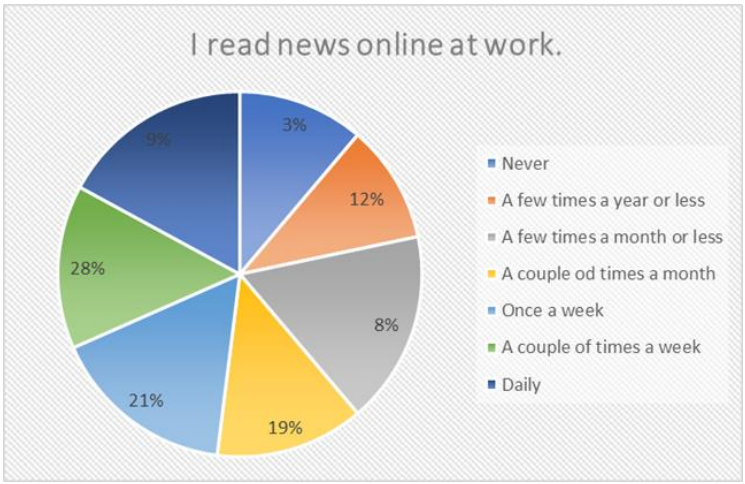


Figure 5. Frequency of reading news online during working hours

Source: Authors' processing based on primary research

By analysing the frequency of online procrastination among office workers in small and medium enterprises in Slovakia, the goal was to explore and investigate the relationship between procrastination and types of motivation according to the Self-determination theory (Table 1).

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Table 1. The relationship between types of work motivation and procrastination

6 With Variables:	IM	IntegR	IdenR	IntrjR	ExtR	Am
1 Variables:	Prokrastinacia					

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
IM	153	14.78431	3.56507	2262	6.00000	21.00000
IntegR	153	14.49020	3.15836	2217	7.00000	21.00000
IdenR	153	15.02614	3.31652	2299	7.00000	21.00000
IntrjR	153	14.22222	3.30713	2176	6.00000	21.00000
ExtR	153	15.41176	3.06836	2358	7.00000	21.00000
Amo	153	9.70588	6.00645	1485	3.00000	21.00000
Prokrastinacia	153	37.67320	20.23573	5764	2.00000	72.00000

Pearson Correlation Coefficients, N = 153
Prob > |r| under H0: Rho=0

	Prokrastinacia
IM	-0.68139
	<.0001
IntegR	-0.46862
	<.0001
IdenR	-0.38836
	<.0001
IntrjR	-0.20938
	0.0094
ExtR	0.07614
	0.3496
Amo	0.78985
	<.0001

Source: Authors' processing based on primary research

The results of the Pearson's correlation coefficient illustrated in Table 1 indicate the following:

- A statistically significant negative relationship (r = - 0.68139, P < 0.0001) between the variables of intrinsic motivation and procrastination.
- A weak negative relationship (r = -0.20938, P < 0.0094) between the variables of introjective regulation and procrastination.
- A statistically significant negative relationship (r = -0.38836, P < 0.0001) between the variables of identified regulation and procrastination.
- A statistically significant negative relationship (r = -0.46862, P < 0.0001) between the variables of integrated regulation and procrastination.
- A statistically significant relationship (r = 0.78985, P < 0.0001) between the variables of amotivation and procrastination.

The results showed how important it is to achieve and maintain intrinsic motivation to lower procrastination. Furthermore, the Self-determination theory (STD) suggests that employees achieve optimal functioning to the extent that they are motivated—a state in which they voluntarily engage in work activities because they find them enjoyable or valuable. It is assumed that the prerequisite of intrinsic motivation is the satisfaction of psychological needs, namely autonomy, competence, and relatedness. It is clear from secondary sources (Slemp et. al., 2020; Steel, 2007) that postponing work tasks and responsibilities cause poor employee performance. Studies show that

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procrastination is a complicated process associated with behavioural elements that can negatively affect organisational performance. Employee procrastination behaviour in the workplace is harmful, and researchers are still interested in investigating the causes and problems of this behaviour.
To support intrinsic motivation in workplaces in connection with the STD theory, we present the following elements modified according to scholars (Slemp et al. 2018; Berntsen & Kristiansen, 2019; Van den Broeck et al., 2016):

- Autonomy support refers to activities that offer employees options to choose between and encourage them to take the initiative. The management will avoid using rewards or sanctions to encourage specific work behaviour.
- Competence support includes activities that support employee efficiency, such as sharing knowledge, providing guidance, constructive feedback and creating realistic expectations.
- Relatedness support is behaviour that demonstrates sustained and authentic interest, care, and friendship among employees: active listening, mentoring and opportunities to develop relationships with others.

Conclusions

Employees' long-term unfavourable psychological connection with the company they work in creates the opposite development of behaviour and causes a loss of motivation and decreased personal productivity. The solution to this type of procrastination is to re-establish the psychological connection between the employee and the employer. Organisational policy and the lack of interest and desire are the main reasons for procrastination. Performance can only be achieved with motivation, and a lack of interest and willingness shows that employees are not motivated. Studies show that motivation leads to sustained intellectual and physical effort. It is an essential aspect of the work environment because it contributes to employee motivation and determines direction. In conclusion, the research sample may not apply to most SME employees in Slovakia. We believe that the respondents could answer the questions sufficiently, and the information obtained in the presented survey should be used as a basis for further research on the impact of work motivation on the procrastination behaviour of employees in small and medium-sized enterprises in Slovakia and abroad.

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SUSTAINABLE COOPERATION MANAGEMENT - INSIGHTS FROM A SELECTED COMPANY*

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Abstract. The issue of cooperation is one of the fundamental elements of the human and biological nature of the world. It creates new connections, strengthens, and repeats the current ones, and defines the conditions for the functioning, remuneration and punishment of individual participants in the cooperation environment. Cooperation management is one of the basic approaches to well-sustained and functioning relationships in a business environment where competitiveness and sustainability in a given environment represent an increase in benefits, fitness in a relationship and other activities beneficial to the partnership. This article aims to point out significant theoretical and practical starting points considering the sustainability of cooperation activities. Within the article's content, a comprehensive content analysis is elaborated, analysing the theoretical concepts of individual elements of cooperation. The essential part of the article also identifies practical starting points from the study of cooperation in the selected company. During the discussion, several recommendations are developed for creating sustainable cooperation management. One of the presented results is the application of a "win-win" strategy, in which the partners agree on the mutual ratio of costs and distribution of revenues within the joint activity.

Keywords: cooperation elements; cooperation management; strategic management; sustainable business; effective cooperation

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1. Introduction

Effective cooperation between organisations and its management is a well-established practical and scientific topic. Scientific studies (please see literature review in the next chapter) focused on states, regions, or surveys on big, middle, small companies, or clusters, etc. offer key findings: effective cooperation and its management are critical tools for corporate competitiveness; cooperation strategy is a relevant and often used choice; effective

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cooperation, such as clusters, have positive externalities on the environment in which they operate (Bublienė et al, 2019; El Idrissi et al., 2020).

Our research has thoroughly examined cooperation relations and their management in a single company. We chose a well-established, middle-sized company in B2B IT and energy sector. IT and energy are sectors with a high impact on the Slovak economy and society. Within this research, we focused on identifying the company's primary cooperation relations, management, effectiveness, and implications for market competitiveness and corporate sustainability.

Cooperation is currently one of the most widely used approaches in a competitive market. Companies from different industries meet and create specific values for the customer and each other in providing and enhancing quality, problem-solving, sustainable innovation, shared resources, and other areas.

This topic is one of the central topics for sustainable solutions. If a company wants to succeed in the domestic and global markets, it needs to know and use the basic rules of cooperation management. This way of managing will help the company achieve a higher sustainable benefit for the customer, more sustainable long-term relationships with partners, new partnerships in the domestic and global environment, and many other benefits.

If we transform this idea into a business environment, the company should be managed to withstand environmental changes. Kotler and John (2009) point to a disciplined approach to identify the sources of changes, predicting vulnerabilities and opportunities to generate critical and appropriate responses to guarantee that businesses continue to exist successfully and succeed in achieving business sustainability.

Creating and maintaining cooperative relationships is based on some aspects of cooperation. These elements from different areas of cooperation research can be used in the field of cooperation management. If the aspects of cooperation are mutually present among the cooperating entities, then the relationship between these entities can be called cooperation. Cooperation should use cooperation management but also consider the added value of cooperation and the synergy effects that may arise from it. The individual elements of the cooperation also create the dynamics of the relationship of the elements in the given environment. These elements may occur at the beginning of the relationship and during it. The initial cooperation elements for this environment are: evaluation, similarity, experience, competitiveness, culture, rules, mutual interactions (power, aggression, punishment, associative learning, altruism, and reciprocity), the structure of human social behaviour, and synergistic effect.

The aim of surveying the selected company was to identify the level of use of the elements of cooperation. Examining the perception of cooperation through the identification of key partners of the company, identification of the degree of satisfaction of the company with current partners, identification of the main benefits resulting from cooperation, identification of criteria (trust, intensive communication, etc.) for effective cooperation and their level and identification of problem areas of cooperation. We focussed on analysis of cooperation of a selected company IPESOFT (a description of the selected company is provided below in this paper).

The reason for such approach understanding that cooperation and the cooperation environment are both knowledge and strategy, increasing social development and progress in particular areas. Nowadays, internal cooperation, i.e. cooperation among individual departments and employees in the company, needs to be improved. This mutually beneficial behaviour must cross the company's boundaries in such a way that the companies cooperate and, by doing so, increase their market value in the future. Cooperation can bring the company improvement in various areas. Specifically, these are, for example, research and development of new products, sharing of production capacities, and merging even the greatest rivals in the industry to increase its competitiveness, i.e. by gaining a foothold among others or the most prominent competitors.

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2. Literature review

A comprehensive theoretical definition of cooperation creates a comprehensive view of cooperation. Knowledge about cooperation is essential for understanding its complexity and possible use in the business environment. They make a basis for assessing appropriate cooperation in market conditions, guaranteeing the cooperating subjects a higher chance to become more competitive, meet the set goals, and bring a specific synergistic effect to the relationship.

Cooperation, like competition, is one of the essential tools that influence the development and create changes in the current dynamic environment. The basis for the proper functioning and creation of links in the system, i.e. in a dynamic market environment, is their management, which can plan, organise and manage the individual activities of enterprises, not only within the enterprise but also between external cooperating or competing enterprises (Griffin, 1990; Kaplan and Northon, 2006; Kotabe and Hensen, 2010; Hannah and Eisenhardt, 2018; Dinning et al., 2022). Cooperation is one of the tools for solving problems in the current environment, where the system as a whole mutually operating elements is managed in such a way that it achieves the set goals – cooperation management.

The goal of every cooperation is a particular benefit for one cooperating party, for both parties, or for the entire community (Mierlo and Kleingeld, 2010; Kotler and Kotler, 2012; Lozano et al., 2013; Chang et al., 2019). A specific benefit is expected from the invested resources, costs for fulfilling the purpose and invested effort, and a loss or only a return of the subsidised costs. The changing market conditions, actors, capital investments, political situations and many other factors make the cooperation relationship a dynamic system defined for a certain period within the established boundaries.

It is essential to search for the most suitable partners through specific criteria. Criteria for searching for a cooperation partner may include: knowledge of the partner; the mission of the partner and its culture; similar goals; competence of the partner; the economic situation of the partner; quality of products and solutions; market position; response to customer input; coordination of joint projects; competitive struggle (Martin and Eisehardt, 2003; Corning, 2006; Hewstone and Stroebe, 2006; Vodáček and Vodáčková, 2009). Determining these and other criteria (depending on the subject of the cooperation and the environment in question) should lead to creating a particular strategy and management, which is necessary to achieve synergistic effects in the cooperation environment.

All these insights create a basis for strategic management in cooperation. It is essential to realise that cooperation and a cooperation environment are not only knowledge and strategy but also increasing social development and progress in particular areas. This mutually beneficial behaviour must cross the company's boundaries so that the companies will cooperate and increase their market value in the future. Recommendations for the management of cooperation:

- To create a cooperation environment, it is necessary to establish a cooperation balance between the costs of maintaining and building a relationship and the benefits of the relationship (Ulrich, 2011; Raihani et al., 2012; Yang ang Zhang, 2019). Castañer and Oliveira stated that certain “goals” of cooperating partners are the main units of comprehensive situation analysis: “1) private altruistic goals; 2) private selfish—sometimes even opportunistic, that is, to the detriment of the other partner—goals and; 3) common or collective goals.” (Castañer and Oliveira, 2020).
- Establishing rules and norms for the relationship is essential, that is, to create an organisation of individual relationships and their boundaries. This environment will achieve higher benefits than an environment with no such rules (Lozano et al., 2013; Safarzynska, 2013; Szolnoki and Danku, 2018).
- Partners of cooperation relations should find data about their partner at the beginning of the relationship. A look at the history of the partner, his past interactions in the environment, and reactions in past

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relationships will point to the similarity of the partner to his state of resources and intentions (influence on the long-term cooperation relationship) (Nowak et al., 2010; Rivas, 2013; Ulrich, 2011; Wu et al., 2017).

- Quantify potential and current relationships from which valuable information can be obtained for assessing competitiveness in the given environment (Bubeliny et al., 2021; Komine, 2014; Safarzynska, 2013; Santos and Zamberlan, 2015).
- Constantly updating information about the partner's past, relationships, and reactions is vital for managing relationships and their strategies and maintaining a cooperative environment (learning dynamics of knowing, checking and evaluating) (Melis and Seeman, 2010; Nowak et al., 2010; Wang et al., 2010; Deng and Zhang, 2021). According to Santos (2021, p.47) "the absence of interaction processes, such as information exchange and interaction coordination, and the absence of top management alliance's endorsement and participation prevents joint value creation. When competition and cooperation are both high, balanced coopetition positively affects joint value creation. Strong cooperation is a mandatory condition for the joint value creation".
- To create a synergy in which the connection of common goals of a related or purposeful relationship in the market will create a competitive position (Kaplan and Norton, 2006; Wei, 2010; Damodaran, 2005; Vodáček a Vodáčková, 2009; Liu et al., 2018)
- Trust can also be defined as the subject's expectation that future behaviour will be within the limits of shared values or moral ideas. The basis for trust can also be predetermined internal rules, boundaries, strategies, conditions and rules of cooperation. Trust can also manifest by accepting other environments and strategies of individual subjects. Trust between partners is a crucial factor for stable social systems, e.g. firms, economic clusters, business partners' relations, etc. (Helbing et al., 2010; Rivas, 2013; Wang and Redmiles, 2016; Amaral, et al. 2019). Therefore, we consider cooperation a competitive opponent, e.g., in biology, the rule of unification in case of threat applies. The competitive struggle creates a dynamic environment where entities update their strategies every moment (Wang et al., 2010; Berger, 2011; Rivas, 2013).
- An internal view of culture shows how individual members behave and react to stimuli from the external environment. Culture is often associated with certain symbols and rules created by a given system. Organisations with an internal culture focused on effective cooperation with customers (external environment) could be more innovative, stable, and sustainable (Gächter et al., 2010; Henrich and Henrich, 2006; Zhou et al., 2021). A corporate culture with a high level of internal knowledge transfer have also strong and mutually beneficial partnerships. Internal corporate processes with substantial overlap in cooperation management with partners could significantly strengthen the company's competitiveness and sustainability (Girdzijauskaitė et al., 2019).

Businesses in the given environment are affected by various factors, which can be external (competition, customers, suppliers, development of science and research, etc.) or internal (strengths and weaknesses of the business, mission, goals, etc.) in nature. The company needs to be prepared for the future, which is characterised by unknown circumstances. Still, from the point of view of current changes in business, it is necessary to anticipate future development, potential areas of growth and the direction of the company's needs.

Cooperation and concept of sustainability. According to the three dimensions of sustainability (environmental, economic, and social), we found that effective cooperation management can positively influence mainly the economic and social ones. The environmental dimension is influenced only partially. A company under investigation, IPESOFT, is trying to be perceived as a company with a serious interest in its ecological environment. All these activities (beneficial, promotional, supportive, etc.) are focused primarily on its employees. There is (nowadays) no need to communicate them towards society, communities, or customers.

We define sustainability within these cases as a concept which provides strategic, long-term relevance of the company's business or satisfaction of customers and long-term and mutually beneficial relations with partners.

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Hugé et al. (2015, p. 5737) state that "it is critical to focus on an adaptable and flexible sustainability assessment procedure, including alignment with organisational objectives and openness concerning various interpretations of sustainability". Effective management of cooperation between partners, their trust, and perception of benefits sharing as fair and strongly positive affect the company's ability to be competitive (from a long-term perspective). Kim et al. (2018, p. 3716) define the connection between cooperation and the concept of sustainability as follows "sustainability implies the extent to which one partner continuously sustains and strengthens its relationship with a partner, based on commitment and long-term orientation." They also conclude that "inter-firm cooperation involves transparent, fair, and mutual relationships between parties. Inter-firm cooperative relationships become collaborative or truly cooperative based on trust, commitment, and long-term orientation"; so they are overall sustainable.

The sustainable economic concept must be understood critically. There are significant barriers to "endless" growth. (Aras and Growther, 2008; Davidson, 2011; Sharma, 2020) We comprehend the sustainable business conception from the point of view of Aras and Growther (2008, p. 436): "Sustainability implies that society must use no more of a resource than can be regenerated". We also agree that corporate culture critically influences a company's sustainable behaviour and business sustainability. They developed a broader concept of sustainability dimensions (Aras and Growther, 2008): (1) societal influence, (2) environmental impact, (3) organisational culture and (4) finance.

Considering "societal influence", IPESOFT developed strong relations with its main stakeholders. They are vital partners with their customers and with the University of Žilina. They are also partners with competitors in promoting IT as an attractive field of study and in supporting technical education in the region. As part of these activities, partnerships with regional and city governments were also created.

Considering "environmental impact", the company supports its employees' ecological education and behaviour. Considering “organisational culture", the company strongly supports fairness and friendliness among customers and partners. It is an essential part of their corporate culture. Considering "finance", the company's investments in a strong customer and partnership-oriented corporate culture and ineffective long-term partnerships have proven essential for its strategic competitiveness. According Aras and Growther (2008, p. 460) “it is possible to state though that a firm which has a complete understanding of both sustainability and corporate governance will address these issues more completely". We also conclude that this kind of sustainable cooperation management provides relevant innovations (within the company). Staub et al. (2016) stated in their research, that product and process innovations affect sustainable corporate performance positively and have a significant relationship.

The development of theoretical statements requires the generalisation of practices of functioning companies. We selected a corporation with well-established cooperation relations and partnerships to identify if cooperation relations are managed effectively judging from the point of view of a) the company's competitiveness, b) partners' satisfaction (beneficial mutual relations) c) overall sustainability of the company's business.

2.1 Elements supporting cooperation

The choice of cooperation partner also depends on the willingness to cooperate or according to previous results of cooperation. Collaboration is more stable over time when choosing according to the desire to cooperate. Gaining information on cooperation entities is based on experience, which can be direct (gaining my own experience) and indirect by an individual through gathering information about past behaviour, interactions, and updating reputation. Trust between the cooperation partners is pivotal; it is abstracted through experience (Berger, 2011; West et al., 2011; Raihani et al., 2012; Rivas, 2013). Trust between cooperation partners is essential for its consolidation and growth.

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Achieving goals is much easier if people engage in mutually beneficial relationships. In this sense, the cooperation maximises the group's results as a whole: a) The application of the win-win strategy; b) the creation of competitiveness, that is, to win over a stronger rival or a stronger enemy. (Nowak et al., 2010; West et al., 2011) To achieve these goals, it is necessary to establish the rules and conditions of cooperation to achieve a balance in collaboration. Adherence to the rules is essential concerning future cooperation activities (Lozano et al., 2013).

Many cases highlight the importance of the cultural environment, and the culture in a given cooperation environment should be internally homogeneous and externally heterogeneous. Cooperating organisations, therefore, create their own culture for the partnership (Henrich and Henrich, 2006; Gächter et al., 2010). Competitiveness is understood as a stronger enemy and increases cooperation between weaker competitors. It is about bringing together competitors to achieve a particular goal. This is where the individual partnerships in which values are created take place. These values are essential for gaining a competitive advantage in the environment in which individuals operate (Berger, 2011; Jensen, 2010; Rand et al., 2011; Rivas, 2013). Regarding natural reciprocity, which can lead to cooperation, for example, in competing entities, it is possible to use this knowledge to create cooperation and gain suitable vital partners (Helbing et al., 2010; Raihani et al., 2012).

Relationships are evaluated not only in terms of cost, altruism, and reciprocity but also for the development and interaction with other elements that make up the cooperation environment. The sanctioning mechanism (punishment) can drive competition and bring better results if supervised. Trust and decency should be the basis, but it is clear from a person's biological nature that individuals fail pretty often, but the group should have the tools, procedures and methods to fail less or not at all (Helbing et al., 2010; Raihani et al., 2012; Ulrich, 2011; West et al., 2011; Lozano et al., 2013; Parks et al., 2013).

Establishing a balance of cooperation is crucial. Rational players choose from the possibility of finding a cooperating player rather than a turncoat. Basic cooperation decisions include cheating as a good advantage if the cost of the cooperation is higher than the benefits gained (Boyd and Lorderbaum, 1987); self-control and spatial heterogeneity (Hamilton's rule); cooperation depends on the reward ratio (Hawk-Dove model); and the application of a "Nash Strategy", where no partner can improve their situation just by changing their own (Gintis and Bowles, 2004; Wang et al., 2010; Rivas, 2013).

The size of the attraction can cause a change of partner. Depending on the benefits of attractiveness, it encourages comparison of the current relationship and benefits with a more attractive partner (Hewstone and Stroebe, 2006; Rivas, 2013). Similar to altruistic relationships, genetically related or similar partners can be misused. That is why these altruistic relationships with a partner in a given cooperation are why they change their partner (Safarzynska, 2013; Komine, 2014). Misuse of cooperation and trust of partners in their favour only to obtain the necessary information or resources that would not otherwise be obtained—also, establishing a partnership with a particular company only to raise awareness or improve market position, not with the real intention of cooperation and a mutually beneficial relationship. On the other hand, there may also be a misuse of the sanction mechanism and the dominant position of key cooperation members for their benefit (Nowak et al., 2010; West et al., 2011). The emergence of a conflict of interest of individual entities during a cooperation relationship occurs when the control mechanism in a cooperation relationship is misunderstood and unaccepted or in poorly formulated cooperation conditions.

Other constraints that significantly affect cooperation include (Wang et al., 2010; Berger, 2011; Lozano et al., 2013; Raihani et al., 2012; Rivas, 2013): high investment in the relationship, too much time spent on developing new products, low costs of sanctions, low fines, changes in the external environment (a political and legal environment that may adversely affect cooperation), discrediting partners, failure to achieve set goals, incorrectly chosen strategy, low level of trust and others.

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2.2 State of the market actions in cooperation

The success of any company in cooperation is based on its strategic management. A company that needs an efficient and effective strategy and strategic management cannot be competitive nowadays. Every business strategy is unique work. From this point of view, synergy is based on the functioning of cooperating companies' strategies. In a cooperative environment, they only harmonise their actions for the emergence of synergetic effects. The corporate advantage of cooperation offers a significant competitive position. Kanter (1994) presents corporate alliances as a living system, evolving gradually within its capabilities. The research team went through more than 500 interviews in 37 companies in 11 countries, some ties were more than 20 years old, and others were just the current response to the environment. They identified three primary aspects of business cooperation Kanter, 1994): a) cooperation connections represent a living system that is evolving and offering better opportunities for the future; b) engaging in alliances is more fruitful than exchanging resources; c) a dense network of interpersonal relationships and internal infrastructure improves learning. If company managers wish to create a cooperation strategy, they need to analyse the cooperation potential of the company, create a shared vision with partners and determine the orientation of cooperation; to build cooperation relationships based on common goals. For success, however, it is necessary to use elements of project management and ensure an environment that will be supported by effective communication, working with information and building partnerships: strategy and planning, business process review, changes in organisational structure, changes in ideas, efficient work with data, cooperation database, sharing information with employees and partners of the company (Kotler and John, 2009; Vodáček and Vodáčková, 2009; Kotabe and Helsen, 2010).

2. Materials and methods

The essential knowledge base on cooperation is broad-spectrum and exists in various fields. This article provides a basis for cooperation from specific theoretical and practical perspectives. The information was gained primarily from the scientific research articles mentioned in the references and the books, which were supported by detailed studies and research by the authors. In this article, the research in a selected company within the cooperation was presented as well.

After examining the individual articles and creating a "knowledge base" for modelling the cooperation relationship, we can assume that cooperation is integral to all areas, whether a business, living or non-living environment. It is pivotal to acknowledge that cooperation and the cooperation environment are not just knowledge and strategy but significantly increasing social development and progress in particular areas.

Based on a comprehensive theoretical analysis of cooperation and its forms, elements, and the formation of cooperation management, it is necessary to link this knowledge to a natural business environment directly. This knowledge was used in comprehensive research at selected company IPESOFT.

The following methodology was used for research purposes. Comprehensive content analysis identified elements that support the cooperation environment and the ones that prevent cooperation. The research was carried out using the method of sociological inquiry in the form of questionnaires, followed by data verification in the form of semi-structured interviews. A survey of cooperation and cooperation relations was conducted at IPESOFT. Logical argumentation, induction, and deduction of information across all research and the processing of its results.

Expert interviews

The basis was a semi-structured questionnaire with open questions. Detailed and comprehensive answers were provided by the managers of the company's main products (in the organisational structure included directly under

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the CEO). There are four managers. The CEO also filled out the same questionnaire. Each completed questionnaire was a detailed and comprehensive document with specific information.

Subsequently, after processing the conclusions from the answers, we conducted interviews with managers and the CEO, where we found out more details and clarifications. We added the results from the interviews as more detailed information to the insights from the inquiry.

The overall results can be presented as comprehensive information about the company's state in chapter 3.
The questions dealt thematically with the process of creating cooperation, their management and elements that significantly affect the competitiveness and sustainability of the company's business:

- Communication with partners
- Potential for cooperation
- conditions of the cooperation relationship
- Contingency plan
- Three main cooperation domains:
    1. Main elements of cooperation with partners
    2. Internal cooperation
    3. Elements that prevent cooperation
- Main cooperation elements of IPESOT:
    - Cultural environment
    - Rules and conditions of cooperation
    - Control and sanction mechanism
    - Trust
    - Competitiveness
    - Number of members in the cooperation environment
    - Marketing concept

The problem is a growing failure or unsuccessfulness of cooperation interactions in the business environment within the defined conditions and expectations of cooperation. Strategic alliances are one of the most common ways of cooperating, where two or more business entities cooperate based on specified conditions and certain obligations. However, most of these alliances fail, which is why the cooperation approach is one of the fundamental areas of our research. Cooperation must be broken down into the essential elements that affect a given case's success or failure.

The objective is to apply appropriate elements of cooperation in the company's internal management to prevent unsuccessful cooperation interactions by 30%. The article identifies these elements in the selected environment and defines general recommendations. The main results include the attractiveness of the cooperation partner and the combination of resources necessary for starting an effective cooperation relationship.

This research makes it crucial to form general recommendations instrumental for other companies. The purpose is to strengthen cooperation in the business environment while creating a mutually beneficial environment. The cooperation environment is the basis for joint success in the frequent changes in the global climate that interconnect national markets. The course of cooperation depends on the initial setting of the partnership (goals, combination of resources) and changes from the external environment (actors of the external environment). Termination of cooperation means not only the assessment (evaluation) of the partnership but also the creation of a point of experience that builds the reputation and reputation of the actor.

IPESOFT represents a unique business environment in which the cooperation approach has proven, but it also prevents cooperation with "grey" companies. According to our research, grey companies represent companies

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with inconsistent behaviour, defensive culture, the occurrence of turncoats, the absence of a win-win strategy and an in-efficient combination of resources. Grey companies represent a risky choice when choosing a cooperation partner in the cooperation environment. The research also points to a business environment in which all these elements (elements that support and prevent cooperation) tend to have certain specific behaviours and results.

3. Results

The versatile aspects identified in the following texts encourage the development of cooperation and its implementation in the business environment. One of the starting points worth mentioning is that cooperation is based on the natural inequality of individuals and entities, which is reflected in the effective use of these inequalities and the creation of higher fitness for the partnership. (We consider fitness in this section a healthy competitive advantage). An essential element is inputting short-term (important) and long-term (experience) conditions.

The current society, market organisation, opportunities and future create a dynamic environment in which each individual, company, organisation, and group must form alliances in cooperation to manage current conditions better and gain benefits for future development and progress. Cooperation and its various forms are currently one of the most widely used approaches in an increasingly globalised market, where companies from different industries meet and together create specific values for the customer as well as for each other in the process of providing and improving quality, problem-solving, innovation, common resources, and others.

3.3 Research results from IPESOFT

By analysing cooperation, cooperating actors, cooperation relations, and cooperation environment, we identified the main starting points for collaboration in the business environment based on theoretical sources. We subsequently observed these in the specific IPESOFT environment. IPESOFT is a successful Slovak IT company with domestic and international customers and partners. They provide comprehensive IT solutions for energy and industrial companies: e.g. IPESOFT D2000® a robust SCUDA system as an industrial multiplatform automation solution. IPESOFT have more than 100 employees and has been active on the market since 1993.

Selected elements of cooperation with partners describe a relationship focused on collaboration and predetermined a thriving environment for achieving goals, ways of interaction and communication, and the potential development of cooperation. Cooperation is described by the elements on which cooperation relationships are built. The latest information identifies the elements that prevent and harm the opportunities for cooperation.

After interviewing responsible managers, we can present commented results:

Cooperation partners come from customers, project partners, customers of individual solutions and tailor-made solutions. They can be divided into three areas according to the current intensity of cooperation: 1) high intensity of cooperation, 2) medium intensity of cooperation, 3) low intensity of cooperation. Establish rules of communication and relationship values to avoid a decrease in relationship potential and trust in the partner, even with highly effective communication. The ratio of trust and effectiveness of communication creates three groups of partners: 1) trust = efficiency; 2) trust <efficiency; 3) trust > efficiency.

Communication. The two main communication channels include e-mail communication and telephone communication. They make up 80% of the total communication. Less, but also used are communications in the form of a personal meeting, and a common IS such as a Helpdesk for individual solutions. The most effective, but

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also the most expensive, is communication in the form of a personal interview. This type will define the relationships, objectives, interactions and rules of the partnership more precisely and on a higher level.

The **potential for cooperation** with current partners is relatively high, with 7.2 out of 10 possible points. The **motives for cooperation** include the expansion of the customer portfolio, particular demand - tailor-made solutions, cooperation in joint projects, and increased profits and sales. The benefits of the partnership include expanding market potential, improving marketing sales (better segment knowledge, expanding sales), increasing market sales, creating references to the company, developing science and technology (evolution of know-how), and increasing efficiency and quality of cooperation. Change after the cooperation establishment.

The partnership brought the most considerable improvements in higher profits, raised market shares and research development. On the contrary, it brought the lowest enhancements in cost reduction, a more quality work environment and education. The work with information and the continuity of individual processes significantly improved.

The **conditions of the cooperation relationship** include financial, contractual - production, contractual - delivery and contractual - after-sales requirements. These conditions are highly demanding. With their satisfaction with their fulfilment, the complexity is always the same, and in some cases, 1-2 degrees lower—criteria for effective cooperation with partners. The examined criteria include mutual trust, benefits of collaboration, compliance with contractual conditions, level of communication, common IS, level of use of cooperation resources and flexibility of the partner. The criteria for the benefit of cooperation and the level of communication have the potential to improve their performance. Satisfaction with the fulfilment of the examined criteria is 74.28%. The criteria are therefore met to a greater extent, and relationships can be considered stable for cooperation activities.

The following activities are used to **develop relationships with individual partners**: teambuilding activities; corporate events; creating common values, providing benefits without sanction, and the possibility of loaned employees.

The **contingency plan** represents a procedure in the event of a decline in the cooperation relationship and the emergence of several inconveniences. The company does not have such a plan because if the cooperation with a partner failed, the company would not get into a significant crisis. The company states that the failure of one cooperation relationship with a customer is not liquidating for the company, as it has a broad portfolio of its partners (customers, suppliers, etc.)

The following table describes three main cooperation domains of IPESOFT: 1) main elements of cooperation with partners, 2) internal cooperation and 3) elements that prevent cooperation. Selected elements of cooperation with partners describe collaborative relationships and predetermine a thriving environment for achieving common goals, for better communication and with potential for further development. Internal cooperation is described by the elements on which the cooperative relationships between departments are based. The elements that prevent, hinder and damage cooperation are determined as the last (Table 1).

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Table 1. Three main cooperation domains of IPESOFT

Main elements of cooperation with partners	Internal cooperation	Elements that prevent cooperation
– Interdependence of partners (hardware, software) – "Win-win" strategy between partners – Collaboration on mutual commercial projects – Synergetic relations with partners – Complemental relations with partners (ability to address complex commerce projects with complementary expertise and products) – Consensual relations – Seeking for compromises – Marketing support – Collaborative products development (innovations) – All partners are certified experts in their fields of expertise – Prompt reaction to customers' needs – Pricing flexibility considering margins and discounts – Mutual trust – Deep knowledge of partners	– Cooperation on software solutions – Looking for a partnership that complies with internal unwritten rules and conditions (localisation, reputation, loyalty, economic situation, etc.) – Compliance with formal rules within partnerships with large companies – Control mechanism within projects (including approval of entry into the project) – Maintaining relations with partners, workshops – Creating "tailor-made" solutions for the customers – Obtaining funds for the growth and existence of the company (economic, professional, communication and others) – Entry into new markets, network partnerships – Marketing support – comparison with the competition – Advantages of cooperation: turnover, references – Establishing partnerships to obtain new business opportunities and new customers	– Only customer preferences decide (no possibility of own ideas) – Different philosophies and cultures of customer and partner companies – The need to adapt – Decision-making is limited by the budget, the final price of the product – Price sensitivity on the part of the customer or partner. Also, inhibiting the development of the solution. – Insufficient allocation of resources by the partner – Insufficient/inappropriate competencies of the partner – Restrictive conditions from the customer (e.g. the entire development of the solution must be done by only one company) – Partners or customers do not understand the relationship as a "win-win" strategy – Worse reputation of a partner or customer – Worse financial or organisational situation with a partner or customer – Lower quality of products or solutions from partners (understood according to the state of the market)

Source: own elaboration

Finding a partnership that meets internal "unwritten rules" and conditions such as location, reputation, loyalty, economic situation etc. IPESOFT always starts mutually beneficial cooperation (strategy: "win-win") and maintains a good reputation and positive reviews on the market. In the first place, it takes care of the customer's needs, which is why it would only be able to cooperate with a company that meets the criteria for cooperation (capital resources, product quality, market references, culture, and company vision). IPESOFT would not work with an "unequal" (different) potential partner. Both partners contribute to the relationship with their resources (hardware-software), from which they create shared solutions for the customer. The effect of a "win-win" strategy: a strategy in which the partners agree on a cost-benefit ratio of 50:50 also corresponds to the setting up a control mechanism within the projects.

IPESOFT considers the partner's reputation when establishing a relationship and during cooperation. Evaluating the partner's reputation and the experience gained from cooperation directly influences future collaboration possibilities. Active cooperation prevails, given that in most cases in IPESOFT these are long-term projects for the customer; it is necessary to adapt operationally to the current situation. Therefore, the conditions of cooperation also need to be adjusted. However, the established contractual requirements are mostly fixed—the changes mainly concern project management (internal dynamics of cooperation) (see Table 2).

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Table 2. Main cooperation elements in IPESOT

Elements	Explanations
Cultural environment	Within the corporate culture, employees follow the IPESOFT Code of Ethics. It is an official company document of strategic importance, which describes the basic set of standards and rules for all stakeholders and appeals to the behaviour of employees towards the external environment, i.e. specific behaviour towards customers and partners as well as behaviour within the company.
Determining the rules and conditions of cooperation	According to IPESOFT, effective project management is based on: "win-win" strategies, contractual conditions of cooperation, and division of project tasks, which creates engagement in a mutually beneficial relationship.
Control and sanction mechanism	IPESOFT bases its partnerships on trust, a proven approach to effective collaboration. The control mechanism takes place mainly at the level of compliance with the contractual conditions.
Trust	As IPESOFT bases all partnerships on trust, this is the driving force behind the growth of cooperation, or more precisely, it will follow the rules and put the same effort into a joint project. Otherwise, the relationship would not be established.
Competitiveness	Cooperation with a partner makes it possible to enter a new market. Development of product properties with partners is an activity at the customer, where the project implementation takes place; it is a mutual complementarity and finding an effective solution for the customer, corresponding to a quick response to customer feedback.
Number of members in the cooperation environment	There are no turncoats in IPESOFT. The reason is the number of cooperating subjects (each of the cooperating members wants to fulfil their tasks on the project, and the maximum number is three due to mutually beneficial relationships and projects).
Marketing concept	The concept of relationship management is the most widely used in IPESOFT. This concept is also the most effective form of communication with the customer. The advantage is personal contact, formally at business meetings, negotiations, and conferences and less formally at IPESOFT workshops and "events" of other organisers.

Source: own elaboration

Limitations of cooperation in IPESOFT

- Failure to achieve set goals: With a comprehensive solution, the hardware partner may not secure the hardware, and the customer may not be able to pay for it—differentiated strategic objectives in cooperation.
- Wrongly chosen strategy: own philosophy and culture of the companies, changes in views on cooperation may hinder its creation or continuation, e.g., failure to identify with the win-win strategy that underpins every single cooperation relationship at IPESOFT. The position of partners in the market and the competitiveness of individual partners increase if they are strategically interconnected.
- Poorly understood conditions of cooperation set at the beginning of the relationship.
- Low level of trust: customer preferences are decisive, and the strength of the competition is driven by its brand, position, marketing, and other alliances that influence customer choice.
- The emergence of conflicts of interest occurs when organisational structures overlap and their organisation, size, complexity, and rules of conduct differ. Too formal partnerships with large companies slow down the project and hinder the development of the solution (compliance).

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- Linking of information with partners. IPESOFT needs a sufficiently efficient linking of information. Linking information is intended to help strengthen a healthy and strong relationship, where both parties know their strengths and weaknesses, expectations, and threats from the environment. It has a partial link between the company's policy and strategy. It has information on accounting status, values, visions, goals, and culture that is partially linked or unrelated. Changes in the external environment, initial legislative restrictions on the establishment of cooperation relations,
- The financial complexity of the cooperation relationship from its inception to its termination,
- The results do not match the effort (benefits of the relationship < costs per relationship).

4. Discussion and conclusion

The word cooperation first appears in every company at the internal level. Because only if all parts of the "internal mosaic" fit together and each article cooperates with the other can we refer to the internal cooperation, i.e. the engine that drives the company forward towards the external environment.

4.1 General cooperation strategy with a focus on business sustainability

According to the close connection between corporate sustainability and effective cooperation management, we provide our strategic point of view. Elements of cooperation management from the literature and the subsequent research in natural conditions were to define a functioning system of cooperation management based on selected elements. These parameters include trust, the theory of stronger competitors - competitiveness, partner evaluation, cooperation benefits, and partners' interdependence.

Trust: The initial impulse to the relationship is created by trust in evaluating the partner's credibility. Trust can also be based on compliance with pre-established internal rules, involvement in the strategy, and compliance with the regulations and conditions of cooperation. Trust is valued throughout the relationship, not just at the beginning. Trust is also assessed in terms of the importance of the partner for the cooperation relationship or the position in the environment.

More robust competitor theory: On a global scale, there is always a competitive struggle, i.e. a struggle for the customer and over-market share. Thus, cooperating companies create partnerships that give them a competitive advantage and more effective and beneficial cooperation. Combining competition within defined limits and set goals is a manifestation of a cooperation relationship from which the partners benefit.

Partner evaluation: Partner evaluation is the primary interaction for a functioning cooperation management system. It is based on the assumption that if the evaluation of a partner in the defined criteria is positive, then such a partner is further accepted and vice versa. Defined stages can vary from relationship to relationship, for example, evaluation of entry into a relationship, current relationship - relationship interactions, potential relationship - future and necessary. The criteria for each relationship are reputation, possible resources and others. The evaluation of the partner needs to be understood in a broader range of a) the benefits that can be gained (present); (b) expected benefits (future); c) activity of members (interest in cooperation); (d) current needs and objectives; e) mission, values, culture; f) information obtained gradually from the relationship (positive, negative, responsible performance, activity).

The benefit of cooperation: The goal of each business activity was a particular benefit for one party, for both parties or the whole community. More significant benefits are always expected from the effort and the resources put into the relationship. From the expected benefit, we can give a few examples of common cooperation relationships: a) a comprehensive solution for the customer, (b) establishing itself on a foreign market, (c) a

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positive reference; awareness, d) higher market share; e) connecting to find a suitable partner; (f) resource efficiency; (g) interconnection intensity; (h) raising other areas (education, joint purchasing and marketing).

Benefits of joint marketing: The element is focused on several marketing directions: recommendations, awareness and promotion. Positive suggestions can gain new customers/members, enter new markets, and strengthen the name / particular branding. The goal effect is to contribute to the competitiveness of the cooperation relationship through joint interactions in marketing areas.

Interdependence of partners: Defined in four areas: a) access to information, (b) resources invested; c) education; d) product development. The partners' dependence in terms of their interconnection in cooperation is evident in all re-searched practical and theoretical areas. From a practical point of view, these are joint activities that create added value for the relationship for all participants.

The system of cooperation management defined in this way has a higher chance of becoming more competitive in the market conditions and meeting its goals.

4.2 General process steps of cooperation towards sustainable business

Process: *Product research and development*. The current market is more focused on adapting to customer requirements, essentially offering customers a "tailor-made" product. In a broader context, product research and development could also be understood as creating the required solutions (products and services). Therefore, cooperation is necessary to develop a mutually beneficial working relationship between the customer and the company. The advantage of this relationship is that the company tries to satisfy its customer.

On the other hand, a significant disadvantage is that the customer often needs to learn exactly what they want or know how to specify it correctly. Their operation area is unique, so the cooperation becomes closer. This increases the product's cost and extends the product's research and development deadlines.

Simplifying the internal process of product development and creation can bring the customer a flexible solution according to his specific requirements. To meet these needs in the required quality and time interval, it is necessary to correctly specify the customer's needs and analyse the company's capabilities.

Process: *Work for an organisation*. It is also necessary to think at the managerial level. Every manager should plan, organise, recruit and lead people and supervise and strive to create an environment where people can be successful. The organisation of work and the team are pivotal. Its basis is the corporate organisational structure. Suppose the corporate organisational structure is well designed and each employee is sufficiently informed about their competencies in the company (especially about the job description, responsibilities and powers). In that case, it is all the easier to form the organisational structure of the project team, which may vary depending on the current situation in individual departments.

Process: *Management and supervision*. The manager's role is to continue to develop team cooperation between the employees in the individual departments, but primarily to ensure that there is regular communication on the part of the management regarding the current state of the project and the fulfilment of its goals. The level of employee awareness should also be increased through regular meetings. Employees should be able to evaluate the state of their work simultaneously, as well as a kind of motivation for employees to become more interested in fulfilling the given goal.

Approach to employees. It is necessary to let people know that they are needed and respected in the company. Greater employee engagement can eliminate uncertainty and improve internal culture and cooperation. Because if

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management is the art of leading people, then it is necessary to think of people at first as they are the main actors in the cooperation.

And finally, it is the need for a check. For each project, regularly: resources, performance, and time. However, checking is relatively simple if the previous actions are set up correctly. It is essential to set goals so their fulfilment can be checked and entrust the person responsible for checking.

Process: *Getting feedback*. Generally, feedback can be identified as information referring to previous activity results. But also as a system connection, in which part of the output is often returned to the input to control or maintain that performance. Gaining feedback is a process. The results obtained from this process can be incorporated into other processes or form their basis. Among the processes based on the feedback results is the continuous improvement process.

4.3. Novelty and practical value of the obtained results

After examining theoretical knowledge about cooperation and sustainability and the literature review, we can observe a need for more relevant research cases from the point of view of a single market entity, a corporation. We were able to observe well-developed cooperation relations or partnerships of IPESOFT. Intensive research of IPESOFT's cooperation management proved that common principles are relevant for this company's general competitiveness- Now we can conclude that all main theoretical principles of effective cooperation management were present in the observed case: 1) Developing and management of mutually beneficial relations between partners; 2) The individual parties must understand the distribution of benefits as fair; 2) Focusing on long-term relations with partners and building of mutual trust; 3) Friendly and rational approach to overcoming possible problems or conflicts We were able to identify and observe all these general cooperation management principles. According to our survey, they are valid, dynamic, and integral parts of IPESOFT's strategy and daily operative tasks. The main general benefit of our findings is that cooperation management principles can powerfully and positively influence a company's competitiveness and sustainability. Research point of view from a single company provides practical information about effective cooperation management in connection with the company's market sustainability. Considering the research gap: a) We identify that observed cooperation relations provide towards the company's competitiveness; b) Main partnerships are managed and developed regarding the satisfaction of the partners - partnerships are mutually beneficial; c) Observed system of cooperation management is effective and significantly strengthen the business sustainability of the observed company as well as its partners.

Our research has two main limitations which must be taken into consideration. First, we have focused our primary survey on the single market entity. This was compensated by a deductive approach – from common scientific knowledge about cooperation management principles to a single company. Secondly, the company is situated in the Slovak Republic. Therefore, the results are more valid for Central European conditions than for the rest of the world. Although this is partially compensated by the fact that the company is active in the European Union market, they have several vital customers from the EU and Asia. So partial generalisation for these markets could be valid.

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STOCK PRICE TREND OF SELECTED COMPANIES APPLYING THE PRINCIPLES OF CIRCULAR ECONOMY*

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Abstract. This paper aims to establish whether there is a relationship between applying the circular economy (CE) principles and the stock prices of selected companies. In addition, a market capitalization change of the companies over ten years since the implementation of CE principles. Correlation analysis and comparison methods are used for this study. The results show that the application of CE principles does not adversely impact the selected companies' stock prices. This finding can help companies to determine whether they should implement these sustainability principles into their corporate cultures. Furthermore, it was established that the business development of the selected companies over the ten years since the implementation of CE principles had been positive for all studied entities but varied considerably. However, it needs to be clarified whether the application of CE principles is responsible for this positive trend. It would be useful to extend this research with further studies.

Keywords: stock; stock price; circular economy (CE); market capitalization; trend/development

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1. Introduction

Pressing challenges such as natural resource depletion, environmental pollution and climate change have urged many economies in recent years to seek strategies to balance growth and sustainability (Lehmann et al., 2019; Chehabeddine et al., 2022). One solution that is often pointed out, according to Dvořáková et al. (2021), is the transformation of the current linear economy into a more circular one. The key idea of the circular economy (CE) is to reduce waste and extend the lifetime of materials while preserving their value, for example, by using by-products of certain economic activities as inputs for others (Kovacs, 2021; Kalinová & Kostečková, 2022). As Horák & Katz (2022) states, CE is based on the principle of efficiency and aims to reduce the consumption of raw materials and pollution.

Currently, environmental issues have a significant impact on all economic sectors and affect financial markets (Olah et al., 2021; Stefko et al., 2021, Morea et al., 2022). This is echoed by Blinova et al. (2022), who also noted that environmental issues affect movements and trends in financial markets. As a result, there is a growing awareness of environmental, social and corporate governance (ESG) issues in the financial sector as well as an increasing attention to environmental risk assessment for the development of appropriate strategies can be observed in the industry (Corall-Marfil et al., 2021; Siminionescu et al. 2022; Ahmad et al. 2022). Morea et al. (2022) state that, from this perspective, the concept of circular economy (CE) is significant. As ESG factors are increasingly important in the business sector, investors pay more attention to corporate ESG information (Sun, et al. 2022). Incorporating ESG factors into the investment process has transformed from a niche market to a mainstream activity (Chen & Yang, 2020). This fact is supported by; for example, the last decade has seen a significant increase in ESG investments associated with the active development of the allocation process (Novakova et al., 2022). At the same time, in the last few years, this approach has been supported by regulators and institutions that provide standards and taxonomies on ESG issues (Sauvé et al., 2016; Gavurova et al. 2021).

Esken et al. (2018) note that investors and analysts have access to more information than ever about firm behaviour on environmental, social and corporate governance issues. And whether they like it or not, company managers need to take CSR concerns into account only to improve financial performance and reduce risks (Capelle-Blancard & Petit, 2019). This statement is supported by Engelhardt et al. (2021), who finds that from the viewpoint of both investor and business, CSR engagement during periods of market volatility, such as in the aftermath of the COVID-19 pandemic, pays off significantly in terms of improved stock performance. Businesses with better ESG performance had substantially higher cumulative abnormal returns in early 2020 and showed significantly lower idiosyncratic volatility. Thus, high-quality CSR makes businesses more resilient when market uncertainty is high, and managers should increase their commitment to developing an appropriate CSR strategy (Yu et al., 2022).

In contrast, Demers et al. (2021) argue that ESG did not impact returns during the pandemic crisis. On the other hand, the extent to which a company invests in internally generated intangible assets is more than just highly significant from an economic perspective. Also, public policymakers are trying to improve corporate sustainability performance disclosure, yet businesses challenge whether or to what extent they should engage in sustainability reporting and disclosure (Du et al., 2017). The negative impact of fossil fuels on the environment throughout their life cycle suggests a shift from the cradle-to-grave to the cradle-to-cradle lifecycle perspective. Studies by Hasheminasab et al. (2022) and Guo et al. (2022) utilize the circular economy approach in developing fossil fuels to reduce unsustainable consequences and ensure the resilience of the ecosystem.

Aldieri et al. (2021), in turn, argue that the circular economy strategy can reduce investment risk and yield superior risk-adjusted returns. The author's argument is based on information from analysis conducted on more

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than 200 European companies listed at Bocconi University (in 14 industries). The analysis showed that the more circular a company is, the lower its risk of outstanding debt and the higher the risk-adjusted returns on its stock.

As stated by Aboulamer (2018), the impact of a circular economy on financial markets is a highly controversial and topical issue that still needs to be adequately studied. For this reason, there is a need to develop further the literature focusing on this issue.

Although we are starting to see research exploring the differences between sustainable and unsustainable de Dios as mentioned, for example, by Mynhardt et al. (2017), or El Ouadghiri et al. (2021), this topical issue is relatively new to the research being discussed. There still needs to be further research, and more research should be conducted (de Dios-Alija et al., 2021) to compare and consolidate whether the circular economy and sustainability impact companies' value and stock prices.

The aim of this study/paper is to identify the stock price trend of selected companies before and after the application of CE principles. That is, to find out whether CE principles affect selected companies' stock prices. If so, to what extent? This leads to the following research questions:

VO1: What is the impact of the application of circular economy principles on the stock prices of selected companies?

VO2: How has the market capitalization of selected companies changed in the ten years since the implementation of CE principles, and how do these results differ from each other?

2. Literature Review

The stock market is a public market in which a company's stock and derivatives are traded at an approved stock price (Vochozka et al., 2020). Zahedi & Rounaghi (2015) state that this market allows brokers and companies to invest on neutral ground and is one of the leading indicators of a nation's economic health. Vui et al. (2013) present the stock market as a promising financial investment that can generate great wealth. However, as Machova et al. (2020) state, the stock market's volatility makes it a hazardous investment. Celebi & Honig (2019) argues that today we live in a post-truth and highly digitized era characterized by a worldwide flow of (mis)information. It has become a much more complex and impossible task to identify the impact of this information on stock markets and predict stock returns and volatility. According to Su & Zhou (2022), the global financial crisis in 2008 spurred research interest in stock price crash risk. However, the determinants of stock price crash risk still need to be clarified, especially in transition economies. A robust empirical link exists between corporate social responsibility and economic growth (Škare and Golja, 2013; Škare and Golja, 2014).

Raza et al. (2021) used content analysis to present a systematic literature review of 91 published research papers on the impact of corporate social responsibility (CSR) on stock prices between 2014 and 2019. They concluded that the interest in the CSR topic and its effect on firm value in terms of price and stock price increased significantly during this period. Another literature review is offered by Dartey-Baah & Amoako (2021), who provided a review using research studies published on the drivers and implications of global CSR between 2010 and 2020. They point out that the main topics of published research papers on the CSR drivers and implications are internal drivers, external drivers and implications of CSR. Publications on the drivers and impacts of global CSR were dominated by studies that used a quantitative approach and a cross-sectional design. A number of studies also used secondary data sources, most of which were not sensitive to sectorial influences. They revealed that CSR emphasis on actions that demonstrate social responsibility is more strongly linked with the overall corporate financial performance and value when contrasted with CSR ethical statements that are related to poorer corporate financial performance and economic results. For this review, they showed that the level of CSR

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engagement and disclosure was associated with higher stock prices, while low levels of CSR disclosure in sensitive industries lead to lower stock prices. In addition, the employee purpose was identified as the critical driver for CSR-related activities. They also identified that businesses engage in CSR due to internal institutional factors such as the code of conduct, corporate culture, and top management commitment. At the same time, the external CSR drivers include socio-political factors, globalization and environmental responsibility.

At a broader level, several studies focus on how the market responds to various events involving ESG-related reflections. Krüger (2015) uses corporate social responsibility (CSR) as a proxy for ESG performance to analyze how stock markets respond to positive and negative CSR-related events. The results show that the response is strongly adverse in the face of negative events and weakly adverse for positive events. Naughton et al. (2019) show that ESG asset announcements generate positive abnormal returns when investors attach a valuation premium to ESG performance. Similarly, according to Flammer (2013), markets respond positively to announcements of initiatives with positive environmental impact.

Numerous studies highlight the positive effect of ESG efforts on corporate financial performance (Ioannou et al., 2015). It should be noted that ESG best practices have different effects depending on the company's business areas (Khan et al., 2016). A study by Eccles et al. (2014) analyzes a sample of 180 US companies and finds the significantly better market performance of companies that meet sustainability criteria. Similar results are identified with respect to the impact of environmental practices (Dimson et al., 2015; Behun et al. 2018).

2.1 Effects of the Application of CE Principles and Capital Markets

"The circular economy is a tool for closing the loop of material flows in the economic system" (Seroka-Stolka & Ociepa-Kubicka, 2019). Seroka-Stolka & Ociepa-Kubicka (2019) described CE in their study, where they focused on the issue of green logistics and CE. The company's transition and the circular economy principles were the focus of Morseletto (2020), who elaborated on the goals CE should achieve. Kristoffersen et al. (2020) discussed the potentials of CE, which mainly focused on improving the efficiency of resources and their subsequent productivity. Taking the CE principles a little further, Sumter et al. (2020) focused on the actual product and service design for the circular economy in their research. Their finding was that companies need more capabilities to create such products, which may become a significant problem in the future. While the CE route is the future for the business development of many companies, it has its detractors. For example, Corvellec et al. (2022) described the significant shortcomings of CE in their paper. They primarily focused on undefined limits and insufficient theoretical foundations to identify the transformation of the very corporate structures as the biggest obstacle to the transition to CE.

Biktimirov & Afego (2022) researched whether investors value environmental sustainability and used regression analysis to analyze stock market responses of companies that were added to / removed from the FTSE Environmental Opportunities 100 (FTSE EO 100) index. Companies added to the FTSE EO 100 index that were not previously classified in the FTSE EO index and companies removed from the FTSE EO index do not show significant changes in stock prices. Conversely, companies that have been added to the FTSE EO 100 index from the FTSE EO index show a sustainable increase in stock prices, while the FTSE EO 100 index returns that remain in the FTSE EO index show a sustainable decrease in stock prices. Using regression analysis for a sample of Chinese A-listed companies over the period 2009-2011, Xu and Liu (2018) studied the role of CSR disclosure in reducing stock market information asymmetry as proxied by stock price volatility and liquidity. They identified that stock price volatility after CSR disclosure is lower than before CSR disclosure. Still, the trend is that it will first decrease to later increase for three months after disclosure. Stock liquidity also improves significantly after CSR publication; however, it will first increase to decrease later.

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In her study, Ludzinska (2017) studied the performance of the Warsaw Stock Exchange RESPECT index as well as the performance of all companies included in the RESPECT index over the period 2009-2014 to determine whether the implementation of the CSR concept supports the creation of firm value on the capital market. Using correlation analysis - Pearson correlation coefficient, Ludzinska (2017) confirmed that CSR helps to create firm value in the capital market. The study results show that socially responsible corporations are characterized by higher return on capital investment and higher dividend yield. Havlínová & Kukačka (2021) analyzed the relationship between CSR and stock market performance in the aftermath of the global financial crisis. They used a new measure of social responsibility from Thomson Reuters, called ESG Combined Score. As the novelty of the study, social responsibility engagement is divided into strategic activities closely related to the core businesses of the companies concerned and the remaining secondary activities. The results of the fixed effect regression showed a positive and statistically and economically significant impact of strategic activities on the performance of the companies' stock markets. This impact is nearly 103% higher compared to secondary activities.

The empirical results suggested that companies should strategically choose their socially responsible initiatives if they seek to increase their stock prices through the corporate social responsibility channel. Bae et al. (2021) conducted research using regression analysis to determine whether corporate performance from three measurement perspectives - environmental, social responsibility, and governance ("ESG") - carries on stock price crash risk. They also examined how the relationship between ESG ratings and stock price crash risk is affected by the degree of financial constraint. The empirical results show that ESG ratings reduce the risk of stock price crashes, and this relationship is significantly mitigated for financially constrained firms. The results suggest that a more significant financial constraint suppresses the positive role of corporate social responsibility in mitigating stock price crash risk. Kang et al. (2021) used regression analysis to examine the long-term performance of stocks that appear in the Dow Jones Sustainability Index in North America. They find that sustainability stocks exhibit abnormal returns for 12-30 months after listing a stock market index, while these stocks do not generate any excess returns prior to listing a stock market index.

Moreover, sustainability stocks experience an increase in institutional ownership after listing a stock market index. However, Kang et al. (2021) find no evidence that short sellers increase their position to take advantage of the potential overpricing of sustainability stocks. Overall, the analysis suggests that sustainability efforts translate into a sustained increase in stock demand, leading to higher performance.

Su & Zhou (2022) studied the relationship between CSR and stock price crash risk in the Chinese context. Based on details of listed firms in China between 2010 and 2019, they provided estimates using correlation analysis and multiple regression analysis as well as empirical proof that restricting CSR to bad news accumulation behaviour can reduce the risk of stock price crashes. They also document that internal CSR significantly affects accident risk while external CSR does not. In addition, Su & Zhou (2022) argue that CSR has a reasonably low impact on crash risk in SOEs, businesses with higher internal control quality, or businesses with better regional financial growth. Utz (2018) used regression and correlation analysis to study the relationship between CSR and the distribution of stock returns in an international sample. Generally, high-level CSR companies exhibit higher stock price synchronicity in the European, Japanese and US markets. In particular, he identified optimal CSR levels to minimize idiosyncratic risk for each region.

Moreover, CSR has a mitigating effect on crash risk in Europe and the United States. Conversely, companies in the Asia-Pacific region show CSR overinvestment followed by higher bankruptcy risk. This seems to be a consequence of globalization which forces companies from the Asia-Pacific region to overinvest in CSR to conform to Western standards.

Durand et al. (2019) extended the study by Hawn et al. (2018), which included Dow Jones Sustainability World Index (DJSI) events to measure deviations in a company's CSR activism and examine their impact on a company's

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stock price. Durand, Paugam, and Stolowy (2019), in their multivariate and regression analysis, obtained similar results on stock price (i.e. no impact) and trading volumes, as shown in a documented study by Hawn et al. (2018). However, extending the analysis, Durand et al. (2019) find that sustainability events attract more attention from financial analysts and lead to an increase in the stock percentage held by long-term investors, suggesting a trend of professional investors paying more attention to companies visible on CSR. Odeh et al. (2020) used Generalized Method of Moment (GMM) statistical analysis to analyze the relationship between CSR expenditure and market stock price. In a sample of 102 service companies listed on the Amman Stock Exchange (ASE) in the years 2010 to 2017, they identified no significant relationship between CSR expenditure and market stock price (MSP) in any direction. However, the findings confirmed a significant positive effect of company size on CSR expenditure and an adverse effect of leverage on CSR expenditure without any significant effect of ownership on CSR expenditure. Wang & Chen (2017) studied the US capital market's perception of CSR by examining companies that are part of the Dow Jones Sustainability Index (DJSI). They used parametric, nonparametric, and bootstrapping tests to determine whether independent organizations' implementation of CSR policies and verification contributes to a variance in financial performance. They also analyzed various events (i.e. nomination, classification, and valuation) to establish how much importance investors place on CSR. The results show that investors do not highly recognize the US companies included in DJSI. Where CSR becomes a common practice within a specific industry, however, certification by independent third parties regarding CSR policies provides real benefits to company performance.

2.2 Determining the Following Steps

The existing research shows that it needs to be clarified whether or not the application and integration of the circular economy principles into the operating principles of companies and their corporate cultures impact the trend of their stock prices listed on stock exchanges. The above studies indicate that, in some cases, CSR and ESG incorporation may positively or negatively affect stock prices and volatility. In some cases, applying these principles has no effect on stock prices in the capital markets. Due to the ambiguity in this topic, further research will be conducted in this study focusing on the stock prices of the selected companies in the period before and after the application of CE principles. The mathematical and statistical methods - correlation analysis and comparison method will be used to evaluate the data.

3. Data and methods

DJSI World is the most selective sustainability stock index, consisting of top environmental experts chosen from the top 10% of the industry. DJSI is the oldest and most respected sustainability index (Durand, Paugam & Stolowy, 2019). Based on the DJSI World Index, the top 3 companies will be selected from the top 10 companies included in the index and ranked according to the weight of this index.

The selected companies based on the DJSI World Index rankings are Microsoft Corporation in information technology, Google in communications services, and United Health Group in the healthcare sectors. It is very challenging and hardly traceable to determine when a company applied CE principles. Companies often apply them in some form in the early stages of their operations. For this reason, the first significant milestones related to sustainability and CE are determined for these companies.

For Microsoft, this milestone seems to have occurred in 2012 when the company achieved its goal of carbon neutrality. This goal was set by Brad Smith, who joined the company that year with the intent of being completely carbon-neutral by 2030. For Google, the milestone occurred in 2007 when the company became the first major organization to go carbon neutral for its operations. For United Health, 1999 can be considered a milestone for

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implementing CE principles. The company has been named to the Dow Jones Sustainability World Index and the Dow Jones North America Index every year since.

VO1: What is the impact of the application of circular economy principles on the stock prices of selected companies?

Data
Data in the form of stock prices of the selected companies applying CE principles traded on the stock exchange will be used for the purpose of this research. Specifically, the so-called Close price after the trading day is closed on the capital markets will be used. Using the document analysis method, these prices will be extracted from historical records on finance.yahoo.com (Yahoo Finance) and recorded as spreadsheet files in MS Excel to be used for further processing. In the effort to obtain the most objective results, data will be selected for the period from 1990 to the end of 2021, and prices will be selected on a weekly and monthly basis to reduce the amount of data.

Methods
To answer the first research question, the data for each company will be broken down into the period before the application of CE principles and the period after the application of CE. The correlation analysis method will be used to process data to determine whether there is a relationship or correlation between the stock price before the period when the company started to implement and follow CE principles to a greater extent and after this turning point. The correlation analysis will be performed in MS Excel using data analysis. This will establish an index of correlation. If the calculation shows that the correlation coefficient = 0, there is no linear relationship between the variables. Then if the correlation coefficient < 0, there is a negative correlation between the variables; if the correlation coefficient > 0, there is a positive correlation between the variables. For positive parameters, there will be a direct linear relationship, and for negative parameters, there will be an indirect linear relationship. The correlation coefficient cannot be > 1 and < -1.

To interpret the strength of correlation, the coefficient will be divided into 3 groups according to value: weak, medium and strong. Weak correlation will be the calculation value of 0.001 to 0.3 and - 0.001 to - 0.3. Medium correlation will be a coefficient value of 0.3 to 0.8 and - 0.3 to - 0.8 and strong correlation will result in a value of 0.8 to 1 and - 0.8 to -1.

VO2: How has the market capitalization of selected companies changed in the 10 years since the year of implementation of CE principles, and how do these results differ from each other?

Data
To answer the second research question, historical data in the form of market capitalization ratios of the selected companies will also be retrieved from companiesmarketcap.com using the Document Analysis method. This data will be processed as a spreadsheet file in MS Excel for better clarity.

Methods
The annual percentage change and the percentage change in the first and last year will be calculated from the available data. Subsequently, the comparative method will be used to compare the results of all 3 companies and a graph will be plotted in MS Excel.

4. Results

For Microsoft, the period from 01/01/1990 to 30/06/2012 and the period from 01/07/2012 to 31/12/2021 are compared in MS Excel using data analysis and the correlation function.

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Table 1. Microsoft correlation result

	Pre-CE	Post-CE
Pre-CE	1	
Post-CE	0.896042	1

Source: own production

The result shows that the correlation coefficient = 0.90 after rounding.
For Google, the period from 16/08/2004 to 31/12/2006 and the period from 01/01/2007 to 31/12/2021 are compared in MS Excel using data analysis and the correlation function.

Table 2. Google correlation result

	Pre-CE	Post-CE
Pre-CE	1	
Post-CE	0.833723545	1

Source: own production

The result shows that the correlation coefficient = 0.83 after rounding.
For UnitedHealth, the period from 01/01/1990 to 31/12/1998 and the period from 01/01/1999 to 31/12/2021 are compared in MS Excel using data analysis and the correlation function.

Table 3. United Health correlation result

	Pre-CE	*Post-CE*
Pre-CE	1	
Post-CE	0.813686109	1

Source: own production

The result shows that the correlation coefficient = 0.81 after rounding.

For the purpose of the second research question, the following tables will be used to show the market capitalization ratios of the selected companies in the period concerned and the percentage development.

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Table 4. Microsoft market capitalization in the selected period

Year	Market Capitalization	Change % [annual]	Change % [total]
2012	$223.66 B	-	
2013	$310.50 B	38.82 %	
2014	$381.72 B	22.94 %	
2015	$439.67 B	15.18 %	
2016	$483.16 B	9.89 %	
2017	$659.90 B	36.58 %	
2018	$780.36 B	18.25 %	
2019	$1.200 T	53.81 %	
2020	$1.681 T	40.10 %	
2021	$2.522 T	50.00 %	
2022	$1.906 T	-24.41 %	852.42 %

Source: data from companiesmarketcap.com under MSFT ticker symbol

Table 4 shows the data from the beginning of the implementation of CE principles over a 10-year period, i.e. from 2012 to 2022. The total percentage change in this period is 852.42%.

Table 5. Google market capitalization in the selected period

Year	Market Capitalization	Change % [annual]	Change % [total]
2014	$359.50 B	-	
2015	$528.16 B	46.92 %	
2016	$539.06 B	2.06 %	
2017	$729.45 B	35.32 %	
2018	$723.55 B	-0.81 %	
2019	$921.13 B	27.31 %	
2020	$1.185 T	28.68 %	
2021	$1.917 T	61.74 %	
2022	$1.466 T	-23.48 %	407.79 %

Source: data from companiesmarketcap.com under GOOG ticker symbol

Table 5 only shows the data from 2014 to 2022, i.e. an 8-year period. The total percentage change in that period is 407.79%.

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Table 6. United Health market capitalization in the selected period

Year	Market Capitalization	Change % [annual]	Change % [total]
2001	$21.84 B	-	
2002	$25.00 B	14.48 %	
2003	$33.91 B	35.65 %	
2004	$56.60 B	66.88 %	
2005	$84.38 B	49.08 %	
2006	$72.26 B	-14.36 %	
2007	$72.92 B	0.91 %	
2008	$32.12 B	-55.94 %	
2009	$34.96 B	8.82 %	
2010	$39.21 B	12.17 %	
2011	$54.02 B	37.77 %	247.34 %

Source: Data from companiesmarketcap.com under UNH ticker symbol

Table 6 shows the data for a 10-year period, from 2001 to 2011. The total percentage change in this period is 247.34%.

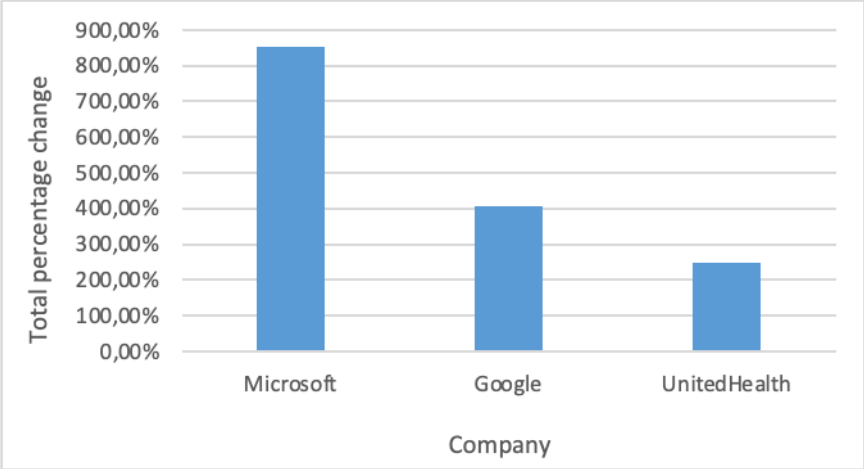


Figure 1. Percentage change of the companies by market capitalization in the specified period

Source: own production

Figure 1 shows a percentage comparison of Microsoft, Google and United Health in the period concerned. Thus, Microsoft grew by 852.42 %, Google grew by 407.79 % and United Health's value by market capitalization grew by 247.34 % compared to its initial value.

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5. Discussion of Results

Based on the results of this research, the research questions stated can be answered:
What is the impact of the application of circular economy principles on the stock prices of selected companies?

Using external data of stock prices for the period concerned, correlation analysis determined the relationship between stock prices before and after the application of CE principles. A strong direct linear relationship was identified for Microsoft. This suggests that the company's value is changing steadily; therefore, the circular economy does not adversely affect stock prices. Google was also found to have a relatively strong direct linear relationship. Thus, it can also be concluded that the value of the company is changing steadily, and therefore CE does not adversely affect the company's stock prices. In the case of United Health, the degree of correlation is close to a moderate to a strong direct linear relationship. Still, in this case it also means that the company's value is changing steadily and that CE does not adversely affect the stock prices of this company. Thus, according to the results, the application of CE principles had no adverse impact on stock prices for all three companies.

This research proved that the application of CE principles does not have an adverse impact on the companies' stock prices. Still, a positive relationship between CE and stock prices could be the subject of follow-up research. On the other hand, Ludzinska (2017) used correlation analysis to show that CSR supports the creation of corporate value in the capital market. The results of her research document that socially responsible companies are characterized by higher return on capital investment and higher dividend yield.

How has the market capitalization of selected companies changed in the 10 years since the year of implementation of CE principles and how do these results differ from each other?

The second part of the results shows that over the 10 year period since the implementation of CE principles, the market capitalization percentage of the selected companies varies considerably. Microsoft's market capitalization has increased by a staggering 852.42% in the 10 years since its implementation. Google's market capitalization increased by 407.79%, almost half that of Microsoft, and United Health's market capitalization has increased by "only" 47.34% of its original value compared to the increase of the two previous companies. The data used for Google, however, did not start from 2007, but only from 2014 for a period of 8 years due to the lack of earlier data. There is a similar problem for United Health, i.e. data used only covered the period from 2001 to 2011.

Conclusions

Due to the lack of research and the ambiguity of results in this research field, this research was conducted to determine whether there is a relationship between the application of CE principles and the stock price of listed companies. The study was also extended to determine the change/trend of selected companies by market capitalization over a 10 year period since the implementation of CE principles.
Using correlation analysis, the research of the selected companies showed that the values of the selected companies have been changing steadily and, therefore, the application of CE principles does not have an adverse impact on their stock prices. However, these findings clearly indicate that there is scope for possible follow-up research that would examine in more detail the relationship between the adoption of CE and its subsequent use in the corporate culture and stock prices, and in particular, research focused on the positive effects of the application of CE principles on stock prices.

Furthermore, the conclusion was that all the companies concerned have changed positively in terms of market capitalization after implementing CE principles, and that these results differ significantly from each other. However, it is not clear whether these facts have strictly resulted from the implementation of CE in the corporate

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culture of the companies; however, it is a conclusion based on the first topic studied that they have not and other factors affecting the capital and specifically the stock markets had an impact on these facts. Therefore, additional research would be advisable to follow up on this topic and provide further clarification and documentation.

For example, it would be interesting to include small-cap companies in this research to compare them with the large-cap companies included in this research.

Sustainability is a hot topic, and CE principles are increasingly being implemented by companies. Research on this issue is beneficial not only for stock market stakeholders such as investors but also for companies themselves as they can change the value of their company to their advantage by increasing their sustainability efforts and implementing these principles if there is a positive effect of applying CE principles on stock prices.

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LITERATURE REVIEW ON DIGITAL ENTREPRENEURSHIP IN SOUTH AFRICA: A HUMAN CAPITAL PERSPECTIVE*

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Abstract: This paper aims to assess the current status of digital entrepreneurship in the South African environment by analysing people's knowledge and behaviour towards the fourth industrial revolution. Numerous studies have been conducted regarding social, corporate and women entrepreneurship. In addition, the current literature on digital entrepreneurship needs to be more specific and depends on the field. Previous studies highlight digital entrepreneurship from various dimensions, such as global growth, women and gender, regulatory challenges and their impact on economic growth. Furthermore, studies assessing human capital's influence on digital entrepreneurship still need to be completed. Individuals and businesses must embrace digital entrepreneurship and consider the impact of human capital on business success. Therefore, there is urgent to consider the human capital factors in digital entrepreneurship. The study uses a library search and analysis of previous literature on digital entrepreneurship, regardless of its impact on economic growth. This study found that a lack of technological knowledge and a low number of mobile social media users are the main factors that affect the development of digital entrepreneurship in South Africa. The discussion provided in this paper would strengthen the body of knowledge on the effects of human capital on digital entrepreneurship and act as a reference for empirical research.

Keywords: digital entrepreneurship; human capital; industrial revolution; digitalisation; South Africa

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JEL Classifications: O31, O32

1. Introduction

Digital technology has recently turned out to be a new social and economic force, remodelling old-style business models, processes and strategies. Digitalisation has become a challenge for human capital since a neep arose to develop continuously in this vigorous period. Digital entrepreneurship emphasises forming new ventures and converting current experiences by developing new digital technologies (Yin et al., 2019; Muafi, Syafri, Prabowo

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& Nur, 2021). Changes caused by technological advancement started years ago, changing the societies' way of living, the state of the economy, and organisational strategies and structures around the world (Steininger, 2019; Elia, Margherita & Passiante, 2020). The Covid-19 pandemic reinforced the progressive expansion of digital technology; since it was needed to lessen direct social interaction due to the Covid-19 pandemic in almost all parts of the world. Isolation led to more social interactions happening virtually than in the real world. Distance and time were no longer vital issues in networking or transmitting messages to the community (Muafi, Syafri, Prabowo & Nur, 2021). Consequently, various offline businesses have shifted to online companies (Nambisan Wright & Feldman, 2019; Geissinger et al., 2019; Richter, Kraus & Syrjä, 2015). This increase in online business has motivated this study to document the influence of human capital so that a clear picture of digital entrepreneurship and human capital is achieved.

Existing literature focuses on digital entrepreneurship and its growth at the global level. Ratten (2014) provided that a decade ago, many studies on entrepreneurship concentrated on North America and Europe. Research on Asian countries was few; studies focused on Africa were omitted. The significant body of research on entrepreneurship focussed on how the context of business doing affects entrepreneurial attitude (Ratten, 2014). Recognising digital entrepreneurship through a much more contextualised approach is still necessary. Hence, studies of African entrepreneurship have to consider the conditions of business operations of countries, specifically in this continent (Beshir, 2022; Rezk et al., 2022; Shipanga, Le Roux & Dubihlela, 2022; Agbaje, 2022; Hegedűs, 2022).

To become a digital entrepreneur, a person has to understand and appreciate how to operate and grow businesses in particular local settings (Wahutu, 2021). How digital entrepreneurship develops in South Africa differs from how it unfolds in other nations.

The fourth industrial revolution has brought severe concerns about human development in developed and developing nations. Even though the fourth industrial revolution inclines to improve human well-being in sustainable and advanced ways, almost half of the work in Africa is vulnerable to innovations of technological changes (Alabi & Mutula, 2022). Ratten (2020) provided that Africa is a diverse geographic space influenced by historical, cultural and societal change. The human ability to adjust to innovation changes affects digital entrepreneurship. Thus, referring to the study done by Huggins, Prokop and Thompson (2017), it is vivid that human capital connects to the experience and knowledge of entrepreneurs, including the growth motivation of their ventures as a result of the strategic decisions they make, impact upon rates of survival. The local setting contributes immensely to the possibility of survival. Therefore, this paper aims to critically discuss the impact of human capital in their respective environment on digital entrepreneurship. Unlike previous studies, the authors focus on the peculiarities of African digital entrepreneurship.

This paper begins with a literature review that explains the definition of digital entrepreneurship and human capital, the current trends of the phenomenon worldwide, including the impact of human capital on digital entrepreneurship. It further explains the gap between theoretical approaches and objective human capital development factors that affect digital entrepreneurship in South Africa. Methodology, findings and discussions follow this section. This paper ends with conclusions and human capital implications for digital entrepreneurship in South Africa.

2. Methodology

Secondary data analysis (SDA) was adopted as the research method for the study. This method is an empirical exercise that applies similar principles to studies using primary data (Johnston, 2014). In operationalising this method, a library searches and examination of previous studies on digital entrepreneurship were applied, guided by a deliberate resolution to select and include only literature on digital entrepreneurship in the study. Compared

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to other methods, document analysis is less expensive and unobtrusive (Neuman, 2011). A critical document analysis systematically discussed the nexus between digital entrepreneurship and human capital. As mentioned, it is understood that the fourth industrial revolution has changed the traditional way of doing business to online business, hence a need for nations to embrace digitalisation. The library search includes online articles and offline materials such as textbooks and newspaper articles. The papers were obtained from the databases for management and entrepreneurship, viz; Taylor and Francis, Scopus and Emerald (with the keyword: digital entrepreneurship).

3. Literature Review

Digitalisation is now an economic and social force which has transformed the old-style business models. Digital technology is a controlling instrument in influencing the growth of new technology-based ventures by forming the capacity to scale the business rapidly (Steininger, 2019; Cavallo et al., 2019; Richter et al., 2017). Digital technology has numerous forms of productivity that can be employed, viz, artificial intelligence, crowd-funding platforms, digital 3D printing, social media platforms, big data, cloud, and smartphones that can create entrepreneurial prospects with innovative methods (Ghezzi & Cavallo, 2020; Cavallo et al., 2019). Therefore, entrepreneurs (human capital) must quickly adapt to innovative changes and be willing to learn continuously. Thus, technological readiness is critical in sustaining a venture since the market condition undoubtedly strains entrepreneurs to heighten the use of technology (Moldabekova et al., 2021). In this regard, businesses must adapt to technological advancements to cope with the changes and remain competitive. Therefore, the pervasiveness and relative accessibility of digital technologies make the creation of digital value imminent for the desired outcome (Sahut et al., 2021).

Elia, Margherita, and Passiante (2020) explained digital entrepreneurship as forming new businesses and altering current companies by generating digital technology. Digital-based entrepreneurship comprises studies exploring the entrepreneurial process through digital changes in business processes (Steininger, 2019; Cavallo et al., 2019). Rauch and Rijsdijk, (2011) define human capital as the skills and knowledge people obtain through investment in education, training, and experience. High levels of human capital may be a pre-requisite for entrepreneurs to adjust to the current technological environment, enable the application of new information within firms, and determine the nature and extent of knowledge spillovers for the survival of new businesses. Barringer and Ireland (2019) stated that the high failure rate of new ventures is caused by the liability of newness, which refers to the fact that businesses always fail because the individual who creates them is not capable enough to adjust to their new roles swiftly. There is a need for entrepreneurs to learn and embrace digitalisation to support business growth.

Too many issues have been discussed in the digital entrepreneurship literature concerning the social, corporate, woman/gender, global entrepreneurship, impact on economic growth and impact of Small and Medium Enterprises (SMEs). However, a limited study organises digital entrepreneurship and how it is influenced by human capital. Before analysing digital entrepreneurship and human capital in detail, it is necessary to skim through the discussions in previous studies. Discussions on the digital entrepreneurship phenomenon embrace the woman/gender aspects (Duffy & Pruchniewska, 2017; Pergelova et al., 2019; Wang, 2022), impact on SMEs (Franco, Godinho & Rodrigues, 2021; Ramdani, Raja & Kayumova, 2022; Pfister & Lehmann, 2021; Lee, Kelley, Lee & Lee, 2012), regulatory challenges (Dong 2019; Lafuente, Ács, & Szerb 2022), and challenges for particular countries are discussed without much emphasis on human capital and South Africa (Briel et al., 2021).

In comparison, previous studies highlighted digital entrepreneurship from various dimensions but still need to address the reality gap surrounding digital entrepreneurship. Based on research by von Briel et al. (2021), current issues affecting digital entrepreneurship are societal problems such as poverty. Thus Dy (2022) stated that despite the productive potential of the internet, the landscape of digital entrepreneurship is still shaped by social patterns of privilege and disadvantage, which prevents people in Africa from acquiring knowledge and accessing funds for

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business activities (Asongu & Odhiambo, 2019). Digital entrepreneurship is being affected by human capital factors. Human capital characteristics are essential, such as digital knowledge and readiness to support digital entrepreneurship.

However, this research explains the human capital issues as current matters influencing digital entrepreneurship. Digitalisation creates new possibilities, which include virtual teams and intelligent work, new communication instruments, quick access to information, the influence of energy structures and improvement in efficiency and standardisation. To assist SMEs and support them in earning the benefits of digital transformations, managers need to acquire various skills, namely: communication via digital media; worldwide connectivity and quick information exchange, generating a competitive environment for the digital venture, which must cope with rapid changes, competition and technology (Horner-Long & Schoenberg, 2002). Entrepreneurship studies concerning economic growth, women and gender imbalances, and globalisation issues are not the only matters influencing digital entrepreneurship in South Africa. Bishop and Brand (2014) argued that human capital's level and heterogeneity are essential for services. Human capital quality is vital for businesses to continue to improve their operations in a dynamic market in South Africa.

The application of digital entrepreneurship has been carried out in all parts of the world. This progress shows the existence of public trust in digital-based businesses. Globally, the market share is becoming wider and continues to grow. Digital entrepreneurship can supplement traditional business models (Elia, Margherita, & Passiante, 2020). Digital technologies are incorporated into internet-based business models and digital platforms (Elia, Margherita, and Passiante, 2020; Richter et al., 2015). Elia, Margherita, and Passiante (2020) provided six research streams related to digital entrepreneurship: digital business models, digital entrepreneurship processes, platform strategies, digital ecosystems, entrepreneurship education, and digital social entrepreneurship. With the alteration of the business environment in Indonesia, the essence of entrepreneurship started to appear in the young generation, with a term called digital entrepreneurship. Among numerous forms of entrepreneurship, digital entrepreneurship is in high demand by the millennial generation, including college learners (Muafi et al., 2021). It means that baby boomers still need to fully embrace digitalisation which is still a challenge in South Africa. This statement is supported by Dy (2022), who claims that there needs to be more knowledgeable about the wide range of people undertaking entrepreneurial activities online - their backgrounds, activities, and experiences - especially outside of high-tech or deep-tech sectors. While not exclusively entrepreneurial, online trading is a principal activity, and notably, 18% of UK internet users sell goods or services online (Prescott, 2017). Yet, apart from the importance of the digital economy for entrepreneurship, the rate at which individuals entrepreneurially practice digital technologies and generate digital venture networks still needs to be explored (Giones & Brem, 2017; Sussan & Acs, 2017).

A study by Wahutu (2021) about digital entrepreneurship in eleven African countries revealed that in none of those the users of social media on mobile cell phones go above 38 per cent, with the highest city with mobile social media users being Johannesburg, with 38 per cent and the lowest being Kigali at 4.6 per cent. This is apart from mobile internet users ranging from 77 per cent in Nairobi to 15 per cent in Addis Ababa and Maputo. These statistics should cause researchers and academics to question social media businesses' claims about their growth and uptake in African countries. Wahutu (2021) further alludes that in Ghana, an interviewee notifies that while more people in Ghana have smartphones, Ghanaians typically use these phones for WhatsApp, so while there was an 'excellent smartphone influx, there's a gap between the phone and the people. In Kigali, an entrepreneur captures this disjuncture by notifying that while mobile broadband coverage has improved, and smartphones have become cheaper and common among wealthy and middle-class Africans, many Africans do not want the designed smartphones available at their price range.

Furthermore, because of the newness of digital entrepreneurship in African countries, locally relevant entrepreneurial knowledge still needs to be improved and has only recently started being built (Wahutu, 2021).

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Notably, this probes a need to explain human capital factors for the success of digital entrepreneurship in South Africa. Mtotywa, Moitse and Seabi (2021), conducted in South Africa, revealed a low level of knowledge about the fourth industrial revolution among unemployed citizens and entrepreneurs. This is concerning as these groups are the main target for the growth of digital entrepreneurship in South Africa. Furthermore, the findings by Alabi and Mutula (2022) revealed that human development positively influenced the fourth industrial revolution. This needs to be improved and is still required to grow the digital entrepreneurship concept.

The analysed papers allow us to distinguish the following aspects, tackled with the context of research in digital entrepreneurship in evaluating it from a human capital perspective (Table 1). The selected papers represent the main aspects of research.

Table 1. Selected articles

Authors	**Analysed aspects**
Alabi & Mutula (2022)	the impact of human development on digital developments in sub-Saharan African countries
Barringer and Ireland (2019)	Human skills in launching a successful venture
Dong (2019)	Regulatory challenges on digital entrepreneurship
Franco et al. (2021)	Impact of digital entrepreneurship on the management of small businesses
Lafuente et al. (2022)	How countries endorsed different regulations to govern their relationships with tech-entrepreneurs
Lee et al. (2012)	How technology resources and globalisation impact small businesses
Mtotywa et al. (2021)	South African citizens' knowledge of the fourth industrial revolution
Muafi et al. (2021)	Challenges facing human capital in the digital entrepreneurship era
Pergelova et al. (2019)	Digital technologies and their effects on the global expansion of small businesses
Pfister & Lehmann (2021)	Impact of digitalisation on the performance of small businesses
Ramdani et al. (2022)	Digital innovations in small businesses
Ratten (2020)	diverse issues related to entrepreneurship in Africa
Von Briel et al. (2021)	Challenges affecting digital entrepreneurship and human capital in South Africa not emphasised
Wahutu (2021)	How Africans are making sense of digital entrepreneurship
Wang (2021)	Women and digital entrepreneurship in East Asia

Source: the authors

4. Findings and discussion

Even though digital entrepreneurship contributes to the economy's success in African countries, the gist of human capital challenges is the same, which is an entrepreneurial and technological adaptation. Some African countries acknowledged the lack of digital knowledge and transformation as the top priority that hinders the development of digital entrepreneurship. In contrast, some other countries consider the little use of smartphones by citizens as a factor that impedes the growth and support of digital businesses. However, the everyday use of smartphones may be attributed to poverty and the need for knowledge on mobile social media use. The existing literature explicates globalisation, economic trends, women and gender imbalances and the existence of SMEs as common factors that influence the growth of digital entrepreneurship. Nevertheless, most of it discusses the surface of each aspect, which warrants the specific human capital matters to be discussed in detail.

Contrary to previous studies, this article successfully highlights the effects of human capital on digital entrepreneurship development, such as lack of technological knowledge and low use of mobile social media. This finding concurs with Wahutu (2021), who found that the highest city with mobile social media users is Johannesburg, with 38 per cent. Though it is high in percentage, it is still low considering the population of this city.

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While construed as opportunities to be solved by entrepreneurs, the country's socioeconomic problems are more likely to be barriers to market development. Furthermore, the level of knowledge about the fourth industrial revolution among unemployed people and entrepreneurs still needs to be higher. Embarking on massive awareness programs that aim to educate citizens about the importance of digitalisation in this 21st century may be necessary to spearhead digital entrepreneurship in South Africa. It is important to understand digital entrepreneurship through a much more contextualised approach to appreciate the level of innovation occurring on the continent,

Conclusions and implications

Reviewing past studies in this area shows that a more comprehensive framework is needed to promote digital entrepreneurship. The discussion on human factors that influence digital entrepreneurship needs serious attention from small and medium enterprises, government, and non-government bodies. All stakeholders must be aware of the challenges related to enabling individuals to cope with this fourth industrial revolution coupled with digitalisation. In addition, the fourth industrial revolution's emergence should be considered an opportunity to conduct business with limited boundaries.

Current literature explains digital entrepreneurship focusing on social and economic trends regardless of context and country. Only specific trends are standard worldwide since many countries have different environmental settings. Unique countries' peculiarities still require special attention.

This study's rationale is highlighted, including lack of technological knowledge and low use of mobile social media as factors influencing digital entrepreneurship in South Africa. Compared to past literature, the description is not specific to the context. The limitations of this study are the lack of data since this is a theoretical paper based on an analysis of contemporary literature in the field. It is, therefore, essential for this study to serve as a baseline study on digital entrepreneurship, and it is recommended that an investigation be considered in South Africa. Matters of regulations, gender imbalances and economic trends remain important in digital entrepreneurship; this study suggested that human capital development can support the growth of digital businesses in this fourth industrial revolution.

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SUSTAINABILITY OF ELECTRICITY PRICES AND THE CONSEQUENCES FOR THE PRAGUE STOCK EXCHANGE

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Abstract. Sustainability of electricity prices hold an important part of the family budget, business operational costs, and vitality of the economy. Currently, multinational corporations are considered the main users of electricity and other energy recourses. For this purpose, we analyze the sustainability of electricity price and their impact equity stocks in the PX Index. The PX Index, which originates from Prague Stock Exchange is generally composed of firms in the financial and energy sector. This paper as well tries to predict the performance of these two variables in the 12 months ahead. The data cover the period from 1995 to 2022 standing on the monthly observations. The Vector Error Correction Model was used to detect the effect that electricity prices maintain on the PX Index. The estimated forecasts were conducted in the R program using Facebook Prophet and Auto ARIMA Model. The results indicate that non-sustainability of electricity prices negatively affect the equity stocks listed on the PX Index. Regarding predictions, the PX Index is expected to stay at almost the same levels while electricity prices increase. The results provide modest indications for investors, government, and regulators on the performance of these two indicators 12 periods ahead. Additionally, it is the first attempt to analyze the relationship between electricity prices and the equity markets since the liberalization of the Czech economy.

Keywords: Electricity prices; Equity Stocks; PX Index; VEC Model; Facebook Prophet; Auto ARIMA

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JEL Classifications: G15, G17

1. Introduction

The stock markets stand as an important element of the financial system that facilitates efficient allocation of national savings (Masood et al., 2017). The equity stocks of Central and Eastern European (CEE) exchanges barely reflect the financial and economic settings of the country (Sinicakova and Gavurova, 2017). At the same time, sustainable electricity prices and permanent supply are vital for well-functioning of the market economy (Belas et al., 2019; Rajbhandari et al., 2022). In many nations, energy efficiency is the focal point of energy policies, and it is also at the forefront of the discussion surrounding energy sustainability (Yao et al., 2022; Guo et

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al., 2022; Androniceanu et al., 2020; Simionescu et al., 2021). The work by Aliu et al. (2021) shows that due to financial literacy, macroeconomic and firm-specific factors are hardly priced into these exchanges. The structure of the firms in the PX Index is constantly changing while few of them exist since its foundation (PSE, 2022). Of the twelve blue chips that the index is constructed, four of them are local firms while the others are international. The index experienced an unprecedented downturn during the financial meltdown of 2008/09 and the Greek debt crisis of 2010/11. The outbreak of the COVID-19 pandemic was an additional shock for the global economy and the financial system in particular (Hassan et al., 2022; Batten et al., 2022; Kufel et al., 2022; Kinateder et al., 2021). At that time, the Czech economy shrank by 5.8% (WB, 2022), while the equity market grew by 30.2%. The speculative prices in the PX Index during the pandemic COVID-19 were mainly due to the excess liquidity formed in the Czech financial system. The Czech Central Bank relaxed lending activities but also gave a boost to the capital market by lowering the discount and Lombard rate (CNB, 2022). The identical speculative flow followed the Eurozone equity markets, where the European Central Bank (ECB) imposed QE measures of 1.8 trillion euros (Škare and Rochon, 2022; Škare and Sinković, 2021). Similarly, the Federal Reserve (FED) in the US confirmed once again that it is the guardian of the capital market artificial respiration (Ihrig et al., 2022). Even though the US economy was heading towards recession during COVID-19, equity markets were quickly recovering. Recently, the Russian invasion of Ukraine on February 24, 2022, placed the European capital markets into cardiac arrest (Ahmed et al., 2022) and sent Euro exchange rates into a free fall (Aliu et al., 2022). As a result of this conflict, commodity prices doubled while inflation began to accelerate quickly in the European Union (Mišík, 2022). From the investor's perspective, inflationary periods constantly raise concerns about the performance of financial instruments. On the other hand, unsustainable electricity prices accelerated enormous panic among financial investors. The empirical findings suggest that in the short run, equity stocks are not suitable anti-inflationary hedging instruments (Sellin, 2001; Kolcun and Rusek, 2018). The short-term negative relationship between stock returns and inflation is largely explained in standard macroeconomic textbooks. The inflationary periods beyond official targets, frequently go along with higher discounts and Lombard rates. In those moments, central bankers generally impose countercyclical monetary policy (raising interest rates), by smoothing the inflationary pressures and affecting stock returns (Pérez et al., 2020). The conflict in Ukraine has deteriorated inflationary issues in the Eurozone but also its growth potential. High and unsustainable inflation during this conflict brought also unemployment problems, known as stagflation. The intensity and duration of the crisis will depend on the shock that will be given to the economy and financial system in particular (Agarwal and Kimball, 2022). As this article is being written, uncertainties regarding gas supplies, electricity prices, and inflation in the EU remain in unknown territory. In addition to the macroeconomic factors and financial ones, equity stocks are as well affected by energy prices. The sharp increase in electricity prices and the expected gas shortages placed the Czech economy under scrutiny. The electricity prices are an integral part of the firm operational costs while constraining their capacity to invest. The association between electricity consumption and the uncertainties formed in the equity market is essential for the investor's positions in the marketplace (Bilan et al., 2017). We consider that this relationship is indirect where electricity prices first influence the firm's financial capacities and consequently their market prices. At that point, if the electricity prices are priced in equity stocks, it largely depends on the level of market efficiency. The stock markets in its majority consist of investors who recognize the limitations of the local environment (Kinateder et al., 2014; Choudhury et al., 2022). Thus, price changes depend on what investors foresee as a critical prospect for the domestic economy. Recognizing this fact, we have predicted the sustainability of electricity prices and PX Index for the 12 periods ahead and analyzed their causal relationship. The results are as expected, where the relationship between electricity prices and the PX Index is negative. Thus, higher electricity prices depreciate the value of equity-listed stocks listed. Meanwhile, forecasts indicate further acceleration of electricity prices in the Czech Republic while the stability period for the PX index.

In this paper, we analyze the association between the PX Index and changes in electricity prices. At the same time, our work tends to predict the performance of these two elements one year ahead. However, in the early 90s, the Czech economy was gradually transitioning to a market economy where the capital markets were non-existent. The difficult structural reforms both in the real economy and in the financial system enabled establishing capital

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markets. The early study by Vošvrda et al. (1998) show that the PX Index has gradually moved towards weak form efficiency. The inefficiency of that time was justified by regulatory deficiencies and the fact that the exchange was dominated by post-privatized firms. Many of the listed firms faced a lack of transparency and difficulty in adapting to a free market mechanism. From 1993 to 2000, the Prague Stock Exchange underwent many institutional changes but also enhanced the trading platform (Němeček and Hanousek, 2002). During that period, a considerable number of shares were transferred through the voucher scheme without respecting the listing requirements. This burdened the Czech equity market with information asymmetry and therefore influenced trading activities. The Czech Republic became part of the European Union in 2004, and from that year to 2008, the value of the PX Index doubled. This period of optimistic euphoria, Baxa (2007) describes as exaggerated expectations driven by common factors on the entire CEE exchanges. Later, Pošta (2008) analyzed the efficiency level of the PX Index by comparing it with that of the PX-GLOBAL Index. The results report that despite increased trade volume, the PX Index still stands within weak form efficiency. The equity stocks in the PX Index have continuously been detached from their intrinsic value and time to time prone to speculative issues. In this context, Aliu et al. (2020) investigated the fundamental value of firms listed on the Prague Stock Exchange based on the free cash flow allocated to investors. The results highlight that the market prices of domestic firms tend to be less speculative compared to international ones.

Sustainability of electricity prices stand as a significant part of household budgets, firms' profits, and the vitality of the entire economy. The energy sector is prone to permanent changes mostly due to geopolitical gravities, climate policies, and natural gas extractions (Brehm, 2019). These changes take place on a global scale, while investments in this field are often prone to strategic errors (Akimov and Simshauser, 2019). Small and medium-sized companies are permanent users of electricity, while corporations are considered the main ones. Therefore, higher electricity prices impose an extra burden on firms' financial performance and ultimately lower their stock prices. The economic reasoning leads us that higher electricity price dampens the market value of listed firms. The prices of equity stocks and those of electricity are subject to the market mechanism but with fundamental differences. The first is completely delivered from the market forces, while the second carries interferences from state regulators. Research on the relationship between the stock markets and electricity prices is limited. One of them is by Anwar et al. (2019) who explored the association between electricity consumption and stock market performance. Their findings could not identify any significant relationship between electricity consumption and changes in equity markets (on a related issue also Vochozka et al., 2021). The continuous supply of electricity is important not only for the country's economic growth but also for national security. Presently, the lack of sufficient diversification of energy sources is jeopardizing the entire economic prospect of the European Union (Gehring, 2022). In addition to other military risks, the dependence on Russian gas and oil is limiting their political actions as well (Vochozka et al., 2020). The CEE countries for a period were subject to a centralized system where the market was non-existent and the prices were the exclusivity of the central office. In the context of the former communist bloc, Bercu et al. (2019) declare that electricity consumption is an essential input of their economic growth and good governance. Our work used electricity prices and not consumption, since consumption trends are not always accompanied by price changes. The electricity prices partly rely on consumption level, while the rest on government regulation, competition, and the international context. In the end, changes in electricity prices are directly involved in the production costs and simultaneously on the equity stocks.

Market prices are necessary signals for investors as they efficiently orient financial recourses in the marketplace (Rowland et al., 2021). The low trade volume and the limited number of participants in the CEE exchanges are characteristic of markets with information asymmetry. Consequently, the equity stocks of the listed firms in the PX Index do not incorporate essential macroeconomic information. Aware of this problem, we analyze if the electricity prices are priced in the equity stocks of the listed firms in the PX Index. The Vector Error Correction Model (VECM) was applied to investigate this phenomenon, covering the period from 1995 to 2022. The significance of the paper increases since only one firm (such as ČEZ) maintains almost 20% of the market share within the index. Besides, it is a dominant firm in the Czech energy sector, whose profit doubled in 2022 mainly

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due to higher electricity prices. According to the Household Energy Price Index, Czech customers pay the highest electricity prices in the whole of Europe (HPI, 2022). On the other hand, the Czech Republic is one of the largest exporters of electricity in the world (Dvořák et al., 2018). The energy crisis that has gripped the European continent is unprecedented in recent decades (Bednář et al., 2022). In the meantime, the war in Ukraine has set security alarms for the EU but has also amplified the problems with gas supply. Facing these circumstances where gas and electricity prices are accelerating, forecasts are more than necessary. To this end, our work has predicted the performance and sustainability of electricity prices and the PX Index for the next 12 months. The work by Batten et al. (2022) considers that almost all investors apply out-of-sample as a forecasting tool. In our case, the Auto ARIMA and Facebook Prophet Model were used to generate these estimates. To the best knowledge, it is the first study that analyzes the influence of electricity prices on the Czech equity market. Recognizing the importance that electricity prices have for the listed firms in the PX Index, the following questions were asked.

RQ1: What is the relationship between electricity prices in the Czech Republic and the PX index?

On the other hand, the performance of the PX index and Electricity prices from June 2022 to June 2023 is too vague. The rest of the paper is structured as follows. The next section reviews the literature while the methodology is placed in section 3. The findings of this paper stand in section 4 while the concluding remarks on the fifth one.

2. Methodology

The methodology section is divided into two parts where 3.1 presents data collection while 3.2 methods are used.

2.1. Data

This work contains two objectives and for this purpose, two different methods were used. First, identify the causal relationship between changes in electricity prices and the PX index. Second, predicting the electricity prices and the performance of the PX index for the next 12 consecutive months. Figure 1 presents the performance of the PX Index and Electricity Prices (EP) in the Czech Republic from 1995 to 2022. The PX index originates from the most liquid companies listed on the Prague Stock Exchange (PSE). At the same time, the index is inefficient since prices do not reflect the macroeconomic settings and the performance of the listed companies. The weak form efficiency is limited by the low trading volume and the limited number of analysts. From 1995 to 2004, the price movements of the PX index remained almost at the same levels with minor variations. The brightest period for PX is between 2004 and 2008 when the growth was in the range of 143%. Due to financial deregulation and liberalization, the financial meltdown of 2008/09 hit the PX index hard. From September 2008 to June 2009, the index lost almost 60% of its market value. The next downturn appeared during the Greek debt crisis of 2010/11, where PX fell from 1175.2 basis points to 878.

Table 1 summarizes the descriptive statistics related to the PX index and Electricity Prices (EP) in the Czech Republic. The table indicates monthly raw data with 330 observations covering the period from January 1, 1995, to August 1, 2022. The standard deviation in the PX index is 14 times higher than for electricity prices (EP). Unlike the stock prices, a larger number of electricity contracts are futures traded, with a later delivery date, which explains the lower standard deviation. EP prices are also affected by the effective prediction of production and consumption, together with the limits of cross-border transmission networks.

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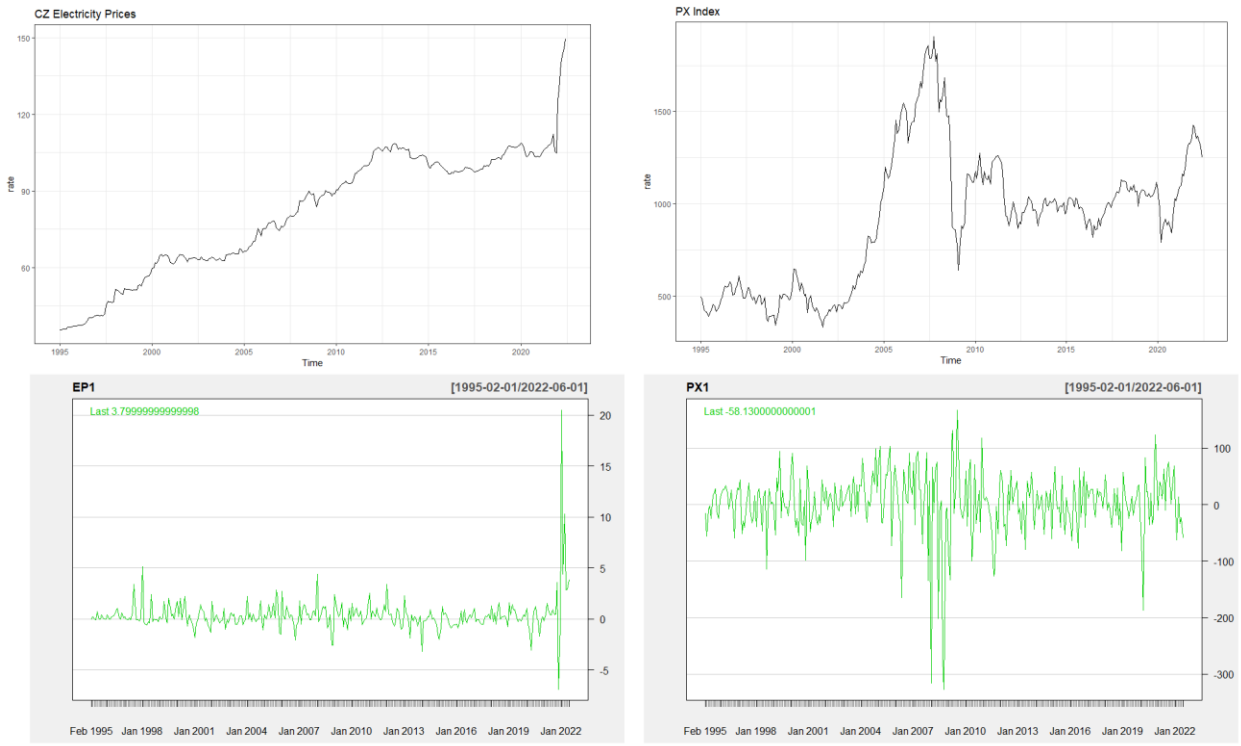


Figure 1. Indicates the Electricity Prices (EP) and performance of the PX index from January 1995 to August 2022
Source: own processing

Note: The figure 1 indicates the monthly closing prices of the PX index and Electricity Prices (EP) from January 1, 1995, to June 1, 2022. The PX Index stands as the main index of the Prague Stock Exchange (PSE) and is calculated in real-time. The index is constructed based on equity stocks of the most liquid firms, using a free floated weighted average price system. The plots are prepared in R studio using the "ggplot2" and "tidyverse" packages. The data on the other hand were collected from the Thomson Reuters Eikon database. The electricity prices are measured for wholesale customers while excluding collateral items, distribution fees, and other effects.

Table 1 indicates the descriptive statistics for the two variables used in our research, based on the raw data. For the time series to have a normal distribution, they must have a skewness of zero. We can conclude that the data are close to being symmetrical with a right light skewness for PX and a negative one for EP. On the other hand, the kurtosis should be three for the data to have a symmetric distribution. None of our data has a kurtosis of 3, where the value for EP is -0.74 while the PX stands at the level of -0.43. The maximum basis point for the PX index was 1908.3 while the minimum was 911.7. The maximum and minimum points for the PX correspond to the period before and during the financial meltdown of 2008. However, the maximum point (149.6 Kwh) of electricity prices is related to the recent European energy crisis.

Table 1. Descriptive statistics of the PX index and electricity prices in the Czech Republic.

	Dim	Mean	Median	Sd	Skewness	Kurtosis	Min	Max
EP	330	81.4	87.8	23.98	-0.20	-0.74	35.8	149.6
PX	330	911.7	956.5	367.73	0.35	-0.43	331.9	1908.3

Source: own processing

Notes: The table 1 indicates descriptive statistics with the raw data of the PX index and Electricity Prices (EP) in the Czech Republic. The table contains the number of observations (Dim), mean, maximum (Max), minimum (Min), kurtosis, standard deviation (Sd), and skewness. The summary statics was performed in the R studio with the "tseries" and "lessR" packages. The monthly data cover the period from January 1, 1995, to August 1, 2022.

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The raw data were not used to generate results from the Vector Error Correction Model (VECM) and Facebook prophet predictions. In the case of VECM, both variables are differenced (diff), while in the case of the Facebook prophet model log-transformation was used. In the construction of the VECM, it is required that the time series be stationary in the first difference. Unit root tests such as the Augmented Dickey-Fuller test, Phillip Peron test, and KPSS test, show that our data become stationary after first differencing. In the case of the Augmented Dickey-Fuller test, and the Phillip Peron test, our data (PX and EP) have a p-value smaller than 5%, while the KPSS is larger than 5%.

2.2. Methods

This section is divided into two parts, in 3.2.1. Vector Error Correction Model is analyzed, while in 3.2.2. Facebook prophet results are placed.

2.2.1. Vector Error Correction Model

The autoregressive model VAR analyzes the dynamic relationship among stationary time series variables. The VAR model is a system of equations where the endogenous variables are influenced by their lags and the lags of the other variables in the system. At the same time, the fan chart function within the VAR model is regularly used for prediction purposes. If the data are non-stationary, then differencing (diff) is usually applied to transform them into stationary. Unit root tests such as the Augmented Dickey-Fuller test, Phillip Peron test, and KPSS test are frequently used to test stationary problems. In the case of the Augmented Dickey-Fuller and Phillip Peron, the p-value must be lower than 5% while in the KPSS higher than 5%. The unrestricted VAR is a commonly used technique for assessing macroeconomic policies, financial crises, monetary shocks, etc. The formula below represents the VAR model with two endogenous variables and two autoregressive lags, known as Bivariate VAR.

$$y_t = b_1 + b_{11}y_{t-1} + b_{12}y_{t-1} + u_t \quad (1)$$
$$x_t = b_1 + b_{21}y_{t-1} + b_{22}y_{t-1} + v_t \quad (2)$$

The u_t and v_t stand for external shocks, while y_t and x_t indicate the endogenous variables in the system of equations. The VECM is a modified type of VAR model with a series that is stationary in its first differencing(diff I). As in the determination of the VAR model as well as in the VEC Model, the determination of the number of lags is important. The optimal number of lags in the R program is generated through three types of information criteria (IC). The optimal number of lags is recommended through Akaike Information Criterion (AIC), Hannan-Quin (HQ), Schwarz (SC), and Akaike Final Prediction Error (FPE). The last step before the implementation of the VECM Model is that the data must be co-integrated. The Johansen co-integration test (Engle and Granger, 1987) measures the long-term association of variables in the system. Co-integration is formed when two or more series maintain a long-run relationship. The formula for the Johansen test stands as follows.

$$y_v = A_1 x_{v-1} + e_v \quad (3)$$

Where:

$$\Delta y_v = A_1 x_{v-1} - x_{v-1} + e_v \quad (4)$$
$$= (A_1 - I)x_{v-1} + e_v \quad (5)$$

From above, the vectors within the equation are denoted by x_v and e_v while A_1 indicates the eigenvalue decomposition matrix. Based on the sequential tests, the ranking can take the form 0, 1, 2, 3, 4, 5.....n depending on the number of variables in the system. The rank of zero is considered the situation when no co-integration vector exists, one when we have one co-integration vector, and so on. In the case when we have three endogenous variables, then we can have a maximum of three co-integration vectors. For this purpose, VECM is a multiple-

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time series model where the data has a long-run stochastic trend. Finally, before testing the VECM, unrestricted VAR should be formed and the data should maintain long-run causality.

2.2.2. Facebook Prophet Package

The Facebook prophet is an open-source package generally applied to the time series variables that maintain seasonality issues. The prophet package was invented by two researchers who worked for Facebook (Taylor and Letham, 2018), currently named Meta Corporation. The foundation and the design of the prophet model stand on the specific characteristics of the Meta Corporation. The content of this algorithm consists of three core components, such as growth rate g(t), seasonality s(t), and error term ϵ_{-t}

$$y(t) = g(t) + s(t) + \epsilon_t \tag{6}$$

The g(t) indicates the trend function for the non-periodic values in the time series. On the other hand s(t), indicates the periodic changes that contain daily, weekly or monthly seasonality. The growth trend g(t) incorporates all data points that the package recognizes as "change points". The “change point” situation occurs when the series shifts direction due to particular events. The growth function in the R program can be built by choosing one of three parameters. The first is the linear growth model that involves linear equations with various slopes among changing points. Second, logistic growth for the series that are saturated and do not exceed the maximum and minimum (cap and floor). The formula for logistic growth is as follows.

$$g(t) = \frac{C(t)}{1 + x^{-k(t-m)}} \tag{7}$$

The growth trend in the logistic growth model includes carrying capacity (C) that varies as a function of time (t), growth rate (k) and offset (m). The flat trend stands as the third option in the prophet package with no growth over time but with seasonality issues. The fixed capacity (C) is always replaced with varying capacity over periods C(t). This metric justifies that innovations or unexpected events can completely change the growth trajectory. For this purpose, a trend change is incorporated by identifying the “change points” where the growth rate may alter. The changing points over time (t) are identified as s(j) and constrained with the rate (k) while completed with the adjustment rate $k+ \sum j:t>s_j$. The whole process can be summarized with a defining vector.

$$a_j(t) = \begin{cases} 1, if\ t \geq s_j \\ 0, otherwise \end{cases} \tag{8}$$

The implementation of this prophet model stands as open-source software, available in R studio and Python. The prophet package is suitable for observations with hourly, daily, weekly, or monthly frequencies. It can also cope with the lack of reasonable missing data and seasonality such as the day of the week or month of the year. The packages used for the implementation of the prophet model in R studio are "tidyverse", "prophet" and "ggplot2". (The coding process and implementation of it in the R studio are available on request).

2.2.3. Auto ARIMA Model

The Auto ARIMA package in the R program uses the algorithm developed by (Hyndman and Khandakar, 2008). The function generates trials of the unit root test, minimization of the autocorrelation function (AIC), and applies the maximum likelihood estimation (MLE). The differencing executes attempts through the KPSS test where the range could be between 0 and 2 differencing. Thus, a maximum of two differentiations can be generated to return the series to stationery. The Auto ARIMA is classified as(p,d,q), where p stands for the number of autoregressive lag, d for differencing, and q for moving average lags. Although there are opportunities for intervention in Auto

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ARIMA to increase the number of autoregressive and moving average lags. In the R program, this type of intervention is done through the commands max.P = 3, max.Q = 3. In this case autoregressive and moving average lags have increased to 3 but higher coefficients can also be set. The fitted model is the one that has the lowest number of AIC, i.e. lags that exceed the 95% confidence band. The process is repeated until the Auto ARIMA model with the lowest number of AICs is found. The process can speed up using the command approximation=FALSE or the stepwise procedure stepwise=FALSE.

3. Results

The results section is divided into two parts, where in 4.1 stands the VECM results while in 4.2 the predictions with the Facebook prophet package.

3.1. VECM eesults

The partial autocorrelation function in Figure 2 indicates part of the correlation for time series that depends on its lag values. The function plays an important role in determining the number of lags in the autoregressive model. From the figure, we can see that the first lag is significant (exceeding the 95% confidence band) in the case of PX and EP. The PACF plots in Figure 2 indicate that the VECM model might be built with one lag in the system. Although the R program automatically suggests the number of lags through information criteria. Based on the Akaike Information Criterion (AIC), Hannan-Quin (HQ), Schwarz (SC), and Akaike Final Prediction Error (FPE) require the use of one lag in the model. Therefore, the VEC Model constructed in the R program for the PX and EP has used 1 lag in the system.

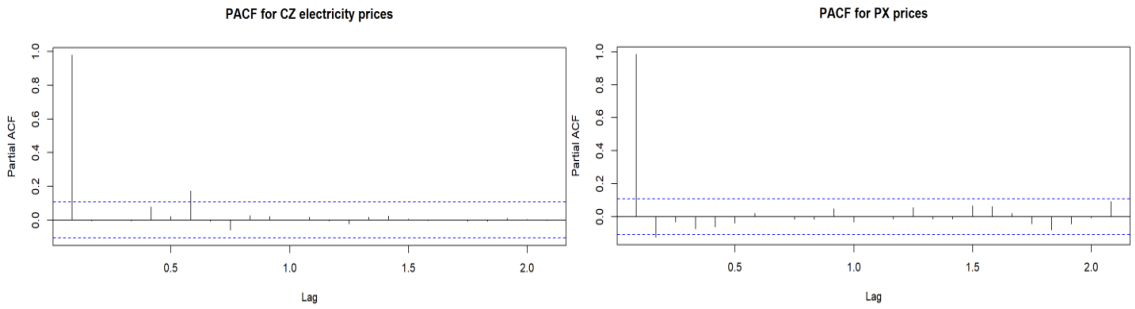


Figure 2. Partial autocorrelation function (PACF) for the electricity prices and PX index.
Source: own processing

Note: The figure 2 shows the plots of PACF function for the two variables used in our study (EP and PX). The variables are differenced (diff EP and diff PX) and cover the period from January 1995 to August 2022. The blue line represents the 95% confidence band, while the black bars stand for the number of lags.

Johansen Co-integration test in R studio was analyzed through the package "vars" and "tidyverse" while implemented through the function "ca. jo". Table 2 presents results from the Johansen test with trace statistics and maximal eigenvalue using 2 lags in the system. The test statistic is higher than the 10%, 5%, and 1% significance levels in the case of trace statistics, but also in the maximal eigenvalue. To this end, we can conclude that there exists long-run co-integration between electricity prices in the Czech Republic and the PX index. The reasons for a long-term association between EP and PX may be different, but the two are very important. First, the increase or decrease in electricity prices affects the operating costs of companies and at the same time their competitive position in the global market. As a result, the performance of listed firms can improve or weaken and this directly affects stock prices. Second, higher electricity prices put a burden on individual savings and as a result, less

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money is devoted to equity stocks. After all, high electricity prices create panic among investors and reduce their positions in the equity markets.

Table 2. Johansen Co-integration test based on trace statistics and maximal eigenvalue

Test type: trace statistic, without linear trend and constant in cointegration					
Eigenvalues (lambda):	[1] 0.314	[2] 0.245	[3] 0.000		
Values of the test statistic and critical values of test:					
	Test	**10%**	**5%**	**1%**	
r <= 1	91.96	7.52	9.24	12.97	
r = 0	215.49	17.85	19.96	24.60	
Test type: maximal eigenvalue statistic (lambda max), without linear trend and constant in cointegration					
Eigenvalues (lambda):	[1] 0.314	[2] 0.245	[3] 0.000		
Values of the test statistic and critical values of test:					
	Test	**10%**	**5%**	**1%**	
r <= 1	91.96	7.52	9.24	12.97	
r = 0	123.53	13.75	15.67	20.20	

Source: own processing

Notes: Table 2 highlights the outcomes from Johansen tests with trace statistics and maximal eigenvalue for the EP prices and PX index. The variables cover the period from January 1, 1995, to August 1, 2022. Each variable holds 329 observations based on their first differencing (diff EP, diff PX). The results are generated in R studio using the "urca", "tidyverse" and "vars" packages.

Table 3 shows the results of the VECM results linked with the electricity prices and PX index. Information criteria (AIC = 2, HQ = 2, SC = 2 and FPE = 2) suggest the using of 2 lags in the system. In this case, the formula requires the reduction of 1 lag in the model (n-1). The use of one lag makes our full sample size 329 as we lose one observation during the process. The VECM model in the R program is generated using the "tsDyn" package. Since VECM requires that the variables must possess co-integration, this is verified through the Johansen test in Table 2. The ECT findings from the VECM model confirm the long-term association between PX and EP. This indicates the correction from the disequilibrium is completed within one month. Moreover, both coefficients hold a negative sign which indicates a stable VEC Model. The situation is different in the short-run where the first lag (PX-1) does not hold short-run causality with itself but only with EP (at 10%). Alternatively, electricity prices show a negative short-run relationship with the PX index and itself at a 1% significance level. As expected, electricity prices in the Czech Republic negatively affect the equity stocks listed in the PX index.

Table 3. Results from the VECM Model

Model VECM		
Full sample size: 329	End sample size: 327	Number of variables: 2
AIC 3051.47	BIC 3085.579	SSR 1091117
Cointegrating vector (estimated by ML):		
	ECT	**Intercept**
Equation diff (PX)	-0.7507(0.0712)***	-1.2151(3.2147)
Equation diff (EP)	-0.0123(0.0022)***	0.0350(0.0998)
	PX1 -1	**EP1 -1**
Equation diff (PX)	-0.0528(0.0572)	-6.3447(1.5671)***
Equation diff (EP)	-0.0040(0.0018)*	-0.3805(0.0487)***

Source: own processing

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Notes: Table 3 highlights results from the Vector Error Correction Model for EP prices and PX index based on differenced series. The PX and EP cover the period from January 1, 1995, to August 1, 2022, standing on monthly series. The variables contain 330 observations, but one observation is lost in the system due to the use of one lag. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

3.2. Estimated Forecasts with the Facebook prophet

The forecasts with the prophet package contain two parts, where 4.2.1 are the estimates for the PX index, while 4.2.2 indicate the prediction for electricity prices.

3.2.1. The PX estimated forecasts with the prophet model

The study analyzes the impact of EP on the PX index, but also the performance of two variables in the 12 months ahead. The variables hold 330 observations and indicate the period from January 1, 1995, to August 1, 2022. The coding process of the prophet package in R studio requires that the date should be named with ds while the predicted variable with y. Figure 1 presents the forecasts and actual data for the PX index for the 12 ahead. As can be seen in the figure, the forecast starts from June 1, 2022, to June 1, 2023, using monthly observation.

The actual values are presented in black dots while the prediction is with the blue line. Based on the forecast, the PX index in the next 12 months does not have any upward or downward trend. As revealed in the figure, oscillations remain almost at the same levels. On June 1, 2022, the PX index was at the level of exp (7.13) = 1248.8 basis points. However, on June 1, 2023, is expected to be exp (7.1) = 1211.9, so for 37.2 basis points less than a year earlier. Recognizing the limitations of

this forecast, the highest point will be on September 22, 2022, when the index could reach 1881.8 basis points. Due to the low trading volume in the Prague Stock Exchange (PSE), the oscillations in the PX index are limited. The index holds four periods of downturns, one of which is the deepest (2008/09) and a clear upward trend that begins in 2004 and ends in 2008. Since the Greek debt crisis of 2010/11, the PX index has remained almost at identical levels without a marked upward or downward trend.

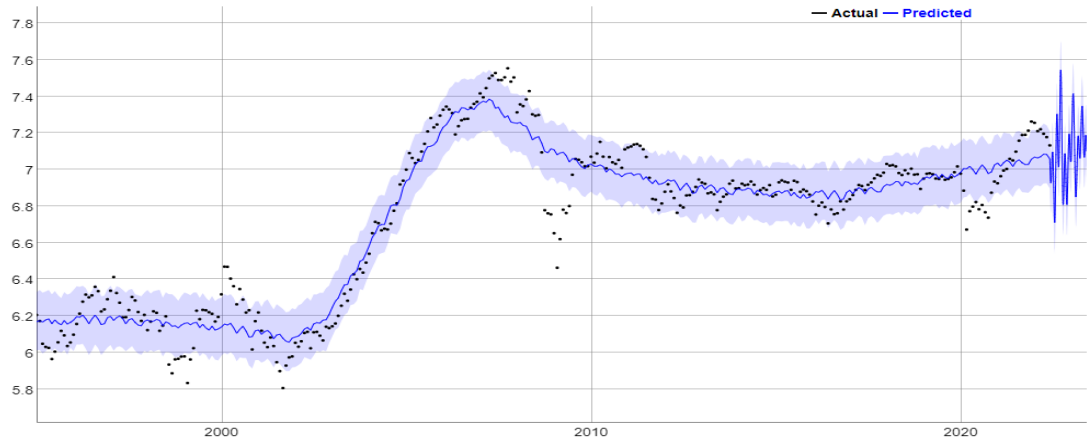


Figure 3. Presents the forecasts of the PX index for the 12 consecutive months.

Source: own processing

Note: Figure 3 plots the forecasts of the PX index from January 1995 to August 2022. The forecasts are made for the 12 months ahead from June 1, 2022, to June 1, 2023. The monthly data used for forecasting are log-transformed. Since the data contains 330 observations, forecasts for the next 12 months start from June 1, 2022. The shaded area with a violet color shows the error margin of the predicted one.

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Figure 4 is built from two components such as trend and seasonality patterns. The trend of the year reports the changes in the PX index from 1995 to 2023. Since the data are monthly, then the seasonality patterns are monthly as well. As can be seen, in spring and summer the activity of the PX index tends to decline. On the contrary, during the winter and autumn, the index tends to increase its activity. In January and September, it tends to reach its highest levels, while in August the lowest. The estimated forecasts of the PX index closing prices rely considerably on the structure of the listed companies. At the same time, these are only estimations while the future depends on many unknown events. The main uncertainty during this period is linked with the developments of the Russian-Ukraine war. The future is unpredictable since it depends on the decisions made by the market forces, government decisions, but also natural events.

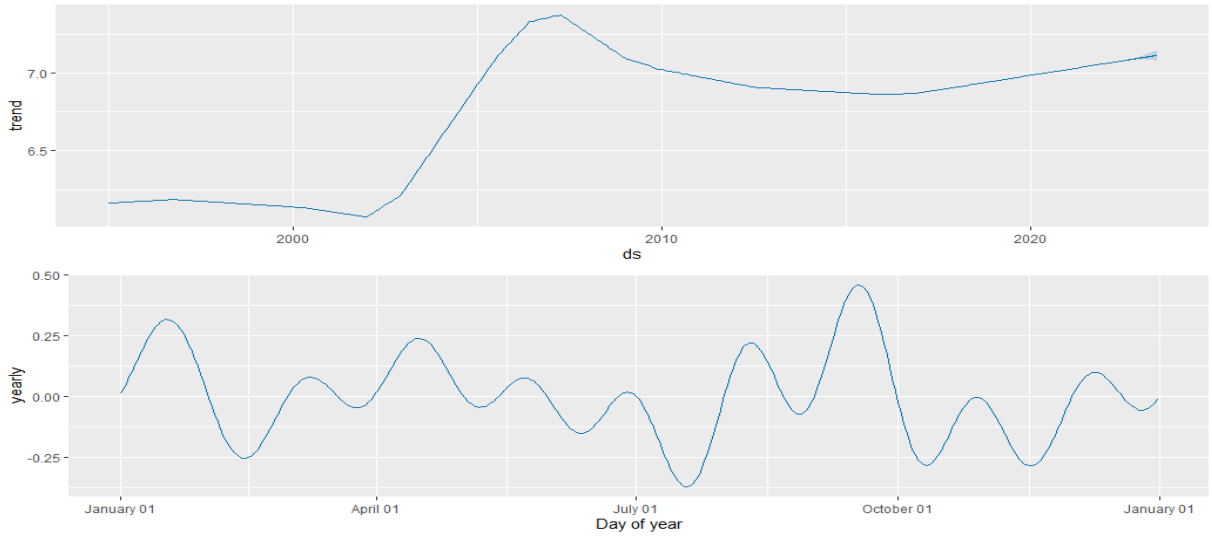


Figure 4. Presents the components of the PX index with day-of-the-year seasonality and trend patterns.

Source: own processing

Note: Figure 4 shows the seasonality issue of the PX index and the trend movements from January 1995 to August 2022. The observations present the trend and day-of-the-year seasonality with log-transformed series. Day of the year seasonality documents the periods when the PX index experiences an increase in activity, a decrease, or a stabilization period.

3.2.2. The EP forecasts using the prophet model

This section describes the estimated forecast of electricity prices in the Czech Republic for the next 12 months. The identical procedure was followed for EP prices as with the PX index. The monthly series is log-transformed indicating the period from January 1995 to June 2022. Figure 5 shows the actual data in black dots and the forecasts in the blue line, while the shaded part in violet highlights the error term. Actual data over the years show that electricity prices have been constantly rising with short periods of stabilization. The escalation period begins on September 1, 2022, until June 1, 2022, when prices jumped by 5.56%. According to prophet estimations, the electricity prices in CZ for the next 12 months indicate an increasing trend. The actual data highlight that the electricity prices on June 1 2022 were exp (5.01) = 149.9, while on June 1, 2023, are estimated to be exp (4.82) = 123.96 kilowatt-hours (kWh).

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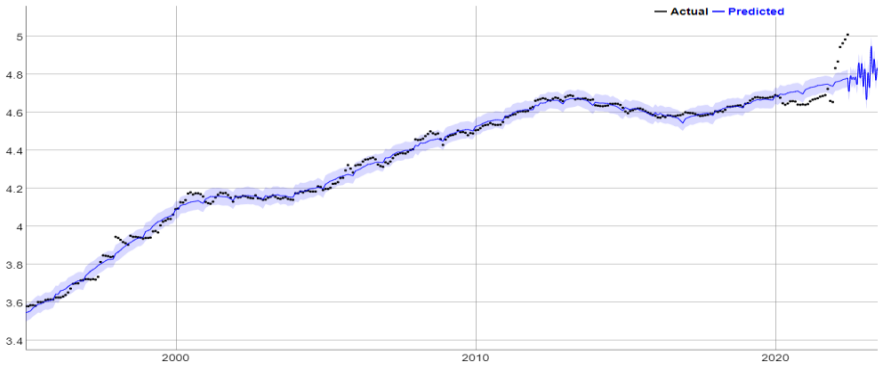


Figure 5. The prediction of electricity prices for the next 12 months with the Facebook prophet package.
Source: own processing

Note: Figure 5 indicates the forecasts for the 12 months ahead with monthly data from January 1995 to June 2023. The blue line represents the predictions, while the black dot represents the log-transformed data. The data for EP has 330 observations while the forecast for the next 12 months starts from June 1, 2022.

Figure 6 displays two related issues linked with electricity prices in the Czech Republic such as seasonality and trend. The trend of electricity prices is increasing, which is also confirmed by the estimations from the prophet package. As for monthly seasonality, electricity prices tend to increase during winter and autumn while they decline in spring and summer. Prices usually start their upswing in January and reach their peak in February and tend to fall in March. From March to June there is a downward trend, to experience a stabilization period from July to October. However, in October a slight increase, and then from December to January, there is another downturn. Electricity prices do not follow identical price patterns as equity shares. To this end, equity stocks are constructed under other intrinsic characteristics where price speculation is their main driving force. Stock prices are generally influenced by firm-specific factors and macroeconomic fundamentals, but at the same time fueled by psychological elements. The stock markets float under free fall principles where demand and supply determine their equilibrium. On the other hand, electricity prices are controlled by national regulators in addition to market forces. For this purpose, stock prices are prone to higher price instabilities compared to electric ones.

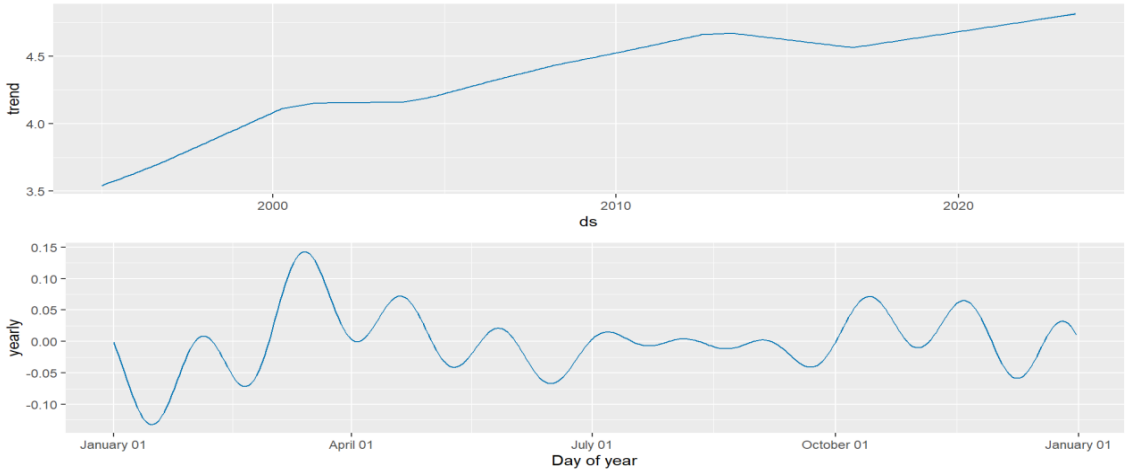


Figure 6. Indicates seasonality patterns and trend components for the Electricity Prices.
Source: own processing

Note: Figure 6 shows the components of electricity prices in the Czech Republic, such as the seasonality and trend. The observations are monthly from January 1, 1995, to June 1, 2022, where the data are log-transformed. The seasonality component is not presented daily since our observations are monthly. The data are collected from the Thomson Reuters Eikon database and processed in R through the "prophet" package.

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Figures A.1 and A.2 in the appendix highlight the deviation between actual data with the predicted ones. The red line shows the estimated forecast, while the black dots stand for the actual observations. The electricity prices in Figure A.2 display that actual data are very close to the forecasted line compared to the PX index. Thus, the estimated forecast is more accurate in the case of electricity prices than in the case of the PX index. This is also explained through the regression analysis in Table A.1 where R-square is higher for the electricity prices. For the PX index, 91.7% of the variations in the dependent variable (estimated forecast) are explained by the independent variable (actual data). In the case of electricity prices, the explanatory power stands at the level of 98.8%. The residual standard error is also lower in the case of EP (0.034) compared to the PX (0.117). Recognizing the characteristics of the two variables, we can conclude that the prediction accuracy is higher in EP than in PX.

3.2.3. Forecasting using Auto ARIMA Model

This section presents estimated forecasts with ARIMA (1,1,1) (0,0,1) [12] related to electricity prices and the PX Index. The results were generated in the R program using the "tidyverse", "forecast" and "tseries" packages. The first step was to declare the data for time series (ts) since they were in the "data. frame" format. To this end, one of the most powerful models for short-term forecasts is considered Auto ARIMA. The model is dependent on autoregressive lags (AR), integrated (I) or stationary issues of the series, and moving average lags (MA). The Auto ARIMA function automatically determines the number of autoregressive, moving average lags and solves for the unit root. In the case of electricity prices (EP), the R program suggested that the best fit model for the EP predictions is ARIMA (1,1,1) (0,0,1) [12]. The ARIMA or SARIMA model (since stands for the one seasonal moving average lag) includes one autoregressive lag, first differencing, and one moving average lag. The model fit is presented in Figure A.3 in the appendix where the model stability is defined through three plots. We can conclude that the model is stable since the data possess a white noise process, the lags are within the 95% confidence band and the histogram indicates unimodal distribution. Moreover, all the roots are within a unit circle and the results are available on request. Figure 7 shows the line of actual data and the projected one for electricity prices in the Czech Republic. As with the Facebook prophet package, the results of ARIMA (1,1,1) (0,0,1) [12] indicate an increase in electricity prices for the next 12 months. Since the forecast is for 12 periods, from 152 kWh (July 1, 2022) the electricity prices will reach the level of 171.3 kWh (July 1, 2023). In the 12 consecutive months, electricity prices in the Czech Republic will increase by 12.5%. Estimates with ARIMA predict that prices will be 152 czk/kWh on June 1, 2023, while Facebook prophet predicts a level of 123 czk/kwh. The ARIMA model predicts that electricity prices after 12 months will be 23% higher than the estimations with the Facebook prophet.

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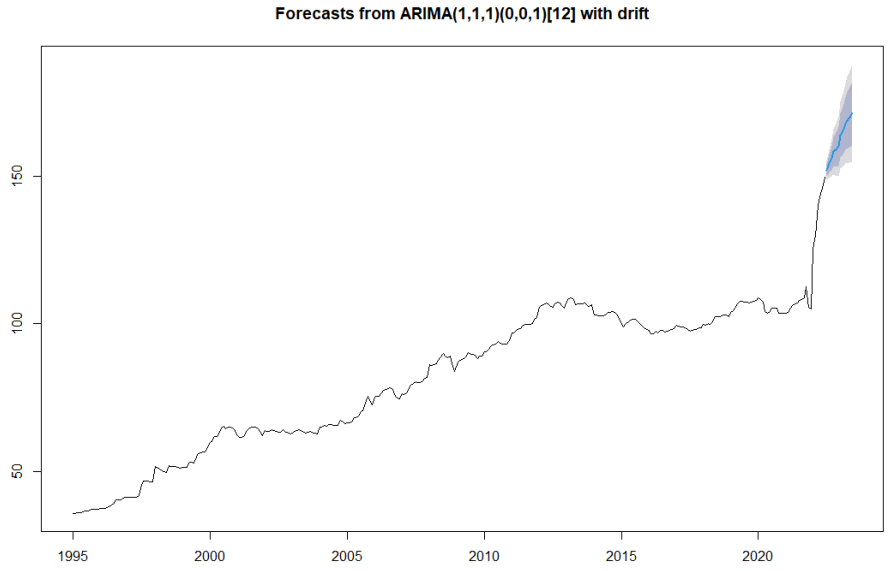


Figure 7. Estimated forecasts of electricity prices based on Auto ARIMA.

Source: own processing

Note: Figure 7 indicates estimated electricity prices for the 12 months ahead based on ARIMA (1,1,1) (0,0,1). The results of this forecast also exist in numerical form and are available on request. The forecast stand on one autoregressive lag, one moving average lag, the first differencing, and one seasonal moving average lag. The blue line represents the estimated forecasts, while the shaded area is the confidence band at 90 and 95%. The predictions start on June 1, 2022, and end on June 1, 2023.

Figure 8 presents the forecasts of ARIMA (0, 1, 1) of the PX index covering the period from January 1, 1995, to June 1, 2023. The estimations start on June 1, 2022, and end on June 1, 2023, with one moving average lag, one differencing, and no autoregressive lags. Estimations for the 12 months ahead are practically identical to those generated from the Facebook prophet. The PX index on June 1, 2023, according to ARIMA (0, 1, 1) will be in the range of 1244 basis points. The Facebook prophet predicted that on June 1, 2023, the PX index will be in the range of 1248.8 basis points. ARIMA (0,1,1) predicts that the index will be four basis points less compared to Facebook prophet estimation. Above all, both models estimate that the index will remain at almost unchanged levels.

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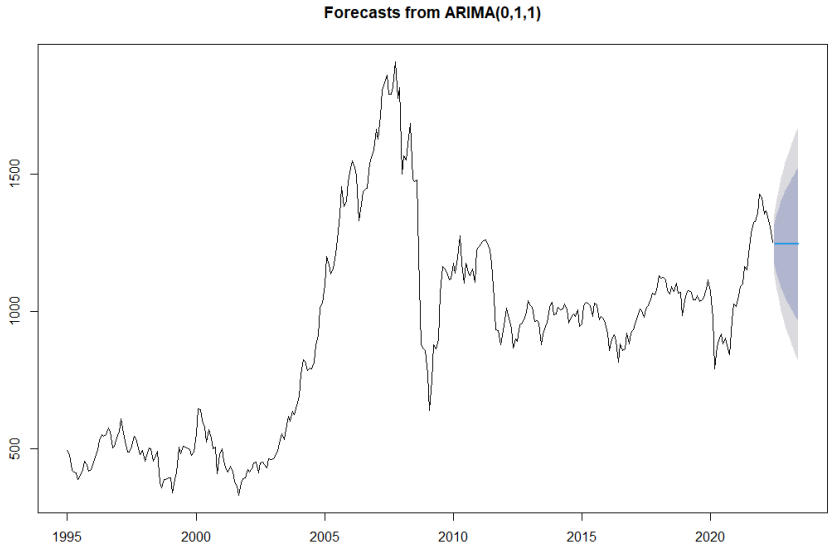


Figure 8. Estimated forecast of the PX index using ARIMA (0,1,1).

Source: own processing.

Note: Figure 8 indicated the full period for the PX index from January 1, 1995, to August 1, 2022. The data are collected from the Thomson Reuters Eikon database and processed in R with the "forecast" and "tseries" packages. The Auto ARIMA function in R has proposed ARIMA (0,1,1) where the variable has one differencing, one moving average lag, and no autoregressive lag. Numerical results of the tables for ARIMA (0,1,1) generated in R studio are available on request.

Conclusions

Sustainable electricity prices generate security for listed businesses and at the same time relax family budgets. Sustainability in this context means a regular supply of electricity but also reasonable prices. Equity markets are an important element of the financial system as they enable the efficient allocation of national savings. In the Czech Republic, banks play the primary role in financing individual consumption and national investments. The Prague Stock Exchange, from which the PX index originates, is a weak efficient form due to a limited number of analysts, low trading volume, financial literacy, market size, etc. Consequently, the market prices do not reflect all the events related to the local economy but also the international one. However, electricity prices are an integral part of the operational costs of publicly listed firms. Changes in electricity prices can improve but also harm the competitive position of firms in the marketplace. The Russian invasion of Ukraine produced unprecedented circumstances in international relations while causing serious consequences for the European economies. Since Russia declared a "special military operation in Ukraine" on February 24, 2022, electricity prices skyrocketed. Consequently, inflation in the European continent and especially in Eastern Europe experienced a continuous uptrend. This war is determining the course of the global economy, geopolitical state, and political relations among nation-states.

The results from the VECM model show that in the short-run, electricity prices negatively affect the PX index. Johansen test documents for long-term co-integration between PX and EP which is justified by the importance that electricity prices have for listed firms. The additional purpose of this paper was to forecast the electricity prices and the PX performance in the 12 consecutive months. The Facebook package predicts that electricity prices in the Czech Republic will have an upward trend until June 2023. The same phenomenon is estimated with the ARIMA model where electricity prices are higher by 23% compared to the Facebook prophet. The PX index

according to the Facebook prophet will have minor fluctuations but it will remain almost at the same levels for the next 12 months. The ARIMA model predicts almost the same results with a 4 basis point difference. As for seasonality patterns, the situation is not the same in the two analyzed series. The PX index tends to increase during winter and autumn while declining during spring and summer. On the contrary, electricity prices experience upward generally during winter and autumn while decreasing in summer and spring. The study is constrained to only one country, which limits the generalization of this phenomenon. Moreover, the investigation with daily series would provide a broader overview of the Russia-Ukraine war and other external shocks imposed on PX and EP.

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Appendix

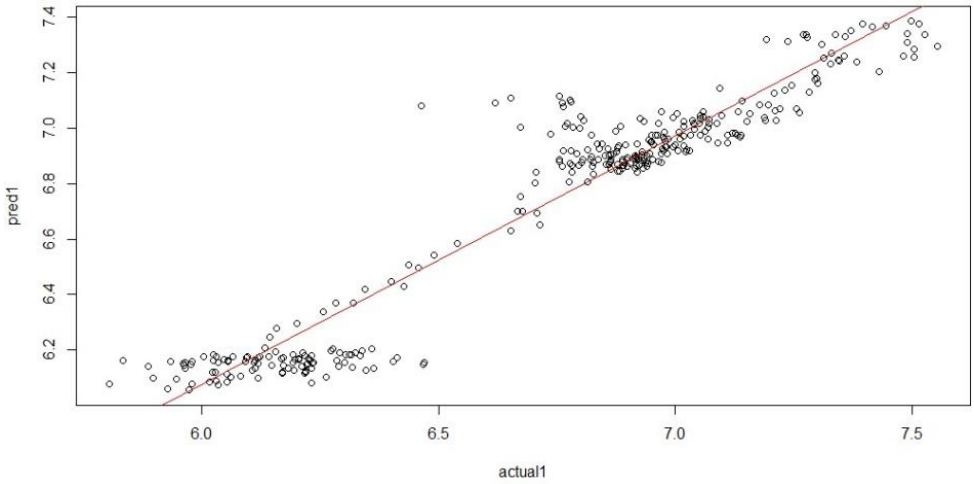


Figure A.1. Indicates the prediction line of the PX index compared with actual data.
Source: own processing

Note: Figure shows A.1. the prediction line (in red) compared to the actual data (black dots) with the linear model (lm). The data are log-transformed and represent the full-time period from January 1995 to August 2022. The results in the figure are explained through outcomes in Table A.1. (Model 1 - PX) placed in the appendix.

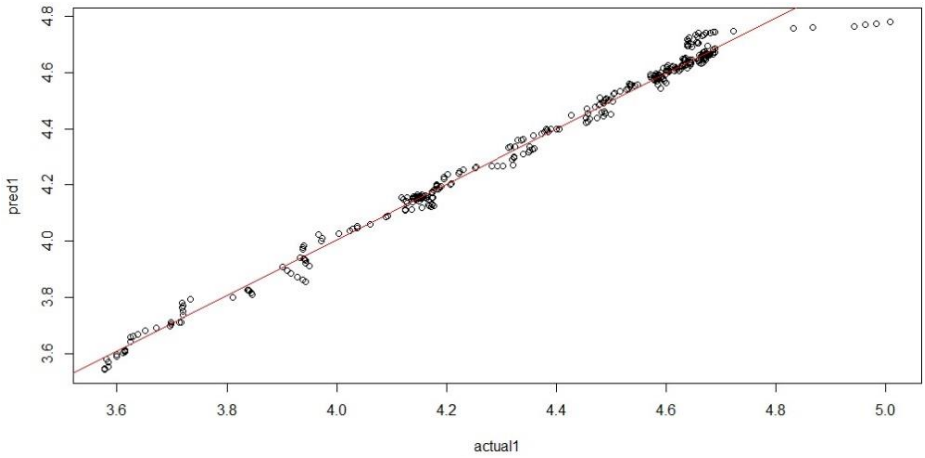


Figure A.2. Presents the forecasted line and the actual data for Electricity Prices in the Czech Republic.
Source: own processing

Note: Figure A.2. shows the prediction line (in red) and the actual data (in black) for the EP data based on the linear model. The data were collected from the Thomson Reuters Eikon database and processed in R studio through the ggplot2 package. The series are monthly and cover the period from January 1995 to August 2022.

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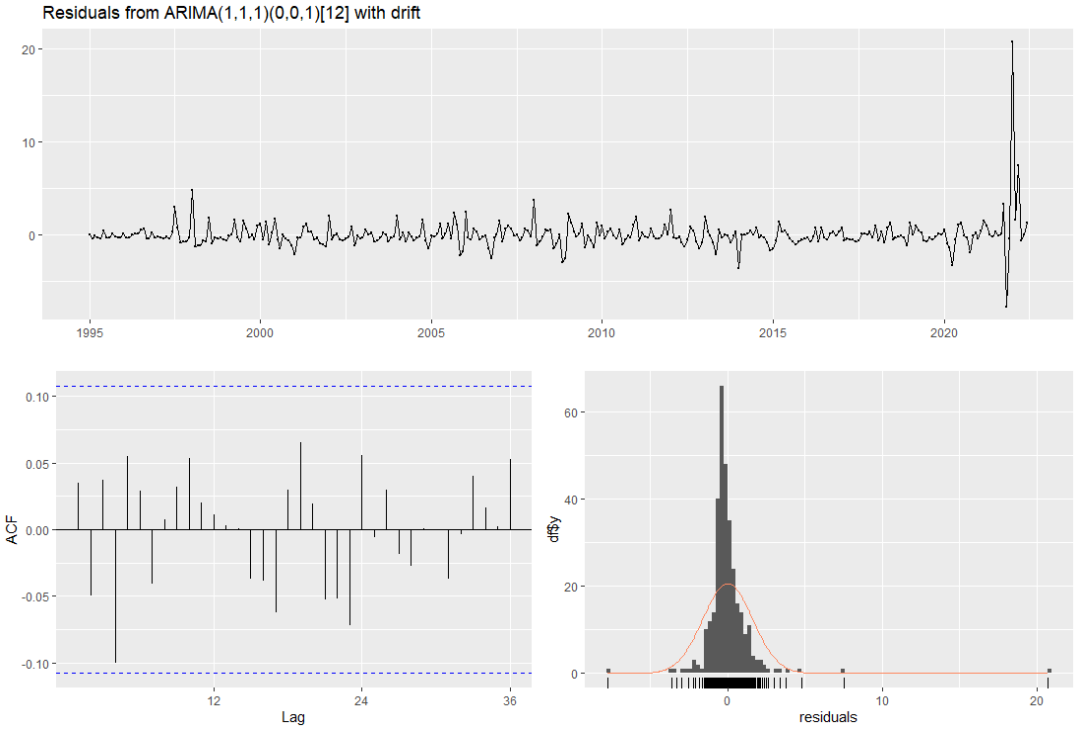


Figure A.3. The residual outcomes from the Auto ARIMA (1,1,1) (0,0,1) [12] in the case of electricity prices.
Source: own processing.

Note: Figure A.3 is composed of three EP plots indicating 1 autoregressive lag, 1 differencing, and 1 moving average lag. The fit of the model stands on the monthly series that covers the full period from January 1995 to August 2022. The residuals are close to indicating the white noise process except for the series lying in 2022. As for the Auto Correlation Function (ACF), all lags are within the 95% confidence band which indicates a stable model. The histogram shows that the residuals hold unimodal distribution and are close to being symmetrical.

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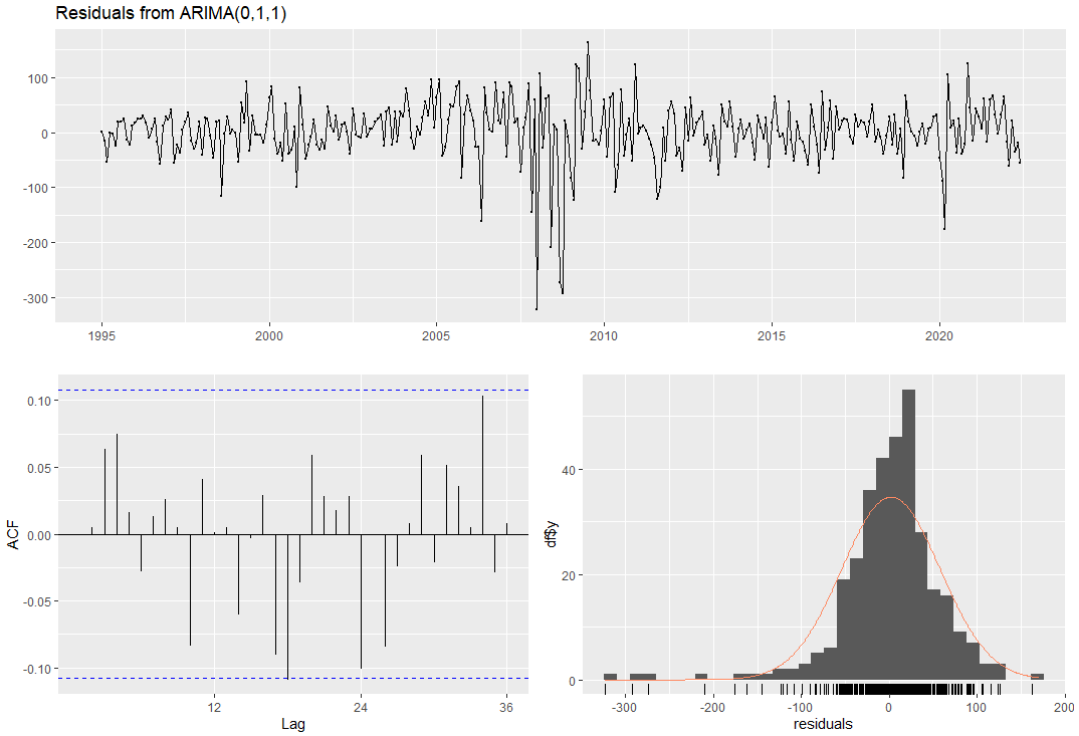


Figure A.4. Residual results for the PX index based on Auto ARIMA (0,1,1).

Source: own processing.

Note: Figure A.4 presents plots for the white noise process, the distribution of the residuals, and the autocorrelation function (ACF) for the case of the PX index. The series for the PX index contains a white noise process with exceptions during the crisis of 2008/09. The lags in the ACF plot stand within the 95% confidence band, while the histogram indicates that residuals are right-skewed.

Table A.1. Simple linear regression for the estimated predicted values and actual data in the case of PX and EP.

Coefficient (Model 1 - PX):			**Coefficient (Model 2 - EP**):		
	Estimate	**Std. Error**		**Estimate**	**Std. Error**
(Intercept)	0.69713	0.09974	(Intercept)	0.053939	0.025145
Actual (PX)	0.89636	0.01480	Actual (EP)	0.987599	0.005764
	t value	**Pr (>I t I)**		**t value**	**Pr (>I t I)**
(Intercept)	6.99	1.55e-11***	(Intercept)	2.145	0.0327*
Actual (PX)	60.85	<2e-16***	Actual (EP)	171.327	<2e-16***
Residual standard error: 0.117 on 328 degrees of freedom Multiple R-squared: 0.918, Adjusted R-squared: 0.9177 F-statistics: 3670 on 1 and 328 DF, p-value: < 2.2e-16			Residual standard error: 0.034 on 328 degrees of freedom Multiple R-squared: 0.988, Adjusted R-squared: 0.988 F-statistics: 2.935e+04 on 1 and 328 DF, p-value: < 2.2e-16		

Source: own processing.

Note: Table A.1 displays the simple linear regression for the electricity prices in the Czech Republic and the PX index. The data are long transformed and cover the full period from January 1995 to June 2022 with monthly observations. The independent variables stand for the actual data while the dependent one for estimated forecasts. The results are divided into two models (Model 1 and Model 2) where in the first model are placed regression outcomes from PX while in the second one for EP. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

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VALUATION OF INTANGIBLE ASSETS VIA APPLICATION OF THE WARA APPROACIN THE AGRICULTURAL SECTOR

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Abstract. The aim is to apply the principles of valuation of intangible assets - goodwill using the Weighted Average Return on Asset (WARA) method to enterprises in the agricultural sector in the Czech Republic in 2016-2020 agricultural sector and what is the value of goodwill of the average enterprise in the agricultural sector in the Czech Republic in the years 2016 - 2020 determined by the WARA method. The calculation is performed from data from the CRIBIS database of the company Crif - Czech Credit Bureau, s.r.o., specifically according to the classification of economic activities CZ NACE section A for the period 2016 - 2020, from which the analysis is subsequently performed. The average company in the industry is determined for the calculation. An average agricultural enterprise's goodwill is determined using the capitalised net income method and property valuation. Subsequently, the goodwill is further multiplied by the WARA percentage value, and the resulting goodwill value determined using the WARA method is determined.

Keywords: Agriculture; WARA; Weighted Average Return on Asset; intangible assets; enterprise, goodwill

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JEL codes: Q10, M21

1. Introduction

Nowadays, intangible assets form a considerable and inseparable part of the company and have become the most critical competitive advantage on a global scale. Because of its nature, it isn't easy to grasp. However, it can generate profit and increase the enterprise's value. In the balance sheet, we divide intangible assets into set-up expenses, intangible results of research and development, software, valuable rights and goodwill (Mařík, 2007), as well as emission allowances and preferential limits. But intangible assets are not just listed items; they also include, for example, product design, customer relationships or the path of goods to buyers, in other words, goodwill. Intangible goods are just as essential in business as their tangible counterpart goods. A large percentage of transactions with technical knowledge and knowledge are already represented in trade in products and services

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(Svačina, 2010). Unfortunately, the methodologies do not solve the distribution of tangible and intangible assets worldwide. However, it is significant for the company's valuation as a whole or for investors' decision-making (Kulil, 2014).

According to Svačina (2010), we distinguish three basic approaches to the valuation of intangible assets: comparative, cost and income. The third yield approach is based on the principle of economic expectation. Yield valuation methods include licensing analogy, decree method, profit share, premium methods, net present value and excess profits (Svačina, 2010). Several auxiliary methods are used to calculate the usual value of goodwill profitably. One of the methods is the difference between the purchase price of the enterprise and the sum of individually revalued individual items of the company's assets in the concept of average weighted return on assets – WARA (Kulil, 2014). Kulil (2014) further states that this method is not suitable for a complex form of risk determination for ordinary assets and cannot be used in practice.

Therefore, this work will focus on the calculation of goodwill by this method to verify whether this method is suitable for the valuation of intangible assets. The company will deal with the valuation of intangible assets using the method of average weighted return on assets – WARA in the agricultural sector in the Czech Republic in the years 2016 – 2020.

The agricultural sector belongs to the traditional sector of the national economy and comprises plant and livestock production. This sector includes about 47,000 agricultural entities that cover an area of 3.5 million hectares, of which arable land accounts for 71% (Eagri, 2021). This sector is markedly different from the others, where the soil is an indispensable means of production that does not lose its value.

The thesis aims to apply the principles of valuation of intangible assets by using the approach to the average weighted return of assets - WARA in the agricultural sector in the Czech Republic in the years 2016 – 2020. This leads to the following research questions:

VO1: How can the WARA approach be applied in the agricultural sector in the Czech Republic in 2016-2020, and is this approach suitable for the agricultural sector?

VO2: What is the value of goodwill of an average holding determined by the WARA method in the agricultural sector in the Czech Republic in the years 2016 – 2020?

2. Literary research

With the change in the economy, globalisation and the development of technology, tangibility is no longer an essential feature. Intellectual capital is an important component of corporate assets and a source of competitive advantage, including all of the company's measurable and immeasurable intangible assets (Mrazkova, 2019; Derindag et al., 2021; Belas et al., 2019). Nowadays, the economy is based mainly on knowledge, i.e., on intangible assets, which are essential for the development of the enterprise, especially from a long-term perspective (Li et al., 2019; Přívara & Rievajová, 2021) and forms a significant part of the benefit to society (Osinski et al., 2017; Přívara, 2021). Ključnikov, Mura and Sklenár (2019) point out that for SMEs, a substantial source of success is the transfer of tangible assets into intangible assets, particularly information that increases the value of the enterprise. Jiang and Zhou (2019) further elaborate that for measuring the total value of a business, the criterion is intangible assets, which the enterprise must take care of efficiently and systematically to succeed in the competition of other enterprises.

Seo and Kim (2020) found that investments in intangible assets in SMEs were mostly low and considered inefficient, and more investments were made in tangible assets. Binh, Ha and Trang (2020) also confirmed the

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positive impact of intangible assets on improving the company's performance and the significance of investing in them, such as research and development, technology, advertising and human resources, to increase the company's value in the future. These elements of intangible assets positively affect the profit and value of the company, where advertising has the greatest impact on the company's appreciation (Seo & Kim, 2020; Přívara, 2019b, 2022b). A similar perspective is also taken on this issue by Vochozka et al. (2021).

In the past, the most important source of a company was tangible assets, but today the success of a company is determined by intangible resources that are difficult to define, measure and appreciate (Petković, et al., 2020; Grumstrup et al., 2021; Gavurova et al., 2020). A similar problem the perspective of the digital transformation of the enterprise was addressed by Sun et al. (2022). Nowadays, intangible assets dominate over tangible assets and play an essential role in today's economy (Azin & Alias, 2019; Štefančík et al., 2021; Ganji & Metzker, 2021). With the contribution of the digital revolution and international entrepreneurship, it has become an intangible asset and one of the important assets for creating added value for a capital market enterprise (Fedorko et al., 2018; Cosmulese et al., 2021; Olah et al., 2021).

Gazimova et al. (2019) propose tools to increase the efficiency of using intangible assets that can be applied to business entities. Companies are aware that their performance, competitive advantage and sustainability are built on intangible assets, which is why more and more businesses are investing in them to create new products and services (Milala et al., 2021; Vorobeva & Dana, 2021; Bilan et al. 2017). Nunes et al. (2018) point out that in the 21st century, the most valuable strategic resources will no longer be physical assets but knowledge, patents and intellectual property rights – intangible assets. Glova, Dancak and Suleimenova (2018) found that a firm with higher intangible investments tends to have higher market capitalisations and investments in intangible assets are rewarded in the form of higher intangible capital. Glova, Andrejovska and Vegsoova (2022) confirmed four years later that spending on research and development and intangible fixed assets causes an increase in market capitalisation. Quirama and Sepúlveda (2018) focused on finding the appropriate value of intangible assets. Intangible assets, especially knowledge, are nowadays a competitive advantage in organisations and their growth engine. Zecca and Rastorgueva (2017) confirm that the current knowledge of the economies requires the global use of information in all aspects of modern society. A similar perspective is also taken on this issue by Vochozka et al. (2020). This is particularly important for the agricultural context, which needs modern practices for improvement and development (Zecca & Rastorgueva, 2017; Kabir, 2021).

The agri-food system in the European Union and worldwide depends on human educational, thinking and behavioural capacity, particularly on intangible assets such as market knowledge or information (Manyise & Dentoni, 2021; Přívara, 2019a). Zelisko et al. (2020) further state that the development of agricultural holdings depends on the segmentation of the ravine, the location of agricultural farm production, the creation of an effective assortment policy, the creation and implementation of the marketing of new products, the development of an effective communication policy so that marketing tools and intangible assets would have an impact on the potential of farms. Intangible assets in agriculture also include the welfare of livestock (Hoag & Lemme, 2018; Sahoo & Pradhan, 2021). Similar issues were also dealt with Rowland et al. (2021). Overall agricultural productivity growth in the EU has slowed in recent years, lagging behind the world's leading competitors. Technical inefficiency is an important phenomenon in Czech agriculture and its individual sectors. The development of agriculture should be based on scientific foundations (Stehel et al., 2019). In a knowledge-based economy, knowledge is seen as a strategic resource that helps entities become market leaders in various sectors of the economy. However, the exception is agriculture, which has been considered a low-knowledge sector for years. However, the Research of Kozera-Kowalska (2020) confirmed that farms have both sources of intellectual capital and high efficiency in their use. However, it calls for farmers to change how they see their resources.

Tahat, Ahmed and Alhadab (2018) also confirmed evidence of the role of intangible assets in improving the performance of firms, which are a major driver of wealth creation in the long term (Pan et al., 2022; Yu et al.,

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2022; Privara, 2022a; Al-Omoush et al., 2022). Goodwill and research and development impact measuring companies' financial performance and increasing their profits (Tahat et al., 2018). Pechlivanidis, Ginoglou and Barmpoutis (2022) confirmed that goodwill and intangible assets are valuable assets that give companies a competitive advantage to increase profitability and shareholder returns. In the world, the meaning of goodwill is not perceived in the same way; it is generally considered an integral part of the value of the company and its assets, especially intangible. The main question is the quantification of the current value of goodwill (Dohnal et al., 2019). Podhorska et al. (2019) also researched the identification of individual goodwill indicators, as knowledge of the critical indicators of goodwill value can contribute to its effective management and growth of the enterprise's market value. The possibilities of valuation and verification of corporate goodwill are also dealt with by Podhorska et al. (2019). A similar topic was also addressed by Novakova et al. (2022). The value of corporate goodwill is still a topical issue for the scientific community. Nowadays, there are many approaches to its valuation. There are several approaches to determining the value of intangible assets. The revenue method considers goodwill as a generator of the company's future revenue, which allows the user to orient itself to the company's future results. The use of the cost method makes it possible to consider the costs that make up the asset's value. The last approach is a substitution-based market approach (Zadorozhnyi et al., 2022). However, accounting does not reveal all the information essential for the company to make decisions, especially the intangible capital that the company creates during its activities (Atehortúa & Agudelo, 2019). To provide the fair value of intangibles, there was a need to substantiate and defend cost estimates of the capital used in the valuation of assets, including intangible assets. Pratt and Grabowski (2014) focus on intangible assets and look at the rate of return on unidentified intangible assets or goodwill by which an implied rate of return can be derived, including weighted average return on assets (WARA) (Patt & Grabowski, 2014).

Schüler (2020) deals with the valuation of intangible assets by a revenue approach. When using data from comparable companies, comparability must be reported with respect to investment risk and an estimate of the cost of equity without asset-specific leverage. Other solutions, such as WACC or the WARA approach, are critically evaluated with regard to the implied capital structure, value allocation, and adherence to the principle of market value added (Schüler, 2020). Atalay et al. (2018) will focus on the main methods used in measuring and evaluating the value of intellectual capital by considering its impact on the company's value. They demonstrate the need to develop new and innovative methods to measure and report intangible assets. In conclusion, intangible assets make the company more efficient, profitable and competitive (Streimkiene et al., 2021; Privara et al., 2018; Škare and Riberio Soriano, 2021; Škare & Porada-Rochon, 2022). All the articles of the authors agree that intangible assets are nowadays one of the main assets that generate profit; therefore it is necessary to be able to appreciate it.

3. Materials and methods

Input data for answering the research question will be taken from the CRIBIS database of Crif – Czech Credit Bureau, s.r.o., specifically according to the classification of economic activities CZ NACE Section A – agriculture, forestry, fisheries, subgroup 01 Plant and livestock production, hunting and related activities, 02 Forestry and logging, 03 Fisheries and aquaculture for the period 2016 – 2020, from which an analysis will subsequently be carried out. This set contains data on farms doing business in the Czech Republic in 2016 – 2020 and 42 620 items. These items represent individual enterprises, their primary and financial data from the balance sheet and profit and loss accounts.

For further calculations, we first determine the average holding from each year from the farm data. The data in the set will be adjusted for companies in liquidation or with a closed business and for data with a negative value in the balance sheet items for assets and liabilities and sales from the profit and loss account. The remaining data will be averaged, and a balance sheet and a profit and loss account will be compiled. This will be followed by

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calculations for determining the valuation of goodwill using the WARA method, for which it is necessary to know the yield and assets value of the enterprise from the difference of which goodwill is calculated.

The yield value of the enterprise is calculated as the ratio of permanently removable net income to the estimated interest rate. The calculated interest rate, i.e. the cost of equity, is the sum of the risk-free rate, the risk premium for business risk, the risk premium for financial hundreds and the risk premium for size. The risk-free rate will be taken from the yield of the ten-year government bond of the Czech Republic from the average for the period 2016 – 2020, which was 1.55% and was traced and from the website of the Czech National Bank (cnb, 2022). Furthermore, data will be used for risk surcharges for the agricultural sector recommended by the Ministry of Industry and Trade of the Czech Republic for 1. – 4. Q 2019 T and this data has not yet been updated by the new financial analysis of the corporate sphere. Therefore l would use the year 2019. From this analysis, a business risk premium rBELOW of 7,82 %, a financial stability risk premium rFINSTAB of 0,44 % and a risk premium for the size of the sector rLA of 0,57 % were selected (mpo, 2022). To calculate the calculated interest rate, a modular method will be used, which will be calculated:

Cost of equity (r_e) =risk-free rate (r_f) + risk premium for business risk (r_{POD}) + risk premium for financial stability ($r_{FINSATB}$) + risk premium for size ($r_{LA)}$

According to the Ministry of Finance of the Czech Republic, the predicted long-term inflation is set

at 3.2% (mfcr, 2022).

The permanently removable net revenue shall be calculated in accordance with Table 1.

Table 1. Calculation of permanently removable net revenue

Profit or loss before tax
+ write-offs
– financial income
– revenues from the sale of fixed assets
+ residual price of sold fixed assets
+ extraordinary personnel costs
– extraordinary income
+ extra costs
Adjusted profit or loss (UVH) before depreciation and tax
Chain price index
Price index basic relative to 2020
Inflation-adjusted UVH (UVH/base price index)
Libra
UVH adjusted for inflation x weights
Sum
Permanently removable net income before depreciation
Permanently removable net income before tax
Tax base (with depreciation of the last year)
Tax (19%)
Permanently removable net income after tax before correction

Source: Mařík, 2007 (own processing)

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A yield valuation of the enterprise is carried out using the capitalised net income method, considering the long-term inflation level. The income valuation of the enterprise is calculated as the ratio of permanently removable net income to the calculated interstate.

The property valuation of the enterprise will be calculated from the balance sheet from the data from the average enterprise for the period 2016 - 2020 by summing the tangible fixed assets, short-term tangible assets, inventories and financial assets. From this sum, the item liabilities will be deducted.

After the calculation of the return value of the enterprise and the property valuation, it is possible to proceed to the calculation of the value of goodwill using the WARA method.

The return on equity ROE shall be calculated:

$$ROE = \frac{profit\ after\ tax}{equity} \quad (1)$$

The required return on foreign capital will be calculated as a ratio of bank loans to interest expenses.

The calculation of intangible assets by the WARA method is carried out according to the formula:

$$WARA = r_{VK} \times \frac{VK}{K} + r_{ck} \times (1 - d) \times \frac{CK}{K} \quad (2)$$

Explanation of the formula:

r_{VK} – the required return on equity,
VK - Equity,
K – total market value of the invested capital (gross, i.e., VK + CK),
r_{ck} – the required return on foreign capital,
CK – foreign capital,
CK/K – debt ratio,
d – income tax rate.

The tax rate is 19% for legal entities pursuant to § 21 para. 2 and 3 of the Income Tax Act.

The final calculation will determine the value of the intangible asset – goodwill using the WARA coefficient, which is calculated:

Goodwill value = the value of goodwill determined on the basis of accounting data + (the value of goodwill determined on the basis of accounting data x WARA).

4. Calculations

After cleaning the data from the Cribis database for the agricultural sector, a calculation was made for the average holding, and a balance sheet and profit and loss account were compiled. From these data, the items necessary for further calculations to determine goodwill using the WARA method of average weighted return on assets were selected.

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Yield value of the enterprise

We calculate the yield value of the enterprise. The calculation of the permanently removable net yields is shown in Table 2.

Table 2. Permanently removable net income and value of the enterprise in CZK

	2016	2017	2018	2019	2020
Profit or loss before tax	**4 295 614**	**6 293 198**	**6 361 739**	**7 832 281**	**12 447 191**
(+) write-offs	519 319	353 894	92 206	159 409	63 333
(-) financial income	0	0	0	0	0
(-) revenues from the sale of fixed assets	-204 252	-155 217	-57 000	-76 864	0
(+) the residual price of the sold dl. property	865 652	649 138	743 546	840 484	2 149 462
(+) extraordinary personnel costs	0	0	0	2 000	0
(-) extraordinary income	-4 880 261	-4 119 220	-4 484 404	-5 025 006	-13 407 182
(+) extraordinary costs	1 228 739	1 052 274	1 049 407	1 328 243	2 660 957
Adjusted profit or loss before depreciation and tax	**1 824 813**	**4 074 066**	**3 705 493**	**5 060 548**	**3 913 761**
Chain price index	1,033	1,014	1,004	1,003	1,005
Price index basic as of 2020	0,974	0,988	0,992	0,995	1,000
Adjusted VH for inflation (UVH/basic price index)	**1 872 651**	**4 123 147**	**3 735 193**	**5 085 850**	**3 913 761**
Libra	1	2	3	4	5
Adjusted VH for inflation x weights	1 872 651	8 246 294	11 205 579	20 343 401	19 568 807
Sum	**61 236 733**				
Permanently removable net income before depreciation	4 082 449				
Depreciation from replacement prices	52 500 CZK				
Permanently removable net income before tax	**4 029 949**				
Tax base (with depreciation from the last year)	4 019 116				
Tax 19 %	763 632				
Permanently removable net income after tax before correction	**3 266 317**				

Source: Custom processing

The permanently removable net income after tax before the correction was set at **CZK 3,266,317**.

Calculated interest rate

Calculate the calculated interest rate (Table 3). As a risk-free yield, I used the yield of the ten-year government bond of the Czech Republic, which is in the average amount for the period 2016 – 2020 of 1.55%, and the predicted level of inflation is 3.2%. Data from the Ministry of Industry and Trade of the Czech Republic revealed a risk premium for business risk rPOD of 7.82%, a risk premium for financial stability rFINSTAB of 0.44% and a risk premium for the size of the sector rLA of 0.57%.

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Table 3. Calculation of the calculated interest rate

risk-free rate r_f	1,55 %
risk premium for business risk r_{POD}	7,82 %
risk premium for financial stability $r_{FINSTAB}$	0,44 %
risk premium for the size of the sector r_{LA}	0,57 %
calculated interest rate	**10,38 %**

Source: Custom processing

The calculated interest rate (equity costs) was set at 10,38 %.

The value of equity according to capitalised net income (KPC) was calculated as follows:
Calculated interest rate: 10.38 %
Projected inflation: 3.2%
Calculated interest rate excluding inflation: 7.18%
Operating value of equity = CZK 3,266,317/0.0,718 45,491,880
Valuation of non-operating assets CZK: 247,128
Value of equity according to KČV: 45 244 752 CZK

Property valuation

The asset valuation of the average holding, shown in Table 4, will be applied to the average balance sheet data for the agricultural sectors from 2016 to 2020. The property valuation will be determined according to the asset value of the book prices.

Table 4. Property valuation of an average enterprise

Item	Value
(+) tangible fixed assets	36 640 388 CZK
(+) Tangible assets of short duration	9 281 712 CZK
(+) Stocks	9 913 624 CZK
(+) Financial assets	921 281 CZK
(-) Accounts payable	11 688 759 CZK
Assets of the enterprise (DHM + KHM + Z + FM) - Payables	**45 068 246 CZK**

Source: Custom processing

The average enterprise in the agricultural sector in 2016 – 2020 has an asset value of **CZK 45,068,246.**

Determination of the goodwill value of an average holding in the agricultural sector

The value of goodwill is calculated as the difference between the income and assets of the enterprise.

Value of goodwill of the average holding in the agricultural sector = 45 244 752 - 45 068 246 = **176 506 CZK**

The average enterprise in the agricultural sector for the period 2016 – 2020 has **a goodwill** value **of CZK 176,506.**

Determination of goodwill for the use of the WARA method

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Calculation of the cost of equity:

Profit after tax	CZK 7,419,197
Equity	CZK 38,860,446
Cost of equity (profit after tax/equity) **0,191**	

Calculation of the cost of foreign capital

Bank loans	CZK 5,917,558
Interest expenses	CZK 716,241
Cost of external capital (bank loans/interest expense) **8,262**	

Calculation REAR

To calculate the WARA coefficient, table 5 was compiled, from which the values necessary for insertion into the formula are visible.

Table 5. WARA calculation

Pointer		Value
K	Total value of invested capital (VK + TA)	57 400 553 CZK
r vk	Required return on equity	0,191
Ic	Equity	38 860 446 CZK
VK/K	Equity/total market value of invested capital	0,677
r ck	Required return on foreign capital	8,262
d	Income tax rate	0,19
(1-d)	1 – Income tax rate	0,81
CK	Value of foreign capital	18 540 107 CZK
CK/K	Debt ratio	0,323

Source: Custom processing

The calculation was made as follows:

$$WARA = r_{VK} \times \frac{VK}{K} + r_{ck} \times (1 - d) \times \frac{CK}{K} \quad (3)$$

REAR = 0,191 x 0,677 + 8,262 x 0,81 x 0,323 = 0,129 + 2,162 = 2,291

The WARA value is 2.291% for the average holding in the agricultural sector between **2016 and 2020.**

This value represents the average weighted return on assets, which we will use next to calculate goodwill in the WARA concept:

Value of goodwill	176 506 CZK
Value of goodwill x WARA	4 044 CZK
Resulting goodwill value CZK 180,550	

The resulting value of goodwill using the WARA-weighted return on assets method for an average enterprise in the agricultural sector in the period 2016 – 2020 is CZK 180,550.

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5. The results and discussion

In this work, two research questions were set. The first question was: *How can the WARA approach be applied in the agricultural sector in the Czech Republic in 2016-2020, and is this approach suitable for the agricultural sector?*

The calculations found that the WARA approach can also be applied to the agricultural sector in the Czech Republic, and this approach is also suitable for the agricultural sector. Data from the CRIBIS database of Crif – Czech Credit Bureau, s.r.o., however, it is necessary to adjust and purify from half-discs that are not desirable for further calculations of the average weighted return on assets. For this reason, the question arises as to how relevant these data are and whether there is a distortion of the research results.

Another research question dealt with the amount of goodwill and was determined as follows: What is the goodwill value of the average enterprise determined by the WARA method in the agricultural sector in the Czech Republic in the years 2016 – 2020?

The calculations determined the value of goodwill in application to the average enterprise in the agricultural sector in the Czech Republic in the years 2016 – 2020 in the amount of CZK 176,506. This value was determined by the yield valuation method by applying capitalised net income and asset valuation. In addition, the VALUE OF WARA was calculated and this percentage of WARA of 2,291 % multiplied by the value of the above-calculated goodwill. The WARA method of average weighted return on assets was used to set goodwill of CZK 180,550.

This value is not very high and would confirm the claims of Stehela, Horák and Vochozka (2019) that technical inefficiency is an important phenomenon of Czech agriculture, which should and be based on scientific foundations. In her research, Kozera-Kowalska (2020) highlights that the economy is based on knowledge, considered a strategic resource. It notes that the exception is agriculture, considered a low-knowledge sector, although farms have intellectual capital resources and high-use efficiency. However, this presupposes that farmers will change how they see their resources. Zecca and Rastorgueva (2017) also confirm the importance of using information knowledge, especially in agriculture, where modern practices need to be used for improvement and development.

According to Zelisko et al. (2020), the development of agricultural products depends on the location of agricultural production, market segmentation, the creation and introduction of new products to the market, and the focus on effective communication policy and marketing tools. All intangible assets impact farms' potential, and farms should learn to use this potential more.

The benefit of the work can be considered the application of the method of average weighted return of assets – WARA to the agricultural sector, finding that this method is suitable for quantifying the value of goodwill by the WARA method in this sector. The benefit of the work is also the quantification of goodwill using the WARA method of the average agricultural holding in the Czech Republic for the period 2016 - 2020.

The benefit of the work is also the method of application of the WARA method because the research to calculate goodwill by this method is not sufficient, and few available resources could be more compared with other works and find out the advantages or disadvantages of applying this method.

Another proposal for research on goodwill in a given sector would be appropriate to ascertain whether the value of goodwill is equal in the division of farms in terms of size, location or legal form of business. Whether farm

goodwill is dependent on these criteria because, for example, the location of a farm is particular, and the farm is dependent on territorial and natural conditions beyond its control

6. Conclusion

The work focused on quantifying the total value of goodwill for an average holding in the agricultural sector from 2016 to 2020 using the WARA weighted average return on assets method and assessing whether this method is suitable for the agricultural sector.

The calculations determined the value of goodwill in application to the average enterprise in the agricultural sector in the Czech Republic in the years 2016 – 2020 in the amount of CZK 180,550 using the WARA method. Therefore this approach of average weighted return on assets can also be applied to the examined sector. The data for this calculation was taken from the CRIBIS database of Crif – Czech Credit Bureau, s.r.o., which, however, had to be adjusted and cleaned of undesirable items. That is why the idea was raised whether these data are suitable for further research and whether these escapes do not distort the research results.

It should be noted that the agricultural sector is significantly different from the others, as its means of production is arable land, which counts 2.5 million hectares, is dependent on natural conditions and the determination of risks is very complex according to Kulil (2014). However, the work has shown that it is possible to calculate and determine its goodwill using the WARA asset-weighted average return method. However, for a more precise determination of goodwill, I have to agree with the author, since there are many risks to the sector that are not influenced by the undertaking, such as its geographical location and, in particular, natural conditions. For further research, it would be interesting to assess agricultural holdings according to their location and influence of climatic conditions, e.g., by region or altitude, or in terms of the legal form of the entity (joint-stock company, cooperative, firm).

In response to the above, it can be noted that the objective of the work has been met. The total goodwill value of the average holding in the agricultural sector from 2016 to 2020 has been calculated using the WARA weighted average return on assets method and assessed whether this method is appropriate for the agricultural sector. Material assets nowadays are becoming an essential competitive advantage; even though they are challenging to grasp, they can generate profit and increase the value of the enterprise. It is as important in business as it is in material goods. Farms should take advantage of this advantage for intangible assets to increase their goodwill.

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VALUATION OF GOODWILL USING WEIGHTED AVERAGE RETURN ON ASSETS: ASSESSMENT OF AVERAGE TRANSPORT AND STORAGE ENTERPRISE IN THE CZECH REPUBLIC

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Abstract. The paper deals with intangible assets - the goodwill of a company and its valuation using the Weighted Average Return on Assets (WARA) method. The paper aims to determine the value of goodwill of an average enterprise in the Transport and Storage sector in the Czech Republic for the period 2016-2020 and then to consider the use and benefits of the WARA method. The data are obtained from the Cribis database of Crif - Czech Credit Bureau, s.r.o. for the period 2016 - 2020; for the paper, an average enterprise in the selected sector was selected, from which the individual items of the financial statements were defined for the preparation of the balance sheet and profit and loss statement. The difference between the income valuation of the company using the net income capitalisation method and the equity valuation was used to calculate the goodwill of the average company, which was then modified using the WARA method. The resulting goodwill value of the average enterprise in the order of hundreds of millions, on the one hand, indicates a long-standing and prosperous enterprise with a sound business name, providing quality services; on the other hand, with such a high value, a possible error in the data can be considered, as the vast data sample provided was difficult to analyse by averaging the data to define the average enterprise in the sector. Further research could be directed again towards the valuation of goodwill by the WARA method, as this research field needs to be strengthened.

Keywords: intangible assets; goodwill; WARA; weighted average return on assets; enterprise; transportation and warehousing

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JEL classification: M21, O34, R40

1. Introduction

Society is changing, and so is the competitive model. The era of innovation is dawning, where the input of intangible assets plays a decisive role in companies' long-term development. This intellectual capital largely determines the value of an enterprise (Li et al., 2019). Thus, knowledge of the critical indicators of the importance of intangible assets contributes to the effective management of the enterprise and the growth of its market value (Podhorska et al., 2019). Intangible assets create synergistic effects and are a source of sustainable enterprise value creation (Da Silva et al., 2015) and a kind of standard for measuring the comprehensive quality of an enterprise. Assuming that an enterprise wants to survive in a competitive environment, it must systematically and effectively manage its intangible assets.

The long-standing traditional notion of Chinese enterprises that "tangible assets are assets and intangible assets are not assets" has resulted in the management of intangible assets not being given sufficient

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attention by enterprise management, resulting in most enterprises currently underperforming in the operation of intangible assets (Jiang and Zhou, 2019). Based on the above, the sources of business success in almost every industry stem not only from tangible assets but mainly from the intangible components of the business.

From a valuation perspective, the components of intangible assets can include set-up expenses, software, valuable rights, intangible research and development results, goodwill, preferential limits and emission allowances (Svacina, 2010). In the current literature, there is a small amount of material containing an understanding of the value of an enterprise based on knowledge-intensive activities, i.e. the value of intangible assets. Almost wholly absent is the matter of quantifying a businss'sof the intangible components of a business using the Weighted Average Return on Assets (WARA) method, (Osinski et al., 2017). The WARA method is a method that values the goodwill of a business as the difference between the purchase price of the company and the net asset value in a weighted return concept, where the average weighted return on assets corresponds to the average weighted return on capital from the perspective of liabilities WACC (WARA = WACC) (Svačina, 2010).

The paper will focus on the valuation of intangible components of the business of Czech companies operating in the transport and warehousing sector, or goodwill itself, in an income approach, analysing the rate of return on intangible assets using the WARA method. The transport sector deals with transport, one of the most essential and pivotal activities created during the development of human civilisation (Petruf et al., 2015; Antosko et al., 2015). Modern transport is the total of all activities leading to the long-distance transport of raw materials, products and people or information, including the intangible and tangible means leading to such transport (Gavurova et al., 2021). Transport is place-specific and differentiated. Within the European countries and the Czech Republic, which are generally small in size, national transport predominates, especially road transport, which competes strongly with rail transport. The importance of air transport tends to be less important on a national scale, given the size of the territory and the variety of communication routes (Gavurova et al., 2020; Kelemen et al., 2021). However, the situation is different in countries with a large land area, such as the United States, Canada, Australia or Russia. Here, air transport is usually the most advantageous. Transport in China is quite specific. This country has the most extensive high-speed railways with a standard travel speed of 300-350 km/h. It is also intensively developing magnetic levitation trains, which should reach speeds of around 600 km/h. Maritime transport accounts for approximately 40% of the world's total transport capacity and is the dominant mode of transport for bulk cargo (e.g. oil, coal, liquefied gas).

The Panama and Suez canals, the Nile and Mississippi rivers and the large lakes on the Canada-US border are economically crucial for waterborne transport. Transport, like other economic and geographic activities, is unevenly spread throughout the world and goes hand in hand with the economic level of each country (Melnikova et al., 2016; Polischuk et al., 2019). In developed countries and countries in the affluent North, transport networks are incomparably denser than in countries with low economic levels and low development of local transport networks (Dobrylovsky, 2021).

The paper aims to express and quantify the intangible components of companies operating in the Transport and Storage sector in the Czech Republic for the period 2016–2020 in an income approach, using the WARA weighted average return on assets method. To meet the stated objective, two research questions are defined:

VO1: What is the total value of intangible assets – the goodwill of companies in the Transport and Storage sector in the Czech Republic for 2016-2020 determined using the WARA method?
VO2: Why was the WARA method chosen to express and quantify the intangible components of business intangibles in the Transport and Storage sector in the Czech Republic for the period 2016-2020 and is this method suitable for the purpose or not?

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2. Literary research

The function and importance of the transport, logistics and warehousing sector have evolved from its historical origins in antiquity to the current decade of the 21st century, which more than any previous stage in history is characterised by uncertainty and the impossibility of prediction. The importance and relevance of a given sector depend not only on the subject of the business but also on the size of the enterprise, its location, the availability of resources and the end customer. Head of Logistics Škoda Auto, a. s. Ing. J. Cee once stated concerning the role of transport, logistics and warehousing in business that "logistics is the artery of the car company and the individual processes are its blood, without which it could not live" (Jurová et al., 2016). A similar theme is also viewed by Rowland et al. (2021). In general, the transport and warehousing sector in the Czech Republic shows financial health and prospects. The process of globalisation in terms of economic and political has caused transport companies to strive to meet the highest standards of leading companies (Vochozka et al., 2016).

The economic literature is increasingly witnessing an increased interest in intangible assets, knowledge assets, intellectual capital and other related concepts. Many books, studies and articles have been written on this topic and these concepts. Still, these have not produced any consensus, and none of the published valuation methods has become the method used globally (Pastor et al., 2017). A similar theme is also viewed by Novakova et al. (2022). The perception of intangible assets by companies worldwide varies according to statistically significant factors such as geographic region, industry sector and size of the organisation (Axtle-Ortiz, 2013). The intensification of intangible asset exploitation within global value chains has created new sources of market power (Cédric & Milberg, 2020).

Ionita and Dinu (2021) state that every company should perceive the essential role of intangible assets, maintain awareness of their importance to the business and invest in the various sub-components. Thus, business managers are advised to invest in intangible assets to achieve managerial goals and strategically use three key contributors such as R&D, advertising and human capital (Seo et al., 2020; Wang et al., 2021; Škare et al., 2021; Streimkiene et al., 2021). The Vochozka et al. (2020) also dealt with a similar issue in predicting future Brent oil prices. This is the only way to ensure the long-term and sustainable development of the company. Every company has assets. These assets can be divided into tangible, intangible and financial assets. According to Krulický et al. (2020), valuing intangible assets is challenging for companies. In some cases, this obligation stems directly from the law, in the Czech Republic from Act No. 563/1991 Coll. on Accounting (Czech Republic, 1991). Valuation issues are dealt with in the field of valuation by experts for a variety of reasons (Rowland et al., 2019). The valuation of property in the Czech Republic is regulated by Act No. 151/1997 Coll. on the Valuation of Property and on Amendments to Certain Acts (the Valuation of Property Act). This Act also applies to the valuation of intangible assets (Czech Republic, 1997). Similar topics were also dealt with Sun et al. (2022).

Intangible sources of wealth creation are represented by intellectual capital (Sanchez-Segura et al., 2014). Baranes (2020) defines intangible assets from a balance sheet perspective as identifiable and non-identifiable, further arguing that identifiable intangible assets most often take the form of patents, trademarks, copyrights, licensing agreements and other forms of intellectual property and are associated with specific product line or a specific product. These assets are initially measured at a cost but at fair value on purchase and sale and are amortised over their useful lives. Unidentifiable tangible assets are generally known as 'goodwill' and are not linked to a specific product line or product (Škare & Riberio Soriano, 2021; Wang et al., 2022; Škare et al., 2022). Intangible assets are rarely valued on their own. They are usually used in conjunction with other assets, according to Pratt and Grabowski (2014), primarily as part of an existing business in the context of a group of assets. The company's reported book value does not consider investments in intangible assets. However, intangible assets can be estimated and added to the business's book value (Amenc et al., 2020). Vochozka et al. (2021) also take a similar perspective on this issue.

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According to Zéghal and Maaloul (2019), intangible assets are increasingly important in a company's capital and are becoming more important than tangible assets. According to economists, this theory expresses the transition of the current industrial economy to a new "knowledge-based" economy. As the knowledge-based economy develops rapidly, intangible assets become more valuable to enterprises, and their valuation attracts much research in the field of technology management (Chiu, 2007). Knowledge-based economies emphasise increasing the value of a company by creating a competitive advantage by putting up barriers to imitation. This advantage represents the company's intangible assets, and the importance of valuing intangible assets should already be perceived here (Hanafizadeh, Hosseinioun & Khedmatgozar, 2015). There are three approaches to the valuation of intangible assets - income, cost and market. According to Crane (2019), the income approach is based on the principle of expected economic benefits, the market approach is anchored on the principle of substitution, whereby alternatives are considered and substitutes are sought, and the cost approach is based on the principle of determining the costs incurred for a given asset. Bryan, Rafferty and Wigan (2017) note that the balance sheet has not been found to be an appropriate place to account for intangible assets, so valuation issues are left to the income statement. Since the nineteenth century, the economic phenomenon of goodwill – a particular type of intangible asset – the goodwill, prestige, brand, image, and reputation of a company has attracted the attention of economic experts, both in the field of identification and quantification (Kliestik et al., 2018). Its value is still a topical issue for the scientific community in the valuation and verification of corporate goodwill (Podhorska et al., 2019 a). Knowledge of the critical indicators of goodwill value contributes to the growth of the market value of a company and its effective management (Podhorska et al., 2019 b). According to Dohnal, Hanusová and Lipovská (2019), the value of goodwill changes over time, so it is necessary to detect its evolution from its very growth to its decline and the emergence of bad will (bad reputation). Generally, the value of goodwill is determined as the difference between book value and market price (Zadorozhnyi et al., 2018), while Goodman (2016) once stated that goodwill could not be bought; goodwill must be earned.

From an accounting perspective, goodwill is valued as a residual amount, i.e., the excess over the fair values of the net assets acquired at the acquisition date. This residual amount does not need to be separately reported in the financial statements and captures the fair value of the assets (Pratt & Grabowski, 2014). To quantify this value, goodwill must be considered in its entire context, which may be, for example, a group of assets or a business enterprise as such with the intrinsic values of identifiable intangible assets and the aggregate value of all assets of the enterprise, including non-identifiable intangible assets (e.g., purchase price or fair value). One approach that can be used to determine the value of goodwill is the Weighted Average Return on Assets (WARA) method (Schüler, 2020). According to Pratt and Grabowski (2014), this approach addresses the rate of return on unidentifiable intangible assets by comparing the weighted average return on all assets with the WACC or internal rate of return (IRR). The overall WARA calculation is then embedded in the subtraction of the fair value of the entity's identifiable assets from the fair value of the entity (e.g. purchase price).

3. Materials and methods

For the quantification of the value of intangible assets – goodwill using the Weighted Average Return on Assets (WARA) method, Czech enterprises in the Transport and Storage sector that can be classified according to the CZ NACE classification of economic activities in section "H" will be selected for the period from 2016 to 2020 (CZSO, 2022 a). The necessary financial and accounting data for the valuation will be drawn from the Cribis database from Crif – Czech Credit Bureau, s.r.o.

The actual data processing will be done by adjusting the aggregate of all data for companies that have unacceptable values in their data (negative values of assets, fixed assets, intangible fixed assets, tangible fixed assets, financial fixed assets, current assets, inventories, long-term receivables, short-term receivables, short-term financial assets, trade receivables, share capital, equity, capital funds, reserves, provisions, sales proceeds, depreciation and amortisation, proceeds from the sale of fixed assets, proceeds from the sale of materials, residual value of fixed assets sold, profit or loss after tax and undertakings in

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liquidation or inactive). The aggregate data will be further disaggregated by 2016-2020, and all available data will be averaged each year. From this disaggregated data, the financial statements of an average enterprise – balance sheet and profit and loss account - will be defined. It will then proceed to determine the values necessary for the income valuation of the average enterprise using the capitalised net income method, namely the permanently withdrawable net income, the calculated interest rate, the risk-free return, the risk premium for business risk, the risk premium for financial stability and the risk premium for enterprise size. The permanently withdrawable net return, i.e. the amount that could be withdrawn from the average undertaking without undermining the overall substance of the undertaking, will be calculated according to the following formula:

Table 1. Calculation procedure for permanently withdrawable net income

Profit before tax
(+) Depreciation
(-) Financial income
(-) Proceeds from sale of fixed assets
(+) Cost of fixed assets sold
(+) Extraordinary personnel costs - restructuring
(-) Extraordinary income
(+) Extraordinary expenses
Adjusted profit/loss before depreciation, amortisation and tax of UVH
Chained price index
Price index base year 2020
UVH adjusted for inflation (UVH/base c. index)
Scales
Inflation-adjusted UVH x weights
TOTAL
Permanently withdrawable net income before depreciation
Permanently withdrawable net income before tax
Tax base (with last year's depreciation)
Tax (19%)
Permanently withdrawable net income after tax before adjustment

Source: Mařík 2007, Own processing

The calculated interest rate for the capitalised net income method represents, in principle, the cost of equity or the return on alternative use of capital and will be determined using the modular method using data published by the Ministry of Industry and Trade of the Czech Republic according to the following formula:

Equation 1: Formula for calculating the interest rate using the modular method

$$r_e = r_f + r_{pod} + r_{finstab} + r_{la} \quad (1)$$

where:
re cost of equity
rf risk-free yield (10year government bond yield)
rpod risk premium for business risk (sector riskiness)
rfinstab risk premium for financial stability (sector riskiness)
rla risk premium for size (sector riskiness)

Source: Mařík 2007, Own Elaboration

From the investor's point of view, the risk-free return is subject to several requirements, such as minimum illiquidity risk, no risk of default, accessibility to investment, etc., which will be determined using the normal interest rate for a relatively risk-free investment customary in the country. For the valuation, according to the established practice in the Czech Republic, the development of the yield of a 10 year Czech government bond will be considered. In contrast, the interest rate of these bonds already

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incorporates all potential risks and corresponds to the local market situation. The interest rate on government bonds is based on the rating of the economy in question by internationally recognised rating agencies and the level of interest rates announced by the CNB.

Table 1. In the development of the yield of the ten-year government bond of the Czech Republic in 2020

Year	Moon	Value
2020	Following	1,62
2020	February	1,47
2020	March	1,28
2020	April	1,28
2020	May	0,92
2020	June	0,86
2020	July	0,86
2020	August	0,95
2020	September	0,98
2020	October	0,94
2020	October	1,12
2020	December	1,26

Source: Kurzy.cz 2022, Own processing

The risk premium for business risk expresses the riskiness of a given sector in relation to other sectors of the economy. It is determined on the website of the Ministry of Industry and Trade of the Czech Republic according to the sector of activity of the enterprise. In this case, it will be determined by the Transport and Storage sector, classified according to the CZ NACE classification of economic activities in section "H", for Q1-Q4 2019 under the financial analyses for 2019. The risk premium for financial stability and the risk premium for size will be determined identically by searching by the sector on the website of the Ministry of Industry and Trade of the Czech Republic (MIT, 2022).

Then, an income valuation of the average company will be carried out using the capitalised net income method, taking into account the deduction of the long-term inflation rate, which is 2% according to the CNB (CNB, 2022). The income valuation will be based on the following formula, with the necessary values of the permanently withdrawable net income and the calculated interest rate determined above:

Equation 1: The formula for calculating the yield value of the enterprise

$$HP = \frac{T\check{C}V}{ik} \quad (2)$$

where:
HP Enterprise Value
TCH permanently removable net income
and the calculated interest rate

Source: Mařík 2007, Own processing

Next, based on the accounting data from the 2020 balance sheet, the company's assets will be valued by adding up the items of tangible fixed assets, current tangible assets, inventories and financial assets and deducting the liabilities from the sum of these items.

The value of goodwill will be determined as of 31 December 2020 as the difference between the enterprise value determined by the income approach and the enterprise value determined by the equity valuation of the business.

The values necessary for calculating the weighted average return on assets, the 'WARA', the return on equity and the required return on equity will then be determined, and the values for the necessary

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calculations will be entered in separate tables. The required ROE (Return on Equity) will be determined according to the following formula:

Equation 2: Formula for calculating the required return on equity called ROE

$$ROE = \frac{\text{profit after tax}}{\text{equity}} \quad (3)$$

Source: Mařík 2007, Own processing

The required return on foreign capital will be determined using the following formula:

Equation 3: Formula for calculating the required return on foreign capital

$$rCK = \frac{bank\ loans}{interest\ expense} \quad (4)$$

Source: Mařík 2007, Own processing

This will be followed by the compilation of a table in which the data needed to calculate the average weighted return on WARA assets according to the following formula will be entered:

$$WARA = r_{VK} * \frac{VK}{K} + r_{CK} * (1 - d) * \frac{CK}{K} \quad (5)$$

where:

rVK	required return on equity
VK	equity
K	the total value of invested capital (gross, i.e. VC + CK)
rCK	required return on external capital
d	income tax rate (19 %)
CK	foreign capital
CK/K	debt ratio

Source: Mařík 2007, Own elaboration

Finally, a table will be drawn up presenting the value of goodwill determined on the basis of accounting data by the difference between the income and equity valuation of the average company, the value of goodwill determined using the calculated WARA coefficient and the resulting value of goodwill according to the following formula:

Equation 4: The formula for calculating the value of intangible assets – goodwill

*+/- Goodwill value = Goodwill value determined on the basis of accounting data + (Goodwill value determined on the basis of accounting data * WARA)*

Source: Mařík 2007, own processing

4. Results

First, an analysis of all financial data available from the Cribis database was carried out. This data was adjusted for companies with unacceptable values in their data (negative values for assets, fixed assets, intangible fixed assets, tangible fixed assets, financial fixed assets, current assets, inventories, long-term receivables, short-term receivables, short-term financial assets, trade receivables, share capital, equity, capital funds, reserves, provisions, sales proceeds, depreciation and amortisation, proceeds from the sale of fixed assets, proceeds from the sale of materials, residual value of fixed assets sold, profit or loss after tax and undertakings in liquidation). The aggregate of the remaining data was then broken down by each year from 2016 to 2020, and all available data were averaged in each year. From this disaggregated data, the financial statements – balance sheet and profit and loss account – were defined.

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1) Income valuation of the average company using the capitalised net income method

In view of the need to determine the values necessary for the income valuation of the average enterprise using the capitalised net income method, namely, the permanently withdrawable net income, the calculated interest rate, the risk-free return, the risk premium for business risk, the risk premium for financial stability and the risk premium for enterprise size, the following values were calculated in stages. The permanently removable net income was calculated according to Table 1 of the methodology.
The results are shown in Table 3.

Table 2. Calculation of permanently removable net income (CZK thousand)

Period	2016	2017	2018	2019	2020
Profit or loss before tax	2 986	6 005	8 352	8 322	10 194
(+) Copies	167	401	166	313	150
(-) Financial income	0	0	0	0	0
(-) Revenues from the sale of fixed assets	145	148	15	101	19
(+) Remaining price of sold fixed assets	111	125	18	34	56
(+) Extraordinary personnel costs - restructuring	0	0	0	0	0
(-) Extraordinary income	0	0	0	0	0
(+) Extraordinary costs	0	0	0	0	0
Adjusted result of UVH before depreciation and tax	3 119	6 383	8 521	8 568	10 381
Chain price index	1,019	1,033	1,014	1,004	1,003
Price index basic relative to 2020	0,948	0,979	0,993	0,997	1,000
Inflation-adjusted UVH (UVH/basic c. index)	3 290	6 520	8 581	8 594	10 381
Libra	1	2	3	4	5
INFLATION ADJUSTED UVH * Weights	3 290	13 040	25 743	34 376	51 905
SUM	128 354				
Permanently removable net income before depreciation (SUM/15 – sum of weights)	8 557				
Permanently removable net income before tax	8 557				
Tax base (with depreciation from the last year in the amount of 151 thousand.)	8 708				
Tax (19%)	1 655				
Permanently removable net income after tax before correction	7 053				

Source: data from Cribis database, Own processing

The chained price index was determined according to the rule 1 + inflation rate for each year 2011–2015/100 (for 2016 the inflation rate for 2011 - 1.9%, for 2017 the inflation rate for 2012 - 3.3%, for 2018 the inflation rate for 2013 - 1.4%, for 2019 the inflation rate for 2014 - 0.4% and for 2020 the inflation rate for 2015 - 0.3%) of the inflation rate for each year (CZSO, 2022b).
The 2020-based price index was determined as follows:

2016 = 1/(1,033 * 1,014 * 1,004 * 1,003) = 0,948
2017 = 1/(1,014 * 1,004 * 1,003) = 0,979
2018 = 1/(1,004 * 1,003) = 0,993
2019 = 1/(1,003) = 0,997
2020 = 1,000

According to the profit and loss account, depreciation from the last year amounted to CZK 151 thousand. CZK. The amount of permanently deductible net income after tax was determined at CZK 7,053 thousand. CZK. This fact confirms the fulfilment of the going concern principle.

In order to determine the enterprise value, the calculated interest rate (cost of equity) was calculated in accordance with Equation 1 of the methodology.

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With regard to the formula for calculating the calculated interest rate, the risk-free yield was first determined using the normal interest rate for a relatively risk-free investment in a given country. In contrast, for the valuation, the development of the yield on the 10-year Czech government bond in 2020 was considered. According to Table 2 of the methodology, the yield of the 10-year Czech government bond in 2020 ranged from 0.92% to 1.62%. Due to the valuation date, the yield of the 10-year government bond for December 2020 will be considered at 1.26%.

To calculate the interest rate using the modular method, the amount of the risk premium for the business risk was also determined based on the field of activity of the company under assessment, the Transport and Storage sector, classified according to the CZ NACE classification of economic activities in section 'H', for the 1st to 4th quarters of the year. The risk premium for the financial stability of 1.95% and the risk premium for enterprise size of 0.28% (see Table 4) were found in the same way on the website of the Ministry of Industry and Trade of the Czech Republic (MIT, 2022).

Table 3. Calculation of the calculated interest rate (cost of equity)

R_f – risk-free rate	1,26 %
R_{pod} – Risk premium for business risk	2,65 %
$R_{finstab}$ – Risk premium for financial stability	1,95 %
R_{la} — Risk premium for the size of the enterprise	0,28 %
Calculated interest rate	6,14 %

Source: Ministry of Industry and Trade 2022, Own processing

The calculated interest rate was set at 6.14%.

On the basis of the determination of the necessary values, it was at this stage possible to proceed to the actual income valuation of the average company using the capitalised net income method.

The value of the average enterprise determined using the net income capitalisation method was thus determined in accordance with Equation 2 of the methodology, with the interest rate calculated at constant prices and the assumed long-term target inflation rate set at 2 % according to the CNB. Table 5 shows the calculation of the equity value of the average company using the net income capitalisation method.

Table 4. Calculation of the value of the equity of an average enterprise using the net income capitalisation method

Calculated interest rate (r_e)	6,14 %
Projected long-term inflation	2,0 %
Calculated interest rate (r_e excluding inflation)	4,14 %
Operating value of equity (permanently removable net income/calculated interest rate excluding inflation)	CZK 170 362K
Valuation of non-operating assets	CZK 815K
Value of equity according to KČV	CZK 171 177K

Source: Data from the Cribis database, own processing

The calculated interest rate of 6.14% was reduced by the assumed long-term inflation target of 2%. The operating value of equity was determined by the proportion of the value of the permanently withdrawable net income after tax of EUR 7 053 thousand. The operating value of equity thus amounts to CZK 170 362 thousand, i.e. a value of 4,14 %. CZK. The value of non-operating assets (tangible fixed assets in progress, long-term securities) amounts to CZK 815 thousand. CZK. The value of the average enterprise determined by the income method of capitalised net income amounts to CZK 171 177 thousand.

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2) Asset valuation of the average company

To determine the goodwill value of the average business, a property valuation of the business was subsequently performed using data from the 2020 balance sheet by summing the items of tangible fixed assets, current tangible assets, inventories and financial assets. From the sum of these assets, the liability item was deducted. Thus, on the basis of the book value, the asset value of the undertaking was determined. The selected items and the calculation result are presented in Table 6.

Table 5. Property valuation of an average holding

Item	Value (CZK thousand)
(+) Tangible fixed assets	17 559
(+) Tangible assets of short duration	27 899
(+) Stocks	5 507
(+) Financial assets	786
(-) Accounts payable	21 905
Calculation of the assets of the enterprise	
(DHM+KHM+Z+FM) – Payables	29 846

Source: Data from the Cribis database, own processing

By summing up all assets that are used for the operation of business activities and subtracting the item of liabilities, the m and property value of the average enterprise was determined by the amount of **CZK 29,846,000**.

3) Determination of the goodwill value of an average holding

The value of goodwill was determined from the point of view of accounting as the difference between the yield value of an average enterprise and its asset value.
The value of goodwill of an average company = CZK 171,177,000 – CZK 29,846,000 = CZK 141,331,000.
The value of goodwill amounted to CZK 141,331,000 as of **31.12.2020.**

4) Determination of goodwill by the WARA method

With regard to the values required by the WARA calculation formula, the cost of equity was calculated according to Equation 3, and the cost of foreign capital was calculated according to Equation 4. The cost of equity was determined by the ratio of profit after tax to equity to the average enterprise. Cost of equity is presented in Table 7. The cost of foreign capital was determined by the ratio of bank loans to interest expenses. The cost of foreign capital is presented in Table 8.

Table 6. Calculation of the cost of equity

Item	Value (CZK thousand)
Profit after tax	7 103
Equity	28 841
Cost of equity (%)	
Profit after tax/equity	0,246

Source: Data from the Cribis database, own processing

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Table 7. Calculation of the cost of foreign capital

Item	Value (CZK thousand)
Bank loans	960
Interest expense	173
Cost of foreign capital (%)	
Bank loans/interest expenses	5,549

Source: Data from the Cribis database, own processing

In order to determine the WARA coefficient, Table 9 was drawn up, containing all the values necessary for the calculation, namely the total value of the invested capital, the required return on equity, equity, the equity ratio/total market value of the invested capital, the required return on foreign capital, the income tax rate, the value of the foreign capital and the level of indebtedness.

Table 8. Calculation of WARA – intangible components of business in the transport and storage sector within the Czech Republic for the period 2016 – 2020

Pointer		Value
K	Total value of invested capital (brutto, i.e. VK + CK)	52 292 thousand CZK
rVK	Required return on equity	0,246
Ic	Equity	28 841 thousand CZK
VK/K	Equity/total market value of invested capital	0,551
rCK	Required return on foreign capital	5,549
d	Income tax rate	0,19
(1 – d)	1 – Income tax rate	0,81
CK	Value of foreign capital	23 452 thousand CZK
CK/K	Debt ratio	0,448

Source: Cribis database, own processing

The calculation was constructed according to Equation 5 given in the methodological section as follows:

$$WARA = r_{VK} * \frac{VK}{K} + r_{CK} * (1-d) * \frac{CK}{K} = 0{,}246 * \frac{28\,841}{52\,292} + 5{,}549 * (1-0{,}19) * \frac{23\,452}{52\,292}$$
$$= 0{,}246 * 0{,}55153 + 5{,}549 * 0{,}81 * 0{,}44848 = 0{,}13568 + 2{,}01578 = \mathbf{2{,}15}$$

The resulting WARA value is 2.15% as of 31.12.2020**.** This value represents the average weighted return on assets, which will be further applied throughout the concept of calculation, based on the calculation from the point of view of accounting, and the resulting values will be multiplied by the value of WARA, as presented in Table 10.

Table 9. Calculation of goodwill in the WARA concept

Pointer	Value (in thousands CZK)
Goodwill value	141 331
Hodnota goodwill x WARA	3 039
Resulting goodwill value	144 370

Source: Cribis database, own processing

The value of goodwill was determined by the WARA weighted return method as of 31.12.2020 at the amount of **CZK 144,370,000.**

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5. Discussion of results

The results were intended to answer two research questions, namely:

VO1: What is the total value of intangible assets – the goodwill of companies in the Transport and Storage sector in the Czech Republic for 2016–2020 determined by the WARA method?

VO2: Why was the WARA method chosen to express and quantify the intangible components of business intangibles in the Transport and Storage sector in the Czech Republic for the period 2016-2020 and is this method suitable for the purpose or not?

The research question under consideration is "Which items (segments) predominantly comprise the intangible assets of enterprises in the transport and storage sector in the Czech Republic for the period 2016-2020?" was finally not included in the conducted research due to the extensiveness of the given matter, which will be the subject of further separate research.

The processed data was used to define the book value of goodwill of an average enterprise as of 31.12.2020 using an income valuation using the capitalised net profits method and an equity valuation of CZK 141 331 000. A subsequent calculation was used to determine the WARA percentage. By multiplying this value by the defined carrying amount of goodwill, an amount of CZK 3 039 000 was determined and added to the carrying amount of goodwill. The resulting value of goodwill of the average Czech company in the Transport and Storage sector for the period 2016-2020, determined using the WARA method, was set at CZK 144 370 000. The resulting value can be assessed as being very, if not disproportionately, high. This fact indicates a long-established and prosperous company with a good business name. However, because of the disproportionate value, a possible data error can also be inferred. The data sample provided was so broad that it was difficult to analyse it based on averaging the data to define an average undertaking in the Transport and Storage sector. However, this assumption cannot be substantially confirmed or refuted. However, the accuracy of the result depends not only on the quantity and quality of the data provided by the evaluator on a particular undertaking, but also on the possibility of predicting the evolution of the market economy.

Because of the above, however, one cannot disagree with the assertion of Vochozka, Rowland and Vrbka (2016), who conclude that the transport and storage sector in the Czech Republic shows financial health and prospects. Regarding the second research question, it can be stated that the WARA method was chosen to express the intangible components of business - goodwill in the Transportation and Warehousing sector within the Czech Republic in order to strengthen the research in the field of intangible asset valuation using the Weighted Average Return on Assets concept method, as it can be stated that scientific research has not been sufficiently focused on this method to date. There is only a limited amount of published material dealing with this method. The WARA method can be found to be appropriate for the purpose of valuation of intangible assets – goodwill, in particular, because of the summarisation and comprehensiveness of the overview of accounting data needed for its calculation.

6. Contribution of the work

The contribution of the thesis can be generally considered as pointing out the importance of intangible assets in the field of ongoing intense competition in all industries around the world with the aim of realising the value of intangible assets and the necessity of increasing it by investing in intangible assets already owned, but also in their acquisition. A company's goodwill expresses the economic individuality of the entity, its activities and products, and is, above all, about the company's reputation. In terms of the evolution of the value of goodwill, unlike other types of intangible assets, its value increases over time. The longer the existence of an enterprise, the higher the value of its goodwill due to its increasing credibility. Last but not least, the value of goodwill as such can also be considered as a benefit, as its value is not derived from accounting, but knowing its value can not only in the transport and storage sector,

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influence the behaviour of shareholders, managers, but also potential investors, as a high goodwill value signals a long-running and prosperous company with a good reputation for providing quality services.

The paper can also be considered a contribution of the work dealing with the valuation of intangible assets using the weighted average return on assets method, the so-called WARA, as this area has not been intensively researched until now and is faced with very few available resources. Further research could again be directed towards the valuation of goodwill using the WARA method, as there is a need to strengthen this research field. Furthermore, the segments that predominantly comprise the intangible assets of companies in the Transport and Storage sector could be specified. Finally, it should be added that future research should consider the economic impact of the Covid-19 pandemic in 2020-2022 and the ongoing war of Russia against Ukraine in 2022. Furthermore, the research results can be the basis for further study in the sector.

7. Conclusion

The paper aimed to express and quantify the total value of intangible assets – the goodwill of an average company in the Transport and Warehousing sector in the Czech Republic for the period 2016-2020 using the weighted average return on assets WARA method, including the reason and appropriateness of using the WARA method in this case.

By processing and modifying the data set from the Cribis database of the Czech Credit Bureau, s.r.o., the provided data was cleaned of unacceptable values, averaged and followed by the preparation of the financial statements – balance sheet and profit and loss statement for the average enterprise. Subsequently, it proceeded to determine and define the values required for calculating the income valuation of the assets of the average enterprise using the capitalised net income method, the property valuation and the WARA value calculation. After obtaining all the necessary information and values, according to the procedure defined by the methodology of this work, the value of goodwill of an average enterprise in the Transport and Storage sector for the period 2016-2020 was determined by the WARA method in the amount of CZK 144 370 000. The resulting high value of goodwill of an average enterprise, on the one hand, indicates a long-running and prosperous enterprise with a sound business name providing quality services; on the other hand, with such a high value, a possible error in the data can be considered, as the provided extensive data sample was difficult to analyse based on averaging the data to define an average enterprise in the sector. The research has shown that to successfully determine the goodwill value of an enterprise, a reasonable and adequate amount of data is needed to achieve a more accurate research result.

In general, the thesis's contribution highlights the importance of intangible assets in the field of intense competition in all industries worldwide, pointing out the necessity of investing in acquiring and maintaining these assets. Another contribution is the quantification of the value of goodwill itself for knowledge of its value by managers, shareholders and investors. Another contribution of the paper is using the weighted average return on assets method, called WARA, due to the need for more research and the scarcity of available resources on this matter. In future research on applying the WARA method to the valuation of corporate goodwill, it would be appropriate to consider the economic impact of the Covid-19 pandemic in 2020-2022 and the ongoing war of Russia against Ukraine in 2022. Given the above, it can be concluded that the objective of the thesis has been met.

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MAPPING LITHUANIAN TRANSITION TOWARDS SUSTAINABLE ENERGY: SOCIOLOGICAL ACCOUNT ON A WASTE-TO-ENERGY CASE*

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Abstract. Energy production technologies have become closer to people's everyday life. Therefore, its social acceptability and scale of spread play a significant role in moving towards a climate-neutral society. A growing body of academic literature shows that social aspects are becoming more central in the transition process. The study's novelty derives from the conceptual framework for analyzing the possible social challenges of the transition and from empirical data that contributes to a more thorough understanding of the direction of the transition and practical opportunities identified by the experts. This article explores expert opinions of Lithuanian readiness to transit towards sustainable energy by analyzing the applicability of Waste to Energy (WtE) and further development in Lithuania. The transition and social acceptability are discussed in three dimensions (socio-political, communal and market). The paper is based on qualitative research conducted at the end of 2021 and the beginning of 2022. Among other discoveries, the study revealed that the majority of experts tend to support WtE input for the Lithuanian transition towards a sustainable energy sector but indicated that some better public awareness, as well as the justified and transparent mechanism of WtE implementation (to correspond with public interest), are needed.

Keywords: sustainable transition; energy sector; waste-to-energy; expert; Lithuania

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1. Introduction

The relationship between energy and the economy in the contemporary world is interdependent. In modern times, energy served as a fundamental driver of human history and has shaped world economics, politics, and even the social structures of human life (Ang et al., 2015). The transition toward sustainable energy will be another big step. A well-functioning and consistent energy sector performance is especially crucial in such a small country as Lithuania. Lithuania inherited the energy sector, which was neither efficient nor developed to respond to the independent country's needs (for more than two decades, it was dependent on Russian energy) (Augutis et al., 2012). To move away from an "energy island" and to pursue a dynamic and so-called independent energy sector, Lithuania had to restructure its energy sector fundamentally: to diversify energy sources and suppliers, create internal markets and international access markets, etc. (Švedas, 2017). The quest was extensive and ambitious but most importantly – successful. However, Lithuania and the rest of the EU are facing another necessary transition – moving from a traditional (fossil fuel dominant) to a sustainable energy sector based on renewables and circular economy principles.

In June 2018, Lithuania adopted an updated National Energy Independence Strategy, which corresponds with both EU policy and the National Climate Change Management Strategy and sets the strategic goal of ensuring the energy needs of the Lithuanian population and business by defining a vision for the energy sector as a whole, as well as the directions for its further development and the principles of implementation (Lietuvos Respublikos Seimas, 2018). One of the key objectives mentioned in this strategy is to reduce the energy sector's impact on climate change and air pollution by moving towards green energy and energy-saving initiatives. The strategy emphasizes that the share of renewable energy must increase as technologies develop, thus ensuring that Lithuania improves energy security by 2020, its ability to compete in the energy sector by 2030 and energy sustainability and self-sufficiency by 2050 (Lietuvos Respublikos Seimas, 2018). Such a transition aiming for a sustainable and competitive energy sector being able to decrease consumption but increase efficiency stimulates to look for innovative technological solutions and their successful implementation. These are also necessary prerequisites for the successful development of the circular economy seeking to reduce resource use and waste generation. It is worth mentioning that important changes require a sufficient level of public involvement (Eurobarometer, 2017), resulting in behavioural changes and acceptance of new social norms. Moreover, society finds proper waste management one of the most important issues when considering climate change (Pažėraitė et al., 2021). Waste-to-energy (WtE) plants are pivotal for the transition towards sustainable energy based on a circular economy (Caferra et al., 2022; Kothari & Pathak, 2010; Pan et al., 2015).

The energy transition issues are increasingly appearing in the Lithuanian political discourse, which shows that this problem is becoming more and more relevant at the state level (Grigas, 2013; Česnakas et al., 2018). Participation in various international initiatives and the aspiration to respond to the global goals set by international organizations gradually contribute not only to the renewal of infrastructure and the implementation of technological innovations but also to changes in the mentality of Lithuanian society (Leonavičius & Genys, 2017). Such a challenge demands both discursive and objective risk assessments, based not only on technical and scientific rationality but also on collective reflection (including both individual and community levels) in creating the future of society.

Accordingly, this article aims to explore expert opinions on Lithuanian readiness to transit towards sustainable energy by analyzing WtE applicability and further development in Lithuania. The task of empirical research is to review the aspects that have both positive and negative impacts on the country's transition identified by experts. An expert in this article is defined as someone who has knowledge in the relevant field and is recognized by others as a qualified expert in a particular area (Rae & Alexander, 2017) and can provide the most relevant information. To cover the holistic view, specific WtE stakeholder groups were identified following their role in

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the WtE production value chain, i.e., users, scientists, technology developers, service suppliers, and policymakers. The research is based on qualitative research (the methodology is discussed later in the text) conducted at the end of 2021 and the beginning of 2022. The novelty of the study derives from the conceptual framework for analyzing the possible social challenges of the transition, as well as from empirical data that contributes to a more thorough understanding of the direction of the transition, limiting obstacles and practical opportunities for how to tackle them identified by the experts.

2. Sociological contexts and dimensions of energy transition

The energy sector could be understood as an inevitable part of the development of industrial society, the development of which in itself (from an objectivist point of view) creates threats (i.e., ecological disasters, etc.) and contributes to the emergence of a risk society (Beck, 1992; 1998). The development of the energy sector is related to the need to ensure a reliable energy supply and to provide ourselves with cheap and ecological energy resources (Winzer, 2012; Sovacool & Griffiths, 2019). The pursuit of sustainable transition is intertwined with various technical, economic, ecological, political, social and even cultural aspects. It is believed that such complicated connections conflict with each other (Sovacool & Mukherjee, 2011). For example, economic interests and environmental protection have long been considered incompatible, but emerging environmental threats and improving technologies encourage further economic development to be developed through an environmentally friendly perspective (Zinn, 2006). The ambition of the Green Deal formed by the EU, which combines the ideas of sustainable development and the circular economy, encourages the search for synergy between economic growth, environmental protection and social justice. Broader integration of waste into the circular economy can result in various benefits. From a financial point of view, it can significantly foster the supply of sustainable bioproducts and bioenergy (Jain et al., 2022). The growing supply is accompanied by the development of innovations, which substantially contributes to sustainable development at large (Lieder & Rashid, 2016). Another study showed that the transition toward a circular economy facilitates valuable financial, environmental, and social performance (Rodríguez-Espíndola et al., 2022). It is worth mentioning that societal benefits are faster perceived if dedicated policy measures are in place (Rodríguez-Espíndola et al., 2022). Despite the societal benefits of the circular economy, various challenges remain. One of them is the consensus among all the stakeholders involved and finding valuable patterns of cooperation (Paiho et al., 2020) in meeting their own and society's needs. Some experts argue that cultural hesitation may be named among the most pressing barriers to circular economy development (Kirchherr et al., 2018). Some studies suggest that these barriers are determined by the lack of governmental activism (Kirchherr et al., 2018) in building awareness among different social groups.

More than one study (Augutis et al., 2017; Vosylius et al., 2013; Baublys et al., 2015) is devoted to the analysis of the security of the Lithuanian energy sector and the search for security enhancement scenarios. It is claimed that the priorities of Lithuania's energy security do not fundamentally differ from those of many other Western European countries, where energy security is associated with ensuring the possibility of self-sufficiency in energy resources (Juozaitis, 2020). The quest for sustainability in the energy sector is understood not only as the physical ability to acquire the desired type of energy resources, or the ability to pay an acceptable price for them (one that would not harm the functioning of economic entities, meet the financial capabilities of the population and would not stop the development of the state's economy), but to ensure a gradual transition to renewable energy sources, increasing the use of solar, wind and other low-polluting energy sources, helping to decarbonize the entire EU economy.

The connections between energy, its sources and various technologies with society's everyday environment in these modern times not only contribute to the challenges posed by the development of complex techno-economic processes but also require much more rational, considered risk assessments and collective reflection in creating the future of society. The emerging need to assess various emerging risks, not as discursively constructed, but as actually existing, moving away from techno-scientific rationality and approaching the level of the individual and

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his experience (Beck, 1992), encourages sociological researchers to contribute to new ideas and ways of acting emergence, corresponding to new social changes. The ideas of sustainable development and circular economy are increasingly being applied, creating visions of goals to be implemented in the areas of economic growth, environmental protection and social equality (Dryzek, 1997).

To achieve a smooth energy transition, not only specific policy measures are needed, but also the analysis supporting them, which would meet the expectations of all interested parties. Alignment of interests is possible only if it is not limited to the application of advanced calculation techniques or narrow expert knowledge, but is fully enabled through cooperation between all participating interest groups (Fischhoff, 2015). Research also shows that stakeholders at different levels can play an important role in contributing to the social acceptability of technological development (Cohen et al., 2014).

The development or transition of the energy sector depends not only on technological progress but also on the previously mentioned factors resulting from economic, social, political and other circumstances. Different authors (Wolsink, 2010; Barat-Auleda & Domènech, 2022) present different necessary configurations of the circumstances enabling the energy transition. Swiss scientists (Wüstenhagen et al., 2007), analyzing the social acceptability factors of renewable energy, distinguish three levels that guarantee a smooth energy transition.

The first dimension is socio-political acceptability, which relates to the social acceptability of technology at all levels (Wüstenhagen et al., 2007). Most of the obstacles to the successful implementation of projects are caused precisely by the lack of social approval. Sociopolitical acceptability includes both the attitude of ordinary citizens and other actors, such as policymakers and other interested parties, who, by applying various strategies, can influence public opinion and acceptability. In other words, this dimension allows us to grasp the potential of approval that exists in society.

The second dimension is community acceptability, for which the approval of the local community is the most important. The potential for dissent is linked to a social factor known as "nimby" (not in my backyard) found in the development of earlier energy technologies (primarily nuclear energy). According to the authors, people tend to support renewable energy if it is not implemented in their backyard. Another essential aspect of this dimension (which also impacts the broader society) is the distribution of returns from implemented projects. The authors argue that key factors influencing community acceptance include the relationship between distributive justice (how costs and benefits are shared), procedural justice (opportunities for all relevant stakeholders to participate in the decision-making process), and the trust of local communities in information and investor intentions (Wüstenhagen et al., 2007).

The third dimension is market acceptability, which includes the process of acceptance of innovation in the market, including the roles of consumers, investors and industry. Renewable energy and the associated interpretation of potential benefits are popular in public discourse as they allow speakers to promise a "beautiful future" (cheap and green energy). However, according to the authors, the reality is that, first of all, the desire of specific entities (regardless of the government or entrepreneurs) to invest in technology must appear, as well as a sufficient number of consumers willing to pay a potentially higher price for environmentally friendly energy (Wüstenhagen et al., 2007). Thus, market acceptability can also be a determining factor affecting other dimensions. For example, if some new technology is more efficient than old ones (or contributes to the solution of some current ecological problem), is able to offer tangible benefits, and the market is able to facilitate the practical limitations of the new technology, this can increase both social and community acceptance. WtE could be a typical example of politicians juggling catchy slogans. Behind it are different technologies with different levels of readiness, which makes local communities not inclined to become a testing ground (Malinauskaite et al., 2017; Caferra et al., 2021).

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3. The role of energy experts: visioning solutions or accumulating problems?

Regarding the role of experts in the energy transition context, they have a great responsibility to evaluate many aspects and circumstances before proposing a concrete solution. This kind of pressure scares the experts themselves. The reluctance to betray the public's trust due to inadequate assessment of the existing threats often encourages the evaluation of the situation based on the principles of the "worst-case scenario" (Dupras & Williams-Jones, 2012). Bearing in mind the social construction of risk, when examining experts' opinions and before presenting generalizations, it is crucial to ensure that the research group consists of experts from a broader range of fields. In addition, there is a risk of overextending the object and it is difficult to calibrate unequivocal arguments. On the other hand, it allows us to see a broader perspective by grasping potential points of disagreement and tension, which will inevitably require a public voice and a political solution to overcome (Leonavičius, Juozaitis & Genys, 2019).

Expert assessments are usually based on the available more immense amount of information, knowledge of specific areas, or the ability to extrapolate data from the past, predicting the future. Detailed modelling of the situation allows for establishing clear criteria for the decision-making process and the application of political strategies, assessing the need for further research, and discussing the problem in a unique way, even in the context of uncertainty (Chilvers & Kearnes, 2020). Accordingly, expert assessments are given greater weight in strategic issues, including the EU's aspiration to ensure a sustainable transition to renewable energy.

An expert approach, especially when interviewing qualified professionals from different fields, helps to grasp a holistic picture of the problem under consideration. The ability to combine the available knowledge with their interpretations by directing considerations to the search for specific actions consequently allows turning abstract knowledge into concrete advice. The expert approach expands the public discourse of energy security and introduces rational arguments indicating sensitive issues, possible development scenarios and optimal ways of solving them (Collins & Evans, 2007).

4. Methodology

A qualitative research approach (semi-structured qualitative interviews and a focus group discussion) is used in the study to gain knowledge about the research question from the interviewee's perspective. The main characteristics of semi-structured qualitative interviews are useful for achieving the goal: the lighter structure does not impose the opinion of the interviewer; the dominance of open-ended questions allows more detailed information to be gathered; greater attention to the specific situation and sequences of actions indicated by the interviewee provides knowledge of the particular case (King, 2004). A huge strength of face-to-face qualitative interviews is the wealth of information gained through the communication process (Gillham, 2000) and the ability to understand the phenomena under investigation by a specific target group.

With the consent of the informants, the interviews were recorded. Then the data were transcribed and analyzed by grouping them according to the preliminary topics and those that emerged during the analysis. The duration of the interviews varied from 30 to 55 minutes. Most of the interviews (23) were conducted live but remotely (i.e., using online communication platforms like Zoom). 9 interviews were conducted in a self-filling manner, i.e., by sending questions to the informants who filled the answers in blank spaces. The Chamber of Commerce was approached in an attempt to reach service delivery professionals. The administration was asked to distribute the survey questions to a specific (with research topic-related) audience, who had the opportunity to contact the authors of the survey and conduct a live interview or answer the questions themselves. This way, 35 questionnaires were sent out, and 9 were returned with completed answers. The implementation of the research took place in three

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stages: focus group interviews – in November 2021; semi-structured interviews – in November 2021 - January 2022; survey of representatives of the Chamber of Commerce – in January 2022.

The questionnaire consists of three parts. In the first introductory part, the questions are intended to clarify a more general approach to WtE, the suitability and appropriateness of the country for the WtE. They assess the main challenges and opportunities for its further development and implementation in Lithuania. The second part focuses on more specific questions aimed at clarifying the main obstacles to the implementation of WtE at the community level. And finally, the third part assesses the subjective expert opinion on the prospects for developing WtE at the market level.

Before selecting specific study participants who could provide the most relevant information, specific WtE stakeholder groups were identified. The stakeholders were divided into target groups following their role in the WtE production value chain, i.e., users, scientists, technology developers, service suppliers, and policymakers. Accordingly, each of these groups was formed according to different activities, nature of work, roles, responsibilities, etc. This way, the research participants' heterogeneity was controlled to cover various aspects of the problem.

This group is divided into two to more accurately and comprehensively identify the technology assessment from the consumer side. The first part of the group consists of young professionals interested in environmental protection and waste sorting. The second one is more deeply related to the problem, i.e., public opinion specialists, independent actors, developers of environmental protection and sustainable development initiatives, energy marketing and communication specialists, environmental activists, and representatives of civil society. Finally, representatives of technology consumer companies (working in different fields) also joined this group. Because WtE interests researchers from various disciplines, the research participants were selected to represent diverse disciplines and share other competencies. Participants were chosen to respond to different hierarchical positions in the power chain to fill the group of policymakers. Accordingly, interviews were conducted with the highest level – ministry leadership; medium-level – heads of departments; and lower-level professionals – persons performing daily practical activities, as well as state supervisory authorities (e.g., regulatory authorities).

The limitations of the research are related to the methodology. Accordingly, the study is not intended to provide objective processes or distribution of existing attitudes towards WtE among different social groups. On the contrary, qualitative research is intended to find out the subjective reflection of experts, so it could be treated either as the initial stage of a larger study or as a contextual (expert opinion-based) study aimed at gathering much broader qualitative information to map the transition towards sustainable energy sector development.

5. Socio-political WtE critique – management, sustainability and public impact

The transition from fossil fuels to the use of renewable energy technologies, ensuring a stable supply and guaranteeing energy production aligned with maximum environmental protection, is beginning to change the established belief that energy security could be based solely on affordability and availability aspects. In this way, the prevailing belief that the energy transition to renewable energy must be based on technical and economic arguments is no longer productive, as it cannot assess the previously discussed circumstances (local and ecological impact, etc.). The sociopolitical dimension helps to understand the readiness and possibility of dialogue between different stakeholders.

The experts were asked to comment on the general situation in the country and assess the acceptability and prospects of WtE. In this respect, four main opinion tendencies emerged among the experts' views. Some informants drew attention to the links between WtE's perspectives and information - its consistency, purposefulness, informativeness of the society, and overall representation of the technology in public discourse.

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Others tended to link WtE prospects to societal behaviour and financial support. The third tendency raised the risks and suitability of WtE for the existing Lithuanian infrastructure. Finally, the fourth - highlighted the importance of policy coherence and implementation.

Public awareness, or, in other words, lack of information, was identified as a big challenge for a smoother transition towards renewable energy in Lithuania by some experts. Interestingly, this aspect was similarly addressed by the policymakers, the technology users/waste providers, and the researchers. Everyone said that information could be both a challenge (such as opposing society) and an opportunity (such as changing public attitudes to waste management). Public education can become a crucial factor, as experts say it is directly related to public behaviour, which affects the development and applicability of WtE technologies. As we will see later, informativeness is linked to public response and broader participation in sustainable development programs. If public attitudes are negative, it isn't easy to expect the successful application of technological development and vice-versa.

The main challenge is the need for more information: there should be more broad talk about energy production methods, their advantages and disadvantages, and how to deal with them. Expert 24
Environmental requirements, proper communication, and possible population resistance. Expert 27
Poor public information on waste management. To this day, people are encouraged to recycle, but it needs to be explained what happens to waste that is not suitable for recycling. They also need to understand how large the industrial waste stream is and that most of that waste is not suitable for recycling. There needs to be more information on landfill problems, so there is no need seen to look for alternatives. In addition, there is a widespread belief that WtE technologies are inherently polluting, smelly, etc., and public hostility arises as soon as the WtE plant is talked about. Expert 12
Recycling waste into energy in society is primarily associated with incineration, which is received quite negatively. Other technological alternatives are less widely considered. But for applying different methods, I would probably see the same greatest challenge in society - as hardly acceptable and negatively received. Expert 11

Accordingly, another part of the experts, talking about the challenges of public attitudes and the prospects of the technology, pointed to the importance of financial aid for the WtE, which, according to experts, could also help change public attitudes and accelerate the development of WtE technology.

The best is financial motivation: if the resident recycles, he pays less, and if he does not recycle, he pays more. Also, controls, warnings, and fines for improper waste management are necessary, but this should not be overstated because if the residents have difficult conditions in sorting and properly disposing of waste, everything can move to the surrounding environment. Expert 6
It is essential to have clear strategic goals, then it is worth investing purposefully to achieve a significant breakthrough. I would think the same with WtE; otherwise, it's easy to get into chaos. Expert 1

As was mentioned in the theoretical part, the economics related to technological development is related to a more general attitude and this was observed by the experts in practice, paying attention to the aspect of social justice in the development of WtE, especially the fair and reasonable distribution of investments and profits, as well as the availability of services to specific communities and strategic interest of the country.

The third group associated WtE with certain risks that go beyond the scope of this particular technology and may have a wider impact on society. Concerns have been raised about the efficiency of the technology, raising questions about its potential impact on the environment and climate change. Addressing the experience of other countries, its readiness for Lithuania was questioned, more precisely, its further development in terms of sustainability. One of the experts raised a similar issue, pointing to the potential danger i.e., the emergence of a

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business industry (as a consequence of further development of WtE in the country) which could make it difficult to control the processes avoiding counterproductive benefits. For example, instead of helping to deal with the country's waste, taking imports from other countries would, according to experts, contribute to the accumulation of waste.

Some of these things are already being abandoned in some countries because it is a costly technology to incinerate, filter, etc. And where to put all the slag and ash generated at the end? <...> The same is true with incineration; the heavy nano-particles with the vapour come out because the filters still don't hold everything. Another thing the slag and ash that will need to be buried were said to be used to build roads, and to reposition the layers in landfills, but here the same thing comes through, we are still hiding it somewhere. I do not see the prospects and opportunities for sustainability in incineration, and it was stupid to build two more factories. Expert 7

It is still very worrying that we are importing waste, it should be banned here, so if Poland does not deal with its rubbish, then it has to deal with it in its territory. And it is still very worrying that these systems, such as cogeneration, operate solely on economic principles. There must be a powerful ecological motive to prevent the import of foreign waste into Lithuania, during which trucks have to pass through Lithuania, emitting CO2, and bringing that kind of waste. <...> and what seems very wrong is that if we look only at the concept of profit, it is awful, because then those cogenerations will be interested in burning more, then we will import the garbage to ourselves, even though we, ourselves, have reduced the amount of waste. On the other hand, there is a real advantage in that it is better than digesting in landfills for those hundreds of years. Cogeneration is part of the circular economy, where waste is converted into energy. Simply put, we have built too much, and those developers are interested in burning as much as possible while the goal is still to reduce waste. Expert 8

However, both experts agreed with the benefits of WtE in addressing waste management but questioned the further development of the technology. Both experts assessed the problem from a consumer and environmental perspective, so ecological arguments predominate in their approach. Using environmental arguments and a deeper relationship between WtE and ecology, the experts highlighted the difference between popular public understanding and expert knowledge.

According to experts, the last trend within this topic is related to the management and administration of environmental and energy problems. Different experts pointed to international and domestic policy choices. According to experts, WtE is just a technology, the productivity and efficiency of which depend on a wider range of strategic choices. Respectively, it is not easy to unambiguously assess the situation in Lithuania. The expert also drew attention to the fact that the situation in Lithuania also partly depends on the priorities and tendencies of the international environmental and energy policy. Another expert extended the idea by saying that it is best to assess the situation when the main goal is known - what is being sought and what breakthrough is expected; otherwise, interpretations may be different or contradictory.

Everything is set up correctly in the waste prevention plan; it needs to be implemented. The infrastructure complies with European standards; they are maintained and licensed. There are responsibilities, but at the same time, naturally, each system has specific "high voltage points," thus specific solutions are needed, sometimes, the system can fail, and it is not just a Lithuanian problem; it is a common thing in all countries. Expert 25

The other thing is what we want to achieve; a sustainable economy, energy security, or successful green course implementation. And it is a problem to connect them; the state needs a clear policy on what goal we are pursuing. We can burn everything and deliver more of those cogeneration plants, but we are looking at what we are aiming for. Or we don't need it because we will recycle everything, separate food waste, force everyone to use only recycled packaging, and there will be nothing to burn. But when we put it all together, everything goes out so that no one knows how to manoeuvre here. Expert 26

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Both experts represent the group of policymakers; thus, it is natural they focus on the administration of the problem. We can see that it takes work to ensure a smooth administration of the process, especially in a broader context, even disposing of sufficient knowledge about technology and its benefits to society. Once again, it was noted by the experts that one thing is to administer the implementation and even the development of the WtE, and the other is to harmonize the process so that it runs smoothly from an economic, social and environmental point of view. On the other hand, as was already mentioned, it isn't easy to crystallize the potential of WtE without clear strategic priorities.

Summarizing the differences in attitudes between the groups, it can be seen that the issue is contextualized widely, taking different aspects into account. Qualitative research does not allow us to make quantitative generalizations, but we can see that more positive views of WtE's prospects in Lithuania dominated among the respondents. In a more general context, the experts drew attention to public awareness, financial aid and potential risks. The differences in attitudes are related to the variety of stakeholder groups. Understandably, the philosophy of environmentalists and activists is more conservative in this case, and marketing specialists and opinion makers (influencers) interpret the issue as both an opportunity and a challenge. Representatives of technology developers mentioned rather pragmatic aspects that could change the situation in the desired direction. Finally, decision-makers suggested assessments of the current situation from a policy and governance perspective. Despite the differences in attitude between different stakeholder groups, no apparent contradictions or disagreements emerged at this research stage. The differences are more of an interpretive nature, related to professional and disciplinary bias rather than principal differences in understanding the operation and applicability of WtE. Such a palette of opinions from different perspectives confirms the theoretical hypotheses of how difficult it is to achieve a more or less unified understanding in this dimension, the formation of which is a complicated process that may take a long time.

Lastly, some experts speaking about the societal mentality draw attention to the country's historical development of waste management. According to them, the problem is the long-lasting tradition of forming landfills and the relatively slow reorientation of large companies (working in the field) adjusting to WtE. In another case, the division mentioned above of the governmental attitude, when it seems that the benefits of waste sorting and WtE are publicly discussed but not translated into practice (for example, in governmental institutions). Using the examples of the situation in public and governmental institutions, the expert linked three crucial aspects - attitude, management and behaviour - into one problem.

The development of WtE in Lithuania is hindered by the fact that the cult of landfills is powerful in our country. Large waste management companies (e.g., Ekonovus or Ecoservice) do not participate in WtE processes. Expert 12
There is still no, or lack of sorting opportunities in educational institutions, places like kindergartens and schools should be a priority to cultivate a new generation with understanding and everyday skills of what needs to be done, and today it is still necessary to explain why this needs to be done. The system needs to be corrected in other institutions, even governmental ones. If we disagree on the highest level where education is required, then society will do what it is said to do; they will not have that inner need; if there are containers - they will recycle, but if they do not find a container - they will not recycle. The effort does not come from a person, e.g. "I understand why I need it, and I want it", but it's more like imposed process, e.g. "it was brought here, and I was told to do so". There's a lack of that education, not in the form of advertising (flyers, posters), but in the form of infrastructure. Expert 7
What is missing for faster progress? Political Leadership in the Ministry of the Environment. It is a populist saying. But on the other hand, there is also some apparent resistance from specific regions. Expert 23

We can see from the examples that the effectiveness of WtE also depends on the behaviour of society and institutions. The expert mentioned that specific examples of conduct by public authorities would illustrate the

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transition from slogans to activities and could have an educational function, i.e., from which others could learn and copy specific examples of how waste management should be organized.

6. WtE potential - creating a sustainable energy sector by recreating communal leadership?

The energy transition from fossil fuels to renewable energy based on the principles of the circular economy includes economy, industry, and social aspects. Important is not only the material or socio-political contexts that shaped the logic of energy consumption, the market and regulatory mechanisms, but also the features of community life - the structure of agreements and practices that exist in society, or otherwise - the formulation and representation of community interest both at the local and national level. In this sense, the latest technologies and modern management trends collide with the abilities of a young democracy to balance different interests and the possibilities of a relatively prosperous, but economically unequal society.

The opinion of experts regarding the readiness of specific communities to accept renewable energy technologies into their neighbourhoods was divided into two distinct parts. The first group of experts drew attention to more general trends, stating that the response of Lithuanian civil society to WtE objects in Lithuania is predictable and does not differ much from more general trends in Europe. On the one hand, society understands that part of the waste will inevitably either be burned or buried in a landfill. Hence, it is more prudent to burn it efficiently than to bury it after taking it to the city's outskirts and leaving it for future generations. On the other hand, until it is clear how such an object will work in reality, people's cautious attitude is understandable, especially if it is close to their homes. Accordingly, according to experts:

Much explanatory work for the public is needed; this is the only way to show that it is not a threat to the neighbourhood. It is worse when these people's fears are manipulated by persons with narrow interests - for business or political ambitions. Interfering with people stops even technically sustainable solutions and raises their price, which is later paid by the same society anyway. Expert 17
The public needs to gain more knowledge about the problems caused by landfills. Expert 18
The active part of civil society, which wants to have a say on all issues, would tend to protest against expansion. Expert 19

Another part of the experts talked about specific examples that speak of a particular hostility visible at the community level, which is related to specific and practical issues of WtE implementation, such as the environmental impact in a local environment:

Citizens living near cogeneration plants are unhappy about air pollution, which is increased due to burning waste. There may be no such difference for those who live further away. This is relatively new; companies provide positive information that energy is extracted from waste. Still, it has yet to be known whether it will be used effectively or whether it will not be necessary to import waste from other countries. Expert 6
There was a very high resistance in Kaunas because, in general, when building such massive objects as cogeneration power plants in Lithuania, there is perhaps too little talking with the community. In Kaunas, when the cogeneration plant was being built, there was a neighbourhood nearby, and there was a lot of opposition from the residents because of the possible pollution and the vibration from the trucks driving by all the time. It was said that the pollution would increase, and the residents tried to protest, but the project failed anyway. On the other hand, there was too little information; people mistakenly think that burning emits smoke into the environment, filters are put in place, protection standards are followed, and a lot of internal things are covered up, where it is not completely clear. Each community will look after its security and, another thing, the community could also benefit, because, for example, the developers of one cogeneration plant said that they were inclined to talk with the community about how to compensate them, they were inclined to invest, maybe build a kindergarten, to invest in the needs of local people. Expert 8

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The opinion of the experts was argued with specific examples. Nevertheless, it contradicts the more general public view that emerged in other studies. For example, in a comprehensive research of public attitudes, examining the existing relationships between risk perception and climate change concepts, as well as attitudes towards them, it was observed that in the attitudes of Lithuanian residents towards energy technologies, a clear differentiation prevails between renewable and non-renewable energy technologies. The country's population has a positive view of renewable energy technologies, while most non-renewable ones have a negative view. The positive assessment of renewable energy technologies shows a high level of acceptability of these technologies in Lithuania, and the technologies themselves are associated with lower risks than non-renewable and other energy technologies." (Budžytė 2021: 149); this allows the author to conclude that "part of the Lithuanian population is ready for value changes in society implemented through energy sector reforms" (Ibid 149). Meanwhile, the results of this study correspond to the theoretical assumption that, often, the dominant attitudes in the general attitude of society, which are tried to be implemented in a local territory (when implementing specific technological innovations), lose support. According to experts, this is not necessarily related to the moral attitude of concrete communities against technology. Still, it works with a set of practical issues (first of all, the specific impact on a particular environment), which do not seem so important in the general discourse but acquire practical value in reality. In the case of Lithuania, such an attitude of local communities, according to experts, can also be associated with the lack of good examples that would allow for the presentation of practical evidence and reasoned answers to the communities concerns. Meanwhile, even those individual cases that are successfully implemented and even provide tangible national benefits are still accompanied by public protests, which reflect the existing dilemma of public benefit versus community risk and eventually settle in shared memory.

7. WtE transition factors – technological progress vs market achievements

Experts agree that WtE is an excellent solution for managing a large part of the waste that cannot be recycled, but it is part of a larger process. You cannot isolate one link and disconnect it from the chain. Thus, WtE should also be considered part of a wider waste management process. Sorting, recycling and incineration should all be balanced and not seen as separate and independent or unrelated businesses. According to the experts, it is important to distinguish between incineration and WtE. Whereas waste incineration is not recognized as part of the circular economy, either at the directive or strategic EU level, WtE is. WtE is a second-generation biofuel, such as biomethane, made from all non-food products.

According to experts, the potential for WtE development is strongly linked to infrastructure and public sorting habits. Both aspects require attention and concrete solutions. According to the experts, if high quality in sorting is reached, mechanical biological treatment would not be needed in waste management, significantly reducing the cost component. Sorting food waste and degradable waste is very important. After all, once mixed in the general stream, they cannot be used in compost because they are contaminated with heavy metals. By contrast, sorting them into mechanical biological treatment plants allows them to be transformed into energy products. Otherwise, and this is the most common case, it goes to incineration. Experts believe that the major cities are the most significant waste generators - Vilnius, Kaunas and Klaipėda - but none of these cities have biogas generators.

Some experts highlighted WtE as a niche of a specific business opportunity. If WtE is developed exclusively as a business, the whole coherence and sustainability of the waste management process are jeopardized by this concept. The criticism is based on the natural business imperative for profit. Still, the risk is that the profit motive will lead to an increase in production volumes, i.e., burning as much waste as possible and converting as much waste as possible into heating (or other energy products), while arguing and emphasizing the benefits of the technology in terms of solving the strategic challenges (e.g., reducing pollution, reducing waste and generating heating for the town). However, the dominance of WtE is likely to harm other waste management sectors, such as

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sorting and recycling. Thus, WtE should also be seen as a part of a broader waste management process. Sorting, recycling and WtE should all be balanced and not seen as separate and independent or unrelated businesses.

By specifying the market limitations of WtE, the experts mentioned the importance of not focusing on the nuances of the technology itself but on its application and wider impact on overall waste management. WtE certainly has a role to play in this process. Still, it needs to be clearly defined in terms of the country's strategic interests, such as demand, infrastructure, strategic development of renewable energy, and so on. Experts have mentioned the possibility of a counterproductive impact of WtE (on the country's interests) in case it begins to over-dominate the public waste sorting habits or recycling process.

It can be something other than the predominant way because the [essence of] materials are lost; they are converted into heat energy, but the immediate essence of the material is changed, and we don't get back what was in the product. Slags, residual products, and ash are generated and must be safely managed and disposed of in a landfill. Expert 25
Does not encourage recycling, no single priority between economy, green course, and energy. Expert 26
WtE development depends on many factors. As I mentioned, its development can be consistent if it is connected to an integrated vision of the waste management problem and strategic orientations. For example, when the price rises for other energy raw materials or supply disruptions, WtE may prove to be an efficient and cheap alternative. However, in the longer term, again as prices and/of supplies fluctuate or as new factors enter the supply chain (e.g,. as the share of renewable energy increases), WtE may become less effective or even problematic keeping in mind the broader context of, for example, sustainable energy development or environmental protection. Expert 30

Experts pointed out how WtE is related and, at the same time, dependent on other energy and environmental issues. WtE contributes to both, but its objectives and functions must be very clearly defined; otherwise, it may have the opposite effect. It can be concluded that the potential of WtE technology depends on a combination of various aspects, not only self-evident – infrastructure, economic, or political priorities –, but also the attitudes and habits of consumers.

According to experts, the development of WtE as a business branch of the energy industry is noticeable and has the potential to expand. However, there are some risks in such development. For example, suppose this [as a specific, autonomous business branch of the energy industry dispatched from the overall concept of waste management] development evolves without supervision. In that case, it could have a broader impact on the whole waste management process. In such a case, there will likely be less waste for recycling, and waste incineration will become dominant. However, experts were not inclined to answer unequivocally whether WtE (if we can recycle) is the best solution for sustainable development. They acknowledged the immediate advantages but needed to be assured of long-term benefits. In addition, the experts emphasized another problem specific to Lithuania. That is the issue of WtE not being consistently administered in Lithuania. This is because responsibilities are scattered across different institutions and municipalities, making decisions dependent on other decision-makers and different priorities, needing a coherent approach, systematic administration from start to finish and thinking in a complex way.

8. Discussion

The experts located the place of WtE in the country's transition towards sustainable energy by distinguishing and highlighting the aspects of technological applicability and its benefits. According to experts, to reveal the benefits of WtE to the full extent, the contextual aspects should be taken into account, i.e., the whole chain of waste management needs to be rationalized. Accordingly, it consists of waste sorting, gathering, recycling and management. The higher the quality and scope of sorting, the better the results. Most of the waste can be recycled

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in Lithuania, and some can be incinerated. Experts pointed out that incineration should not be overly admired, as almost all waste can be incinerated. Still, the potential consequences include a stagnant sorting system and diminishing public waste sorting skills. Experts have repeatedly emphasized the chain of waste management: sorting, recycling, and only incineration of all that is not worthwhile or cannot be recycled. Speaking about the prospects of WtE in Lithuania, the experts noted that Lithuania has a notable legacy - large mountains of landfills –and the use of WtE technologies can be helpful in their management. The study participants indicated that despite the problem's urgency, there is no final decision on how to organize this process. However, the question is marked red on the political agenda. Thus, the efficiency of WtE is to be assessed by summing up all aspects (including the environmental impact of waste logistics and transportation), i.e., not only counting the number of WtE installations but also estimating the amount of energy consumed in transporting waste from one point to another and the pollution generated by that transport, as well as in economic terms – how much it will cost to the state and end users.

Table 1. WtE Assessment Based on Three Dimensions

	Positive/ transition-enabling aspects	**Negative/transition-disabling aspects**
Socio-political acceptability	WtE is a well-developed technology which is already beneficial (corresponding with strategic interests); WtE mediates energy demand and increases green energy in the overall energy balance in the country.	It is difficult to reveal the full potential of WtE due to public mentality (unwillingness to sort the waste), waste logistics (separation of contaminated waste) and administrative (lack of unified governing strategies) reasons in the country.
Community acceptability	WtE reduces local problems (such as landfills) and contributes to the strategic goal (ensuring energy security with sustainable energy generation) by providing reliable and relatively cheaper heat supply to the local neighbourhoods.	Due to the lack of good practices, the overall positive public attitude towards WtE in Lithuania only partially converts into local readiness to accept concrete WtE plant implementation in the local neighbourhoods.
Market acceptability	WtE is relatively easily integrated and balanced into the current energy infrastructure as a part of an extensive waste management process.	WtE has an uncertain future in light of other technological (waste management) progress and changing consumer behaviour; WtE tends to grow into a specific business industry whose interests might contradict the country's strategic goals.

Source: made by the authors

The theoretical assumption formed at the beginning of the research that a successful energy transition depends on the country's overall readiness became evident in the empirical part as well. The specific aspects identified by the experts covering both positive (transition-enabling) and negative (transition-disabling) aspects could be summarized into three dimensions (in this case, socio-political, community, and market) (see Table 1).

Conclusions

According to the experts, we have reached a time when creating something technologically efficient is no longer difficult. Making that technology work for the benefit of all is much more difficult. This requirement changes the efficiency of and attitude to technology because one is to pursue narrow interests, and the other is to seek benefits for the larger public. Empirical discoveries corresponded with the theoretical notion that social aspects are becoming more critical for assessing and evaluating energy sector development, especially when building a sustainable energy sector based on such innovative technologies as WtE.

Summarizing the aspects of attitudes towards WtE among different stakeholder groups in Lithuania, some differences of concern about the future scenarios of WtE in the country emerged. Still, no principal differences in

the assessments of the country's transition were evident. Most experts support WtE input for the Lithuanian shift towards a sustainable energy sector. Still, they indicate that some better public awareness and a justified and transparent mechanism of WtE implementation (in order to correspond with public interest) are needed. Different groups rationalized their views with arguments closer to their background (e.g., environmental activists with ecological arguments, public researchers with public attitudes and behaviour, policymakers with administrative and management problems, etc.), which allowed them to grasp a holistic view of the analyzed issue. Different energy threats stem from political, economic, technological and social spheres. Likely, different opinions will not be avoided until generally accepted strategic goals can mobilize various stakeholders and unify justification for the transition towards a sustainable energy sector.

Empirical findings also speak about the practical value of the study: an opportunity to understand the direction and circumstances of the transition process. The subjective testimony of experts (in terms of both current and future challenges, as well as possible opportunities) enables the formation of a targeted and argumented political response to ensure the success of the transition, as well as the construction of an effective and evidence-based (on the aspects raised by the experts) communication campaigns targeting both specific interest groups and public attitudes in general.

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FINANCIAL LITERACY OF SECONDARY SCHOOL LEAVERS: A CASE OF LATGALE REGION IN LATVIA

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Abstract. Financial literacy, as a totality of knowledge and skills, provides an opportunity for a person to manage finances successfully, and take rational decisions concerning the choice of various financial services, thus facilitating both individual and public welfare and sustainability. The financial markets have changed along with the financial consumers' awareness. Financial services have become a mass and freely accessible product group, whereas financial institutions have become a part of everyday life for all social groups. Over time, the age of the persons involved in financial processes and evolving consumers of financial services becomes younger and younger. Hence, the need for knowledge and awareness of finances, financial product diversity and related risks is growing more acute for improving financial decision-making. For this reason, financial literacy is acknowledged as a vital life skill globally. The research aims to study, assess, and analyse the financial literacy of secondary school leavers in Latgale.

Keywords: financial literacy; financial literacy index; youth; school learners; secondary school leavers; Latgale

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JEL Classifications: G32, G20, H31, L26, M1

1. Introduction

Financial literacy is a totality of knowledge and skills that provide for understanding and successfully organising one's financial management and making rational decisions concerning the choice of various financial services and their proper use, intending to reach financial stability and sustainability (Sarnovics et al., 2016; Davoli and Hou, 2021). A financially literate individual has knowledge of finances and economics in general, and they can apply this knowledge to advance their welfare and financial growth to reach their personal goals (OECD, 2011, 2013; Taylor and Wagdand, 2013; Latvijas Universitātes, 2017; Garg and Singh, 2018; Kakinuma, 2022; Lo Prete,

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2022). In Organisations for Economic Co-operation and Development, operationalisation financial literacy is divided into three constructs: financial knowledge, financial behaviour and financial attitude (OECD, 2020).

Financial literacy affects not only a person's quality of life but also sustainable economic development (Swiecka et al., 2020), the development of entrepreneurship (van Rooij et al., 2011; Riepe et al., 2020; Graña-Alvarez et al., 2022), and the improvement of business activity in region or country (Yin et al., 2015; Barba-Sánchez et al., 2018; Skica et al., 2022).

The demographical situation in Latvia, especially in Latgale, is unfavourable since the number of retired residents is larger than the ratio of children and adolescents. A prospect of a future decrease in the number of working-age residents and an increase in the demographical load. Therefore, more attention should be paid to improving education at school so that secondary school leavers can manage their finances, thus facilitating the entrepreneurship of young people that, in turn, would contribute to the national economy development.

The topicality of the research is related to the current debate in society on the financial literacy of the Latvian population. In connection with the country's economic processes, various activities are implemented to improve the financial literacy of residents in different age groups, including youth and secondary school leavers.

The paper aims to study, assess, and analyse the trends of financial literacy of secondary school leavers in Latgale using the:

- theoretical source studies on the significance and essence of financial literacy, methodology of its assessment;
- survey of secondary school leavers in Latgale to investigate their financial literacy trends.

2. Theoretical aspects of youth financial literacy

On the one hand, there are views that financial literacy and education in finance are necessary for every individual's life (Asmalidar, 2019; Janusz et al., 2021; Narula, 2022). On the other hand, financial literacy is relevant for regional sustainable development (Kozubikova et al., 2015; Novokmet and Zalic, 2019). Financial literacy is vital at the person, family, organisation, regional, and country levels.

Financial literacy includes two significant issues: firstly, knowledge about finances and, secondly, the reason why such knowledge is of importance. Financial literacy is motivated by its usefulness in making everyday decisions to provide for humans' valuable existence in contemporary society (Sarnovics et al., 2014; Marinov, 2020).

There is no universally accepted definition of financial literacy, as each organisation, individual researchers, and countries define financial literacy differently (OECD, 2013; Titko et al., 2014; Riepe et al., 2020). The authors adopt the following definition: financial literacy is a totality of knowledge, skills, attitude, and conduct that helps an individual understand financial conceptions and procedures, provides an opportunity and readiness to apply one's ability for making rational decisions for one's welfare and that of the society on the whole.

According to financial socialisation, the significant agents of financial socialisation are family (Davis et al., 2018; Wann and Burke-Smalley, 2021) and school (Kuzma et al., 2022) positively affect the financial literacy of adults. Financial literacy and school-related variables also have a direct effect on economic behaviour. Researchers suggest that family factors and schooling work through complementary channels (Grohmann et al., 2015). Research results confirm the impact of parental socialisation received in childhood on adults' later financial outcomes, parents' financial literacy level and literacy socialisation influence children's financial literacy (Lusardi et al., 2010; Zhao and Zhang, 2020, Wann and Burke-Smalley, 2021). Researchers underscore the importance of

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financial socialisation in the family context and encourage parents to discuss financial matters with their children at home (Grohmann et al., 2015; Hanson, and Olson, 2018; Vosylis and Erentaitė, 2019).

Prior research shows that differences in financial literacy degrees are also related to the socio-demographic characterises – social status (the higher the social status, the better financial literacy), an education level (the higher the education level, the better financial literacy), and age (adults have better financial literacy than youth and senior citizens) (Coria et al., 2019). If a person has weak knowledge in mathematics, s/he is not involved in financial matters (financial exclusion) or does not select the right product due to difficulty in considering and comparing offers (Eiropas Parlaments, 2008). Hence, checking knowledge in mathematics is included in the assessment tool component because one of the financial literacy elements is the ability to do mathematical calculations (Widdowson and Hailwood, 2007; Barba-Sánchez et al., 2018).

According to OECD suggestions of 2005, more and more countries acknowledge the significance of financial literacy and include it in school curricula. However, there are significant obstacles to accomplishing this: lack of political will, shortage of resources and materials, overburdened school curricula, and insufficient competence (International Network of Financial Education, 2012). There are indicated preschool and primary school children among the target groups with high priority in the Latvian population financial literacy strategy 2021-2027 (2020). The problem of financial literacy of children and youth has been the object of scientific research by Iwanicz-Drozdowska (2015), Titko et al. (2015), Potrich et al. (2016), Andriichuk (2021), Kuzma et al. (2022) and others. The relevance of financial education at the university level and its economic and social significance have been revealed in the studies by Kozubíková (2015), Felipe et al. (2017), Kozubik et al. (2019), Swiecka (2018, 2019), Davoli and Hou (2021). The research by Davis et al. (2018) analyses the financial literacy of Italian students. It shows that welfare and social and economic background significantly affect students' acquisition of financial literacy skills in Italy.

Researchers argued about the continuous feature of financial education as a necessary condition of its effectiveness (Van Campenhout, 2015; Swiecka, 2018). Conclusions have been made on the necessity of teacher training and high-quality textbooks (Jayaraman et al., 2021). Other scientists emphasise teachers' role in financial education (Compen, 2019; De Beckker et al., 2019).

There is also a connection between financial literacy and the economic and education level of the family: those who are financially more skilled to a much greater extent come from highly educated and economically complex families (Lusardi et al., 2010).

While elaborating on the method for detecting the financial literacy level, it is essential to specify whether a person knows the respective information and whether s/he can deal with it adequately (Huston, 2010; Legenzova and Gaigaliene, 2017). Surveys are a powerful means of measuring financial literacy. Yet it is essential to assess financial literacy, not a subjective opinion of one's financial aptitude. This way, when doing a survey, it is advised to avoid the following: 1) approach "one size for everyone", 2) exclusive self-assessment and subjective questions. Survey questions must include definitions and several similar questions structured differently to obtain the mean that most precisely reflects financial literacy and aptitude since it solves the problem of casual choice and guessing (Capuano & Ramsay, 2011).

Several studies in the USA and other places of the world show that youth have a low level of financial literacy. Regarding financial literacy and conduct, youth become one of the most minor protected groups in the population (Lusardi and Wallace, 2013; Kozubik, 2019; Zheng et al., 2020, Andriichuk, 2021). The younger generation faces not only the growing complexity of financial products, services, and markets but, in the course of growing up, they need to assume increasing financial risks compared to their parents (OECD, 2013; Kuzma et al., 2022). It is vital to learn already at school how to spend money smartly, how to save and be able to lead a happy life. It is

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necessary for school leavers who enter the age of employment to be ready to manage their income and avoid any financial problems (Chaiphat, 2019).

Researchers from a bank higher education institution (BA School of Business and Finance) in 2014 produced research in 5 secondary schools in Riga and the Riga region "Options of raising the financial literacy level at secondary school: Latvia's case". The study showed that school learners have general knowledge of financial matters but face difficulty with practical tasks requiring precise calculations and resource planning. School learners need to understand why they should learn their rights and duties concerning financial operations. The research results also reveal that school learners have heard about numerous financial regulations and services but need to understand them (Sarnovics et al., 2014) fully.

As the financial literacy issue grows more topical globally, in Latvia, a memorandum was signed in 2021 for implementing “Strategy of financial literacy of the population in Latvia for 2021-2027". The financial literacy strategy of the population in Latvia for 2021-2027 sets the goal of promoting financial literacy culture and sustainability among the people, providing a proper economic environment and improving financial literacy's strategic planning. Finance and Capital Market Commission (FCMC) and research service providers perform regular sociological research on the financial literacy of the population of Latvia. The study aims to detect changes in the financial literacy level of the population, assess their knowledge, and conduct in connection with various financial literacy issues.

Assessing the population's financial literacy levels is a vital component of a successful national strategy for financial education, enabling policymakers to identify gaps and design appropriate responses. International comparisons increase the value of such an assessment by allowing countries to benchmark themselves with other countries. Where similar patterns are identified across countries, national authorities can work together to find standard methods for improving financial literacy within their respective populations.

3. Assessment of the trends of financial literacy of secondary school leavers in Latgale

The questionnaire was used to acquire research data for the present research. The obtained data allows other parties to replicate comparisons and analyses.

Taking into account the information obtained in the theoretical part, the questionnaire for the authors' research comprises self-assessment and subjective questions as well as objective questions that balance the course of the study concerning the basic financial literacy of the respondent. At the same time, objective questions make it possible to ensure whether the respondent has or has not overestimated their knowledge when answering the self-assessment/subjective questions.

The survey was done in two parts – part one (19 questions) specifies the respondent's attitude and habits regarding financial issues, and part two (10 questions) checks the knowledge of financial issues covering five topics – general financial matters, bank services and loans, insurance, taxes, investments. Each topic contains two assignments – a theoretical and a practical one (calculation).

The target group of the survey or sampling cluster comprises all secondary school learners of form 12 in Latgale, whose majority are aged 18 to 19. Via contacting each school separately, the authors found out that the number of form 12 learners in all secondary education institutions in Latgale is 1488.

The quantity of the sampling for research was calculated according to the formula (1) (Orlovska, 2007)

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$$n = \frac{t^2 * S^2 * N}{t^2 * S^2 + \Delta_x^2 * N}; \quad (1)$$

where:
N- general quantity,
t- probability coefficient,
S^2- sampling dispersion,
Δ_x – allowable limiting error.

The parameters of the survey sampling are as -follows:

t = 1,96, with 95% believability of results,
S^2 = 0,25, as the part of the researched feature in the cluster is not known,
Δ_x = 0,05, as the maximum allowable quantity of the sampling error will be 5%.

$$n = \frac{1{,}96^2 * 0{,}25 * 1488}{1{,}96^2 * 0{,}25 + 0{,}05^2 * 1488} = 305\ learners \quad (2)$$

The calculations concluded that the ideal sampling volume would be 305 respondents; still, 341 were surveyed for the research. The authors calculated limiting error probability (95%) and statistical error (plus/minus 2.7%) to assess the survey data's credibility. Limiting error and statistical error are calculated mathematically based on probability theory (Orlovska, 2007).

As a result of the research, from all surveyed secondary school leavers in Latgale (the number of respondents n=341), a target group of 10% was obtained who are very knowledgeable and well informed, and 63% of respondents consider themselves as well informed and knowledgeable in financial matters. The mentioned respondents can manage their finances to reach economic well-being. Further research results show that the replies ought to be assessed more critically as those respondents who considered their financial knowledge excellent and good had overestimated their expertise and state of being informed within the given question. They may be known as concerned about using the currently selected financial products, yet, regarding future perspectives, there are financial products they have yet to deal with practically; thus, the authors assume that the respondents need to consider this fact.

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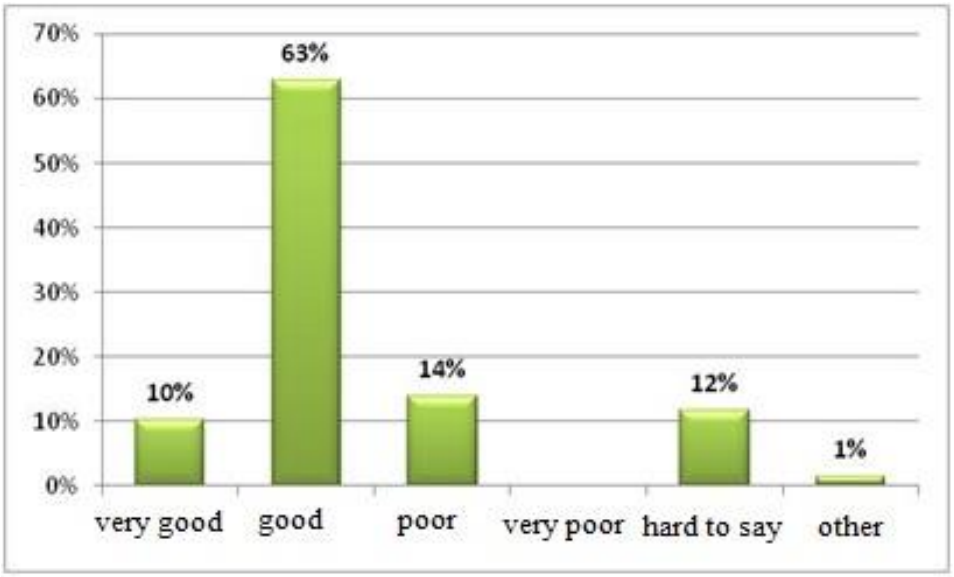


Figure 1. Respondents' assessment of their financial literacy (% from the total number of replies)

Source: created by the authors on the survey result basis

The distribution of the replies in Figure 2 shows that three primary sources of obtaining information on finances among the respondents are parents, friends, acquaintances (relied on by 71% of respondents), the Internet (relied on by 69% of respondents), mass media (social networks, TV, radio, magazines, newspapers) (relied on by 53% of respondents).

Only 34% of respondents state that financial literacy knowledge was obtained at school that, according to the time spent, takes second place after the family, where knowledge and life skills have been acquired over 12 years.

This assessment suggests that the school curricula must be completed and provide young people with the essential knowledge for their further life and well-being. 11% of respondents admit that they are not interested in this information, which may testify to the youth's low level of financial knowledge that may lead to poor calculated financial decisions.

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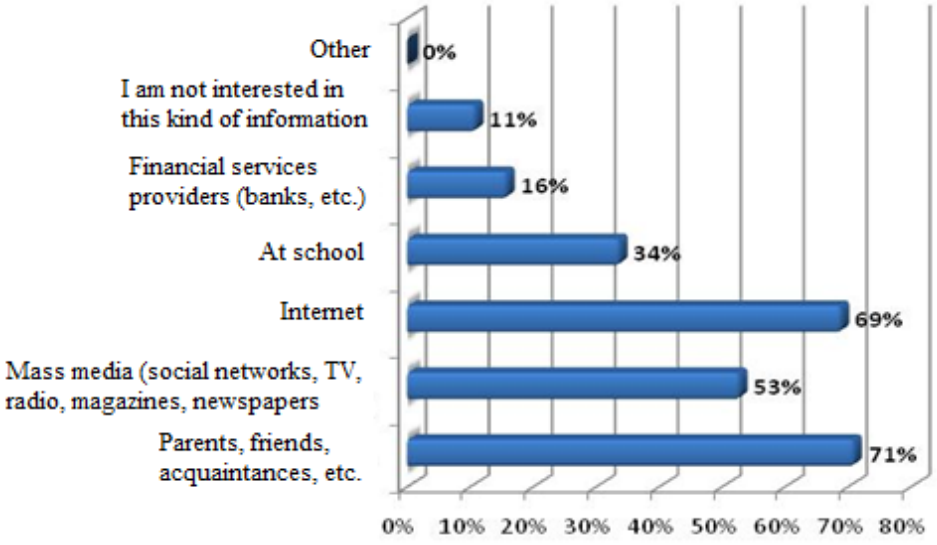


Figure 2. Sources of obtaining information on finances by the youth (% from the total number of replies)

Source: created by the authors on the survey result basis

Summarising the replies to the question of what financial products the respondents have dealt with (see Figure 3), the greater majority deal with accounts and payments (95% of respondents) and e-services (77% of respondents). Less than half – 42% of respondents have made savings and investments.

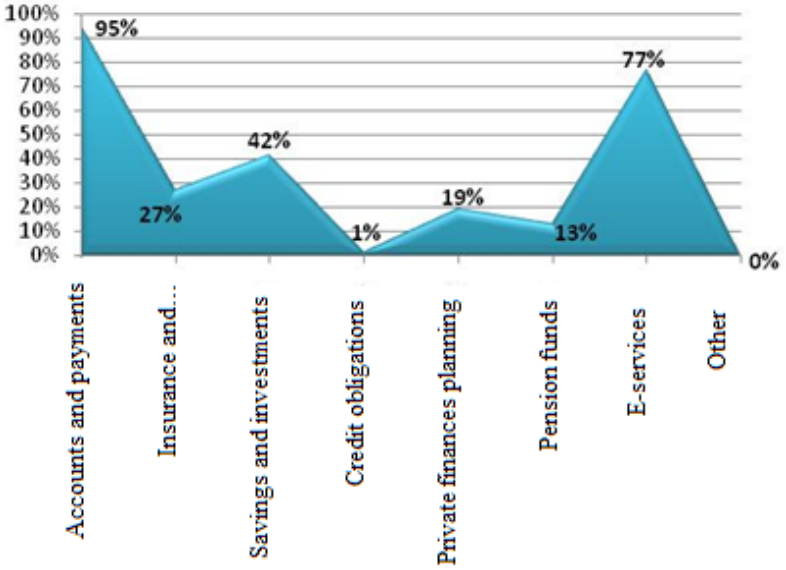


Figure 3. Financial operations dealt with by respondents (% from the total number of replies)

Source: created by the authors on the survey result basis

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Figure 4 compares the authors' research data with BA School of Business and Finance research of 2014 "Options of raising the financial literacy level at secondary school: Latvia's case". The data approve that better results in almost all topics, except one, are achieved by secondary education learners at schools in Riga and Riga region. In the topic "general financial issues", learners in Riga and Riga region showed 21% better results than secondary school leavers in Latgale; a similar case is with the topic "bank services", wherein learners in Riga and Riga region showed 21% better results. The only topic wherein secondary school leavers in Latgale show better results is insurance – for 24%. The most remarkable difference appears in taxes, where learners in Riga and Riga region show 56% better results. According to the survey, the knowledge of Latgale secondary education learners for the topic "investments" is 45% poorer.

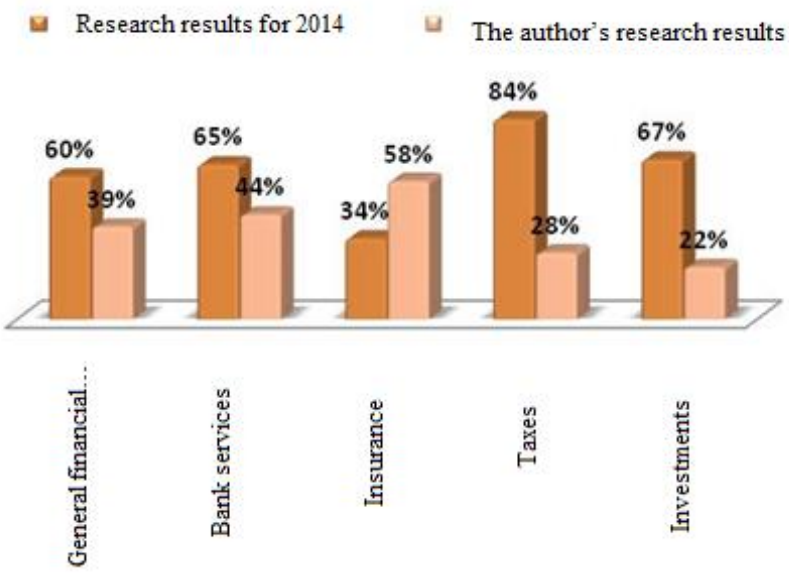


Figure4. Comparison of the research results for 2014 and 2020 across financial topics (%)

Source: created by the authors based on the obtained research results and Sarnovics et al. (2014)

These results highlight and approve the results of OECD research that school learners in Riga and Riga region show better knowledge than learners of schools in the rural areas; learners of gymnasia show incredibly high results compared to secondary schools. It has to be considered that participants of the research of the year 2014 were not only form 12 (final secondary school year) learners but also form 10 and 11 learners, and this means that they produced better results than form 12 learners in Latgale. Financial literacy differences are also observed within state regions; hence, this should be attributed to special attention.

Though school leavers estimated their financial literacy knowledge as very good and good (10% and 63%, in total 73%), the results obtained for other survey questions did not approve of their self-assessment, thus leading to a conclusion that school leavers overestimated their knowledge. This is proved by the question asking to assess one's knowledge about financial products, the replies to which show that approximately 9% of respondents are well informed about all offered financial products. In addition, respondents could not provide a correct answer or gave an incorrect answer for part two of the survey questions – the question about converting money (approximately ¾of respondents), a question about taxes concerning 3rd pension level (almost $^{4}/_{5}$of respondents), a question about deposits (more than $^{4}/_{5}$of respondents) and question about investing in pension levels (more than ¾of respondents). School leavers in Latgale showed poorer skills in practical financial literacy tasks. Only one

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task from five was completed right by half of the learners. The rest was done right by an average of 23% of school leavers.

Most school leavers in Latgale who participated in the research estimated their financial aptitude too highly. At the same time, their actual knowledge in this sphere could be better. The survey results from the study show that secondary school leavers in Latgale need more theoretical and practical financial literacy knowledge, which needs improvement.

At the same time, only 14% of respondents estimate their knowledge of financial issues acquired at school as sufficient. However, the way of obtaining information to improve their financial literacy most appreciated by school leavers is through school/higher education institutions (30%). It is necessary to improve education programs so that school learners may obtain basic financial literacy at school and higher education institutions, notwithstanding the sphere of their further studies, because financial literacy knowledge must be accessible to each member of society.

4. Conclusions

The scientific novelty of the research lies in providing an original definition of financial literacy. A novel instrument of research in form of theoretically grounded questionnaire for the assessment of financial literacy of school learners of form 12 was elaborated.

According to the present research results, it is established that 10 % of secondary school leavers in Latgale access their self-financial literacy as “very well” and 63% as “well”. The assessed level of financial literacy of youth in Latgale is similar to the financial literacy level of the Latvian population and is insufficient (Finanšu un kapitāla tirgus komisija, 2021; Mavlutova et al., 2021). Although the current status of financial literacy of Latgale youth is not enough, it is slightly increased since the authors' previous research (Caplinska et al., 2019). The target youth group who are well informed in financial literacy increased by 4%, and the target group who are well informed increased by 5%. According to the Financial Literacy Survey of the Financial and Capital Market Commission (2014; 2019), the Latvian Financial Literacy Index increased slightly from 20.6 points in 2014 and reached 21.7 points in 2019 out of a possible 99.

The primary sources of obtaining information on finances among school learners of form 12 in Latgale are parents and friends 71%, the Internet 69%, and mass media 53%. The data on financial literacy in the context of the linkage between the causes of family and youth financial literacy received within the present research has confirmed the conclusions obtained by other scientists (Vosylis et al., 2021; Jančius et al., 2022). Researches highlight the school's impact on youth financial literacy level (Kuzma et al., 2022; Compen et al., 2022). Only 34% of school learners of form 12 in Latgale obtained financial literacy knowledge at school.

The findings have practical value for the State Education and Content Centre by the Ministry of Education and Science and other social agents since they allow them to set up a financial literacy standard. The institutions can develop and adjust the content of learning in various subjects for the school learners to form during 12 years of learning the basic financial literacy knowledge necessary for adult life.

As elaborated education content only sometimes yields the planned results, there is a need for research about the financial literacy of the teachers of the respective academic subjects. Consider updating teachers' competence in financial literacy issues so they can pass their knowledge over to learners.

Finance and Capital Market Commission need to list in the unified website of Latvian finance literacy activities all activities and available materials related to the acquisition and self-assessment of financial literacy offered by

strategic and other partners. At present, it is necessary to examine Internet resources in order to find out where and in what way it is possible to improve or check one's financial literacy knowledge. This would provide an opportunity to categorise the available information according to topics and target groups and spot the issues that need new activities/events for school learners/youth to obtain a complete opportunity to acquire financial literacy.

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THE STATE OF THE CROSS-BORDER ECONOMY IN THE BALTIC SEA REGION IN MODERN CONDITIONS

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Abstract. The current economic crisis has been caused by the constraints of the COVID-19 pandemic, which has weakened the state of the economy. This study aims to identify and describe the status and development of COVID-19 in the Baltic Sea Region and to identify the economic consequences and changes in the economy caused by the pandemic. The situation is exacerbated by the extreme uncertainty of the actions taken by the public administration in the border regions. These include, above all, the lack of concrete and transparent measures to impose quarantine in specific sectors, the forced restriction of the population's economic and commercial activities, the limitation of access to recreational areas for the entire population, the displacement to remote work and education, the closure of childcare and pre-school institutions. The scale and nature of the consequences of all these restrictions in different sectors and industries need to be clarified. All this adds to the complexity of developing specific measures to respond to the crisis in the prevailing conditions. There is an urgent need to recognise crises and new challenges in border regions, which rapidly change in pandemic conditions and affect people on both sides of the border. The well-established principle of a "Europe without borders" has been shaken, and countries that have abruptly closed their national borders have done so unilaterally. A multiple regression study of selected macroeconomic indicators of the COVID-19 pandemic is conducted. The scale and nature of the consequences of sudden border closures on population movement in the Baltic Sea Regions are shown. All these restrictions peaked in 2020; unfortunately, the COVID-19 spread has yet to improve. Government measures applied to overcome the crisis must therefore identify the most effective way to restore lost positions and outline the future development of the border regions.

Keywords: cross-border cooperation; cross-border region; COVID-19 pandemic; Baltic Sea Region; economic crisis

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1. Introduction

The state of the economy and the ongoing crisis showed that the countries in the Baltic Sea Region (BSR) were unprepared and did not understand how to deal with the pandemic at the beginning. In addition, many researchers have tried to make sense of the economic consequences of the COVID-19 pandemic and concluded that the pandemic crisis is a severe, multi-period exogenous shock (Ludvigson et al., 2020). Baker et al. (2020) note that COVID-19 caused a significant uncertainty jump, and no similar scientific study exists. The authors found that the COVID-19 pandemic shock caused an 11-12% year-on-year decline in GDP (Baker et al., 2020; Sforza & Steininger, 2020). Another fascinating study, conducted on a sample of 42 countries (mainly European), shows how coronavirus mortality levels affect GDP growth (König & Winkler, 2020). The researchers note that the severity of enforcement measures is essential for growth. For example, a change in the situation leads to a decline in GDP in the quarter studied but is associated with a positive catch-up effect in the following quarter. The impact of the crisis has enormous implications for the labour market, as the forced closure of enterprises leads to sharp unemployment and will have severe economic consequences in the long run (Adams-Prassl et al., 2020; Béland et al., 2020; Hennig, 2021).

The COVID-19 pandemic has classic and new unique features. Declines in production and international trade, financial turmoil and business tensions are classic features of any crisis. Declines in production and international trade, economic chaos and business tensions are classic features of any crisis. In the border regions, the problems associated with coronaviruses mainly concern the impediments to the movement of people at all levels and their isolation at different levels (country, city, town). Consequently, a large part of the production has been severely affected by the pandemic, and the decline in economic activity dependent on isolation measures is reaching impressive proportions. The pandemic affected almost the entire world economy, and the BSR was forced to impose severe restrictions, which led to a sharp decline in the production and exchange of goods.

2. Review of scientific literature and problem definition

The COVID-19 pandemic caused an economic crisis and had a significantly negative impact on economic activity, GDP growth and unemployment (Subramanian & Betty, 2022; Kip Viscusi, 2021; Kaplan et al., 2022). Research on countries in the Baltic Sea Region supports this conclusion (Ehlert, 2021). The author studied German regions, which showed inter-regional differences in socio-economic, demographic and health variables affecting the economy in the COVID-19 crisis. Marinov (2020) analyses some critical issues related to the country's socio-economic characteristics that affected the Denmark economy during the pandemic. Particular attention is paid to government measures in the labour market, household consumption and entrepreneurship. Hensvik et al. (2020), in their paper, show the changes caused by COVID-19 in the Swedish labour market. They give the example of a 40% decrease in vacancies in the first three months after the COVID-19 outbreak. The resulting tightness in the labour market has resulted in a shift in job search towards occupations less affected by the crisis, regardless of changes in job offers.

The Baltic Sea Region's economy is heavily influenced by micro and macroeconomic factors such as day trips, domestic tourism, and international travel, as well as segments such as air travel, public transport, cruises, hospitality, cafés and restaurants, sporting events, festivals and conferences. These business sectors suffered severe losses across the board, leading to a severe economic downturn in 2020.

The course of the crisis phenomena makes it possible to identify four factors of great importance for developing the BSR economies. The first factor is the decline in consumer behaviour, including for goods and services. This is a very heavy and difficult factor to overcome. The second is the decline in capital market investment and share prices. The next factor is a decline in government spending on all development items with a significant increase in

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new credit. The final factor is a decline in exports of domestically produced goods to international markets. Studies of the impact of the pandemic on the world economy confirm these estimates. Again, supply chains are shrinking, demand for goods, in general, is falling sharply and trade with significant exporters is declining (Ajmal et al., 2021; Vidya & Prabheesh, 2020). For countries in the Baltic Sea Region, assessments confirm the above rationale. Again, primary sectors related to the extraction and processing of raw materials and those related to product manufacturing and tertiary sectors representing services have been severely affected.

Another problem is the concept of a "Europe without borders", which lost meaning during the pandemic. The closure of borders and border controls changed the daily lives of many people living in and travelling to border regions overnight. Although the member states of the Schengen Agreement were able to temporarily suspend or reintroduce border control for the majority of the population in the border regions, the complete closure of the borders came as a shock (Jańczak, 2020). They found themselves cut off from their families and friends, education and work on both sides of the border. Many scholars point this out, and some write that COVID-19 brought unexpected and dramatic changes to the established political and economic system and to the tradition of managerial decision-making (Van Dam & Webbink, 2020; Will, 2020; Webb et al., 2022).

Some studies emphasise additional powers of public administration during a pandemic (Humer, 2020). In the countries of the BSR along the Denmark-German border, there was a "return of the state as a single entity, replacing the practice of multi-level cross-border governance" (Klatt, 2020; Henning, 2021). A similar situation developed on the Polish-German border. Germany also closed state borders and rightly questions to what extent territoriality threatened multi-level border management or to what extent state and economic actors could interact in cross-border cooperation under pandemic conditions (Opiłowska, 2020).

Cross-border cooperation on the German-Polish border has always served as an example for other countries, and the closing of the border came as a shock to many, as previously, local authorities and state institutions had always supported the inhabitants of border regions based on the ideology of a "Europe without borders". Cross-border cooperation in an integrated Europe has always been based on the "space of flows" (Castells, 1996). Naturally, borders are the most important objects of a sovereign state and are "organised around the exclusion of other" (Salter, 2021) subjects and populations. At the same time, states use borders not only to permit entry but also to protect other citizens from infection and to limit those who can spread the virus by crossing the border. Many public and state figures, as well as the population, criticised the authorities for closing the borders and demanded the abolition of the ban on border crossings between closed cities and settlements because, for them, before the closure of borders, there was a common space in which people lived and worked, infrastructure and other institutions functioned, which successfully contributed to their unification.

Many EU states, including the Baltic Sea Region, have decided to close their borders unilaterally. However, foreigners with residence or work permits were allowed to cross the borders. Many restrictions made crossing the border and professional activities virtually impossible (mandatory stay in a neighbouring country for 21 days followed by a two-week compulsory quarantine at home; workers had to submit to negative tests daily to cross the border). Most international and cross-border transportation services were interrupted. Cross-border workers, especially those employed in unskilled occupations, were the hardest hit by border restrictions. The remaining categories of cross-border workers were usually able to work from home. The closure of borders had a significant impact on the financial habits of many citizens, as access to some goods sold at a better price in neighbouring countries was suddenly prohibited. Tourism and the event industry were very much affected, as most of the events planned for the summer were cancelled (European Commission, 2021, 2022).

The examples of two Baltic countries, Sweden and Poland, can be cited here. Sweden, unlike many other countries of the Baltic region, did not impose a lockdown at the outset but retained most freedoms and opportunities for population movement. Many researchers and political actors admired Sweden's courage and

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cited it as an example. But when the number of cases of infection in Sweden rose sharply and the number of deaths increased, the Swedish political establishment officially declared such a policy wrong.

It was on 18 December 2020 that the government ordered strict quarantine measures, including the use of masks. The effectiveness of these measures was confirmed by the new pandemic wave (Q4 2021). Some Swedish researchers wrote that "the COVID-19 pandemic revealed deficiencies in the management and legal framework of health and social services, including lack of multisectoral coordination, accountability to multiple authorities at different levels (community, regional and central) who share responsibilities, and transparency in policy-making and decision-making processes" (Claeson & Hanson, 2021). As of 20 November 2020, COVID-19 had a mortality rate of more than 80,000, or 787 deaths per million population, dozens of times higher than in neighbouring countries. Following an analysis by the Swedish Academy of Sciences, recommendations were made to the government to introduce stricter quarantine measures. Although on 21 April 2020 deaths were recorded at a higher level than in the BSR, already in the autumn (October 2020), the Swedish government relaxed restrictions, increasing the number of people attending public events from 50 to 300 and allowing people over 70 to mix freely.

In Poland, the situation was somewhat different. The problem with the increase in infections and deaths caused by coronaviruses was that the government centralised the whole issue of the pandemic onto itself, removing local authorities from this vital element. In addition, the government frequently imposed and frequently withdrew, restrictive measures. Finally, migrant workers from other European Union (EU) countries, where the infection was extreme (red zone), gradually began to return to Poland, further increasing the number of coronavirus carriers. G. Kolodko made an excellent point about the mistakes made by governments and state authorities during the development of the pandemic. He writes that all the problems associated with an epidemic force political institutions to develop the capacity to confront challenges and conflicts of interest and to rise to the occasion when a pandemic is raging. "It is thus all the more important not to make mistakes on other fronts. The art is to recognise an error in advance" (Kołodko, 2020, p. 153).

There were other restrictive examples. The Baltic countries (Estonia, Latvia and Lithuania) reacted similarly to the first wave of the COVID-19 pandemic. All three countries took a highly centralised approach and introduced restrictive measures relatively early, with a state of emergency declared in each country after fewer than 30 reported cases. Due to the initially low incidence of COVID-19, the countries built testing capacity, contact tracing and infrastructure without subjecting the health system to a significant stress test in the spring and summer of 2020. However, problems with access to routine health services had already emerged. The countries of the Baltic Sea Region entered the pandemic with an unstable starting position, primarily due to smaller operating budgets and shortages of medical staff, which could have contributed to a more proactive response to prevent transmission during the first wave.

And one more point is vital in developing cross-border cooperation between the BSR. We are talking about seaports and adjacent areas – the hinterlands. Despite stringent restrictive measures, ports in the Baltic Sea Region have lost little in terms of cargo traffic, while hinterland ports have suffered significantly. Quarantine measures have been fully implemented in these areas. Many researchers suggest that the dynamics of Baltic ports in a pandemic will allow them to weather the crisis more calmly than other maritime activities. This fact makes optimistic sense and will encourage economic activity in the innovative and investment development of the coastal regions, increase wages, reduce unemployment and expand international trade (Bilczak et al., 2021).

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3. Research methodology

The study is based on an analysis of the causes of the crisis in the BSR. The impact of the crisis on the level of gross domestic product (GDP), exports, imports, unemployment rate, inflation growth and the economic sentiment index was studied. The study applied systemic, structural, factor and comparative analysis methodology, considering standard and available parameters. A multiple regression of selected macroeconomic indicators was developed.

A summary of data for the years 2017-2021 is presented. Individual lists of feature values were subjected to qualitative and quantitative analysis. In the structural analysis, as a reflection of the significant features in the sample structure, the sample structure was summarised and comparisons between samples were made using descriptive parameters. Individual value indices were determined based on classical and positional parameters. The averages describe common statistical characteristics regardless of the differences between the constituent units. They characterise the similarity of the sample due to the assigned variable (Okólski & Timofiejuk, 1981; Buga & Kassyk-Rokicka, 2008; Jóźwiak & Podgórski, 2012).

First, the data were subjected to Pearson correlation analysis and significance tests were performed to determine whether the test statistic fell within the critical area. This allowed us to determine whether the null and alternative hypotheses were rejected or accepted. Correlation analysis determines the strength of the relationship between variables and, in the case of a linear relationship between two variables, also the direction of that relationship. The Pearson correlation coefficient determines the direction and strength of the relationship between two measured variables. It takes values in the range <-1; 1>, with the closer to a value of 1 or -1, the stronger the relationship, and the closer to 0, the weaker the relationship.

4 Analysis of the Baltic Sea Region in crisis

It should be noted that the overall state of the economy and the course of the crisis showed that not only was the economy significantly affected (Susskind D & Vines, 2020; Padhan & Prabheesh, 2021), but also the social life of the population was significantly affected. The BSR pandemic has affected all countries, limiting the usual freedom of movement of goods, persons, services and capital (Medeiros et al., 2021; Opioła & Böhm, 2022; Capello et al, 2022). Exceptionally high costs have occurred in cross-border integration and internationalisation processes. Research shows that in the BSR, the course of the pandemic showed all the contradictions and possible costs that characterise this manufactured crisis (Table 1).

Table 1. Main characteristics of the spread of the epidemic in the Baltic Sea Region of the EU in 2022

Baltic Sea Region	Population at the beginning of 2022	The total number of detected	Number of cases per 100,000 people	Mortality	Mortality per 100,000 people	COVID rate per capita
Germany	83,155,031	26,809,245	32,235.55	139,807	123.33	0.32
Poland	37,840,001	6,010,090	15,833.47	116,371	224.26	0.16
Sweden	10,379,295	2,510,930	24,312.84	19,049	146.83	0.24
Denmark	5,840,045	3,143,392	53,984.54	6,404	50.01	0.54
Lithuania	2,795,680	1,064,064	38,082.67	9,155	267.62	0.38
Latvia	1,893,223	830,698	43,545.05	5,839	221.84	0.44
Estonia	1,330,068	577,655	43,466.17	2,574	136.19	0.43
Finland	5,533,793	1,114,573	20,172.2	4,714	24.54	0.20

Source: author's research based on World Health Organization data

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The table shows that Denmark, Latvia and Estonia have the highest number of cases per 100,000 people (53,984.84; 43,545.05 and 43,466.17, respectively), although detected COVID-19 cases are highest in Germany and Poland. However, the most objective indicator that characterises the pandemic's state and course is the mortality rate per 100 thousand people. Therefore, Lithuania and Poland (267.62 and 224.26, respectively) are ahead of other countries in the Baltic Sea Region. This indicator is exceptionally hard for the population and clearly shows that public administration bodies and other state institutions are not fully coping with the epidemic. The development of coronavirus COVID-19 is confirmed by indicators of 2021. For all countries of the Baltic region, mortality rates show that the pandemic is increasing significantly, including through the emergence of new strains.

The economic consequences caused by the artificial reduction and sometimes closure of sectors and individual branches of industry in the countries of the BSR of the European Union have led to severe economic, social and human consequences. The countries of the Baltic region and all EU territories were marked according to the situation, which is related to the number of cases of COVID-19 virus infection. With 50 cases per 100,000 population – red zone; from 25 to 50 cases per 100,000 population – orange zone; below 25 cases per 100,000 population – green zone. The analysis of this marking was considered for 14 days. This approach (right-wrong) influenced public administration decision-making. At the same time, the measures taken to restrict freedom of movement, especially the closure of borders, had a negative impact on economic development. The actions taken to limit freedom of movement, especially the closure of borders, hurt the development of the economy.

It should be noted that during the COVID-19 pandemic, hotel and transportation services were most severely affected in 2020. Hotel accommodation services fell by 85% and air transportation services by 77%. Unfortunately, these industries still face several limitations. By the end of the year, air transportation services were 33% and hotel accommodation services were 57%. Enterprises working in the field of tourism were also significantly affected by the development of the crisis. In 2020, the number of international tourists arriving in the Baltic Sea Region, including the EU, decreased by 87% compared to the previous period. Also, the number of domestic tourists decreased by 81% (Eurostat, 2020).

The overall economic situation in the Baltic Sea Region is significantly influenced by inflation. The inflation growth is closely related to the policies of central banks and governments, as massive measures have been taken to support the economy in the crisis. In the countries of the Baltic Sea Region and the European Union as a whole, an outbreak of infection became a deflationary factor due to the pandemic. However, the emergency measures mitigated deflationary forces, which could lead to excessive inflation.

It has long been noted in the economic literature that the corridor between the deflation trap and the inflation trap is very narrow, and this is due to the low central bank rate, which tends to be close to the reverse rate. In this case, deflation looks like a liquidity trap, with the population increasing savings (in the face of uncertainty) while reducing consumption, which in turn puts downward pressure on prices. In contrast, the inflation trap increases consumption, accelerating the rate of price increases. In addition, the population can invest more in foreign currency, which simultaneously weakens the national currency and fuels inflation.

In the countries of the Baltic region, severe restrictive measures and adverse economic effects contributed to the inability to purchase goods and services related to anti-pandemic restrictions. The growth of inflation in 2020 decreased in all countries, except Poland (Eurostat, 2022). All this is because the reduction in income and the desire of the population to save money has led to the rate of turnover of money in the economy falling.

Here we should remember that the population will eventually return to restaurants, stores, movies and theatres, resume travel, and the unemployed will find new jobs. In the long run, it can be expected that pent-up demand in the Baltic region will lead to a surge in spending and inflation after the pandemic. However, the measures taken to

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support the main sectors of the economy, as well as the state of the labor market, prices for raw materials and food, and high unemployment (there will not be a strong increase in wages), the impression is that after the pandemic a surge in inflation is likely to be short and not very large (Fig. 1).

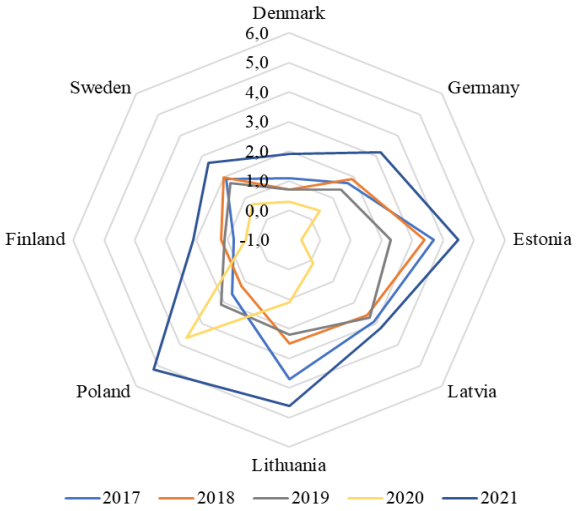


Figure 1. Inflation rates of the Baltic Sea Region in 2017-2021, %
Source: author's research based on Eurostat data

It should be noted that the highest annual inflation rates in 2021 were in Poland (5.2%), Lithuania (4.6) and Estonia (4.5). The lowest rates were in Denmark (1.9), Finland (2.1), Sweden (2.7), Lithuania (3.2) and Germany (3.2).

The course of COVID-19 pandemic has seriously affected the mood of economic actors. The study analysed economic sentiment indicators in the Baltic region's countries. At the beginning of the pandemic, the economic sentiment indicator (which shows the economic climate in the European Union) fell to 50 points. This was the sharpest drop since 1985, and since then the BSR has shown signs of recovery (Fig. 2).

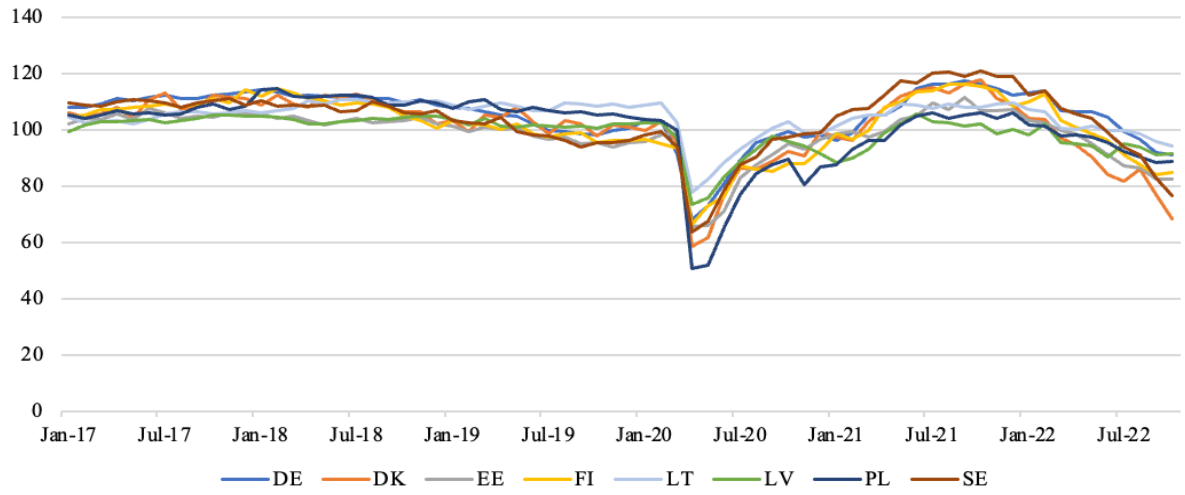


Figure 2. Economic sentiment indicator of the Baltic Sea Region 2017-2021
Source: author's research based on Eurostat data

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The economic situation in some industries is assessed as difficult. The most pessimistic assessments are presented by companies operating in accommodation and catering, construction, and t**ra**nsport. At the beginning of the 2020 pandemic, the economic climate in these sectors was assessed worse than in other sectors of the economy. At the end of the year, all sectors had improved, although the overall economic climate was still negative compared to 2019.

A survey of selected macroeconomic indicators was conducted to more accurately assess the state of the crisis caused by the pandemic (Table 2).

Table 2. Pearson correlation coefficient and significance tests for selected macroeconomic indicators in the BSR in 2020

Baltic Sea Region	GDP, million euros	Exports, million euros	Imports, million euros	Trade balance	Unemployment rate, %
Germany	3,367,560.00	1,462,090.00	1,269,289.00	206,966.16	3.7
Poland	526,445.20	294,182.30	258,641.50	13,713.28	3.2
Sweden	475,666.10	212,050.30	190,001.40	5,351.88	8.5
Denmark	312,516.60	171,513.90	151,354.00	10,223.83	5.6
Lithuania	49,507.20	36,388.50	31,791.40	-507.89	8.5
Latvia	29,456.80	17,803.20	17,457.10	-2,125.76	8.1
Estonia	26,834.50	19,099.70	18,970.30	-982.21	6.9
Finland	237,995.00	85,104.00	84,537.00	-2,545.48	7.7
n	**α**	$\rho_{XY} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{n\sigma_X\sigma_Y}$			
8	0,05	0,9986	0,9988	0,9931	-0,6080
$T_{1-\frac{\alpha}{2},n-2}$	**c**	$t = \frac{r_s\sqrt{n-2}}{\sqrt{1-r_s^2}}$			
2,45	(-∞;-2,45)∪(2,45;∞)	46,90	49,44	20,75	-1,88

Source: author's research

Analysing the data, it can be determined that the correlation of exports, and imports, as well as the trade balance in correlation with GDP has a similar course and strength. There is a strong monotonic relationship with a positive direction between GDP and the aforementioned indicators, which means that as they increase in a country, the value of GDP also increases. In these three cases, the determined test statistic also falls within the critical area, which allows the rejection of the null hypothesis. The unemployment rate, expressed as a percentage, had the lowest, moderate monotonic relationship, and the determined test statistic was outside the critical area, resulting in acceptance of the null hypothesis and rejection of the alternative hypothesis. From the data, too, one can see the disparity between the level of development of economies during the pandemic.

The lowest unemployment rate in 2020 was recorded in Poland and Germany, while the highest was in Sweden, Lithuania and Latvia. The author compiled a detailed comparison of the mentioned countries in the following section. The study of the shape, direction and strength of the stochastic relationship between variables for which we assume a linear relationship can be carried out using a regression module for this purpose. The multivariate regression module was created in the study, using selected macroeconomic indicators that describe and affect GDP (Table 3).

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Table 3. Multiple regression of selected macroeconomic indicators during the COVID-19 pandemic

Regression statistics	
The multiple of R	0,999987
R square	0,999973
Fitted R square	0,999938
Standard error	8841,003
Observations	8

Analysis of variance

	df	*SS*	*MS*	*F*	*Relevance F*
Regression	4	8,84E+12	2,2111E+12	28288,25	3,41E-07
Residual	3	2,34E+08	78163331,56		
Total	7	8,84E+12			

	Coefficients	*Standard error*	*t Stat*	*Value-p*	*Bottom 95%*	*Top 95%*
Intersection	-171535	20414,06	-8,402809758	0,003536	-236502	-106569
Export	-7,72333	1,115393	-6,924318246	0,006175	-11,273	-4,17366
Imports	11,06535	1,2406	8,919350213	0,002973	7,117206	15,01349
Unemployment rate	18711,97	2447,866	7,644194656	0,004649	10921,76	26502,17
Hadl balance	3,463434	0,454159	7,626040201	0,004681	2,018098	4,90877

Source: author's research

The error of estimates of the free expression and the regression coefficient is Sa= 20414.06%, Sb=1.12%, Sc=1.24%, Sd=2447.87%, Se=0.45%, respectively. The calculated multiple regression function is a good fit to the empirical data, the coefficient ϕ^2=1-0.999973=0.000027. The value of the *F statistic* and the corresponding test probability level *p* confirm a statistically significant linear relationship. In addition, the *t* statistic values indicate that the free expression and regression coefficients are significantly different from zero. Rejecting the null hypothesis H_0 that there is no relationship between the variables under study will commit an error with a probability of 0.00035.

Interpreting the estimated value of assessments of individual parameters, we can conclude that an increase in exports by one unit during the pandemic will cause a decrease in GDP by 7.7% on average, with the values of the other independent variables unchanged, the *ceteris paribus* rule. In contrast, an increase in imports by one unit will increase GDP by 11.1% (also with the values of the other variables fixed), and an increase in the trade balance by 1 unit will increase GDP by 3.7% (also with the values of the other variables fixed).

The unemployment rate, defined as the percentage of the working-age population without a job, fell from 6.3% in 2017-2019 to 5.2 the year before the pandemic. In 2020, due to economic uncertainty, or a production constraint, the average unemployment rate rose to 6.4% and gently declined by 0.2% the following year. The highest value in the year of the pandemic outbreak was in Lithuania and Sweden, where the unemployment rate was 8.5% and 8.3%, respectively. In Sweden, by contrast, there is no downward trend. The unemployment rate in 2021, relative to the previous year, increased by 0.5%.

The most significant increase in the unemployment rate is in Poland, where the downward trend continued until 2020, only to increase by 58% in 2021. This is the only such case among the countries analysed. The distribution of the unemployment rate in the year of the COVID-19 pandemic outbreak among all nine countries studied is characterised by a solid leftward asymmetry negative to the average unemployment rate, as Vs=-0.66.

In the other periods studied, the asymmetry has different directions. In 2017 it was weak right-handed, while in the other years, it was left-handed negative. The difference in the negative periods is only in its strength. In the year of the pandemic, it is strong, while in the other years, it is moderate. The highest value of the coefficient of

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variation was recorded in 2020, with a coefficient equal to 31%, indicating that the moderate trend of variation in terms of the unemployment rate was sustained. In 2021, the 25% of states with the lowest unemployment rate achieved a score of 5.2%, and the 25% of states with the highest rate received a score of 7.6%.

Real GDP is a good measure of a society's standard of living. Countries with high GDP per capita have better education and health systems, more educated citizens, better housing, better nutrition, longer life expectancy, etc., so a higher GDP per capita generally means a higher level of per capita consumption (Fig. 3).

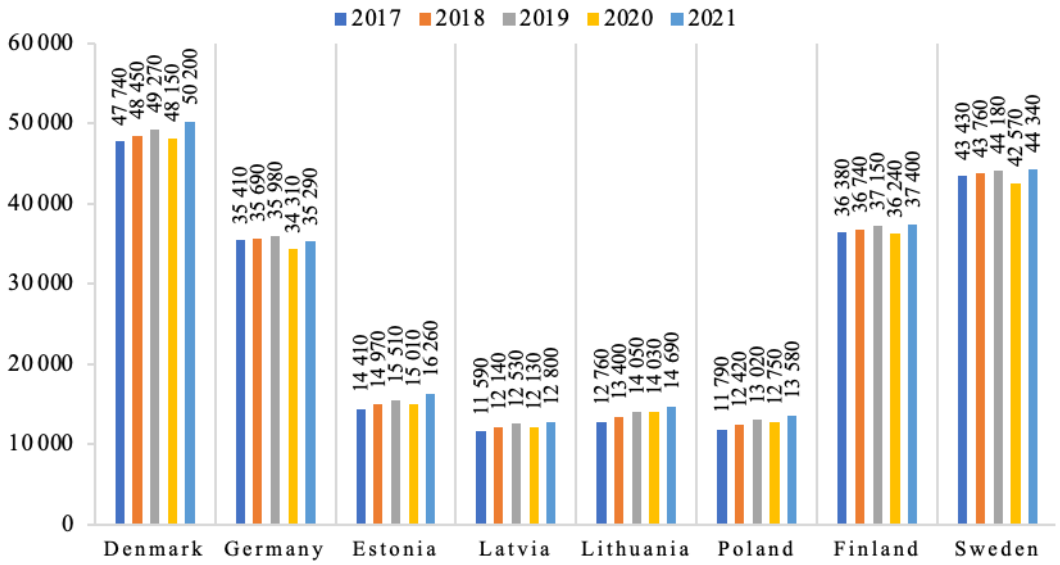


Figure. 3 Real GDP per capita of the Baltic Sea Region 2017-2021, euros
Source: author's research based on Eurostat data

However, this indicator needs to inform us about at least the value of leisure time, the quality of the environment, and the value of goods and services produced by households for personal use and not sold on the market. Analysing the statistics, it can be seen that real GDP among the surveyed countries year-on-year recorded a decline in 2020 to 46%. Referring to individual countries, the most significant decrease was recorded in Germany, Lithuania and Sweden.

In the following year, all countries experienced recovery, so real GDP increased. The worst performance was in Lithuania, where there were no significant differences. There was a slight variation in real GDP among countries in general. The differentiation against all countries was strong in the nominal GDP. In the case of a country-by-country analysis over the years, the greatest differentiation in terms of the studied characteristic was noted in Lithuania and Estonia. If we notice an increase in real GDP, we are sure that goods and services have increased since they are measured based on prices occurring in the selected base year. Thus, real GDP is a better measure of an economy's output than nominal GDP.

The countries of the BSR are heterogeneous in terms of the number of exports. Among the studied Baltic Sea Region, the average exports in these countries in 2017 amounted to 314,799.14 million euros and successively increased. The highest export values in the period under study were in Germany, where the average export amounted to 1,708,564.54 million euros. In last place is Latvia, with exports in 2017-2021 at 19,815.39 million euros. A noticeable decline in average exports in all countries was recorded in 2020. The following year, average

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exports increased by 61,252.06 million euros compared to the previous year. The average deviation in 2020 from average exports equal to 310,523.65 million euros was 490,130.28 million euros, with a coefficient of variation equal to 158%, indicating strong export differentiation among the surveyed collective.

The difference in the number of exports between the best and worst exporting countries was 1,559,829.74 million euros, and the interquartile deviation value of 273,282.97 million euros shows the largest export difference between 50% of the BSR. The distribution of exports in the year of the outbreak of the COVID-19 pandemic among all nine countries studied is characterised by a strong rightward asymmetry concerning average exports, as Vs=2.83. In the other periods studied, the asymmetry also has a strong rightward positive distribution. The lowest value of the coefficient of variation was recorded in 2021, with a coefficient equal to 153%, indicating that the trend of strong differentiation in terms of exports was sustained. The typical export in this group in 2021 is an export in the range of -196,753.30 million euros to 940,304.70 million euros, so relative to previous years, the typical area of variation is more significant due to the recovery in this sector.

Analysing imports, a similar trend can be observed. The average imports in 2017-2019 were increasing. With the advent of the pandemic, it was recorded as declining. Average imports in 2020 amounted to 266,649.50 million euros, to increase significantly in the following year, even above the state of the years before Covid-19. In 2021, average imports increased by 52,541.41 million euros and amounted to 319,190.90 million euros. Half of the countries surveyed in 2020 imported 163,462.32 million euros, and the other half at least 163,462.32 million euros. In the following year, half of the countries imported at most 191,647.73 million euros, and a half at least 191647.73 million euros, which, in about previous years, indicates an economic recovery in this area. Typical imports in this group range from -158,068.25 million euros to 691,367.24 million euros.

The distribution of imports in the year of the outbreak of the COVID-19 pandemic among all nine countries studied is characterised by a strong right-handed asymmetry concerning average imports, as Vs=2.72. The asymmetry also has a strong right-handed positive distribution in the other periods studied. The lowest value of the coefficient of variation was recorded in 2021, with a coefficient equal to 157%, indicating the continuation of the trend of solid differentiation in terms of imports. There needs to be the unification of export and import performance, and the situation of the BSR continues to diversify. The directions of change, on the other hand, are the same. The determined Pearson linear correlation coefficient of exports and imports at a level close to 1 indicates a solid positive relationship. Changes in the value of exports are 99.7% determined by changes in imports and 0.3% by changes in other random or non-random factors. With an increase in imports of $1 million, one can expect an increase in the value of exports of 0.8489 million on average.

5. Conclusions

Our research confirmed that the economy and social life of the population were significantly affected during the pandemic. A review of the scientific literature has shown that researchers are seriously concerned about the measures taken to eliminate the costs of the pandemic on economic sectors and industries. The article's empirical part describes the pandemic's main features in the countries of the BSR. The impact of the crisis on GDP, an indicator of the general business climate under crisis conditions, is shown. Special attention is paid to unemployment and the decline in economic activity. Unfortunately, measures taken to reduce employment have not been as effective as predicted in all forecasts.

The pandemic has led to significant changes that have resulted in corresponding restrictions and quarantines. However, this is only part of the problem, which has affected people on both sides of the border and many sectors of the economy—most notably transport and tourism, accommodation and catering. There is much to be done to eliminate these distortions. A system of economic and economic continuity will need to be established, and those in power will need to focus on preventive measures to restore normality in health facilities quickly.

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In addition, the pandemic in the Baltic Sea Region poses a real threat to socio-economic development. There are countries where the coronavirus has had the most damaging consequences. This is particularly true in Sweden, where initially no restrictive measures were introduced, but after a dramatic increase in infections and deaths, the political institutions recognised their mistake and the government introduced quarantine measures and closed the border. In Poland, the situation also changed in the stages of the spread of the coronavirus. The government introduced prohibition measures, lifted them, and loosened controls on compatriots arriving from red zone countries.

The closure of state borders led to the cancellation of many planned projects, events and meetings. As a result, most organisers and institutions supporting the development of projects, scientific progress and cross-border exchanges were forced to change their planning and funding conditions, as well as to use digital technologies and organise important meetings and events online. Undoubtedly, this has had some impact on cross-border cooperation, which in the pre-pandemic era functioned successfully and had the desired effect. Above all, however, the article shows that the unshakeable thesis of a "Europe without borders" has lost its relevance. In our view, there is much work to be done on both sides of the border to address the consequences of border closures and quarantine restrictions.

Currently, the countries of the Baltic Sea region are facing new challenges that test the basic mechanisms of functioning in a crisis. It is essential to note that the lessons of the pandemic have contributed to the unity and integration of the BSR and the EU as a whole. There is reason to believe that the ongoing pandemic processes will be effectively eliminated. However, industries and sectors disrupted by the pandemic (due to the emergence of new virus strains) will need to be rebuilt at an accelerated pace. Public administrations can use the study to diagnose cross-border cooperation processes during the recovery from a post-pandemic crisis.

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FINANCIAL PLANNING IN SLOVAKIA: RESULTS OF EMPIRICAL RESEARCH *

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Abstract. In this paper, we have highlighted one of today's most critical issues: financial literacy and its importance in our lives. According to several studies, financial literacy needs to be at the appropriate level, not only among the younger but also among the middle and older generations. Financial literacy is the knowledge that allows people of different ages to understand the workings and importance of finances. It helps people make the right decisions in appropriate situations. Finance is a part of everyone's life. Daily, we perceive their importance concerning current spending and the financial concepts to which people are exposed at every step. We have analysed the population's financial literacy and financial planning, which contains Slovakian households, especially in the case of the young generations. Our goal was to have a sample size of at least 400 people, and our sample size was 463 people. As we applied snowball sampling, our research can not be considered representative. Collected data were analysed in statistical software and commented. While the older generation is more attentive to planning for their retirement, even if they cannot always stick to the plan they have set, they also design their spending goals to a greater extent.

Keywords: finance; financial literacy; financial planning; financial concepts; Slovakia

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1. Introduction

The importance of financial literacy is increasing as the expected lifetime of the population is rising, as the fertility ratio is decreasing, and as a result, even less population has to generate a higher value of pension covering the spending of the ageing population. Furthermore, the increasing inflation is impairing the importance of savings generated in their active life. In these circumstances, conscious financial decisions seem more critical than ever. We are curious about the background of financial decisions of focus on the younger generations of Slovakian households in our work. We focus on their interest in financial planning for retirement and their spending habits. We were interested in working on this topic because of its topicality and the enrichment of personal experience, as this topic affects everyone. It was interesting for us to pay more attention. This work aims to assess financial behaviour planning and spending to use this data to provide additional interesting information for those attracted to the finance world. We highlight the importance of financial literacy and interest in managing retirement savings at a young age.

There needs to be more academic work on financial planning for Slovak residents. Our work explores the topic's importance and the need for further research to improve financial literacy and financial planning in Slovakia.

2. Theoretical background

Financial literacy

As we have already noted, people mismanage their money and lack knowledge of basic economic concepts. This phenomenon can be related to poor financial literacy (e.g. Dvorsky et al., 2018). In doing so, however, they must consider changing economic conditions and life events. The authors have derived this definition from five behavioural categories that allow us to understand the breadth of financial literacy. Firstly, it is the knowledge of economic concepts and the ability to communicate them; the application of this knowledge requires the ability to manage personal finances by performing money-related tasks (such as earning money, spending money and saving money (Simionescu et al., 2018). Another manifestation is the ability to make appropriate decisions by thinking critically and considering the consequences of a decision concerning one's values, needs and goals; finally, confidence in planning effectively for future financial markets is essential (Hershey et al., 2012; Andrejovská, 2019; Karas & Režňáková, 2021; Cabagnols et al., 2022).

Financial literacy in Slovakia

Financial literacy is one of the skills we need for life. It is 'the ability to use knowledge, skills and experience to manage one's financial resources effectively to ensure the financial security of oneself and one's household throughout life' (National Financial Literacy Standard, version 1.2, p. 3). Household facts in Slovak conditions are analysed in the papers of Šubová and Buleca (2020), Šubová et al. (2021),

Raising the population's financial literacy level is also one of the state's priorities. In 2008, the Government of the Slovak Republic approved the document "Proposal for education in the field of finance and personal finance management", based on which the National Standard of Financial Literacy was developed, which has been in force since 1 September 2017 in version 1.2 (MoF SR). The Ministry of Education, Science, Research and Sport of the Slovak Republic approved the document. It was prepared in cooperation with the Ministry of Finance of the Slovak Republic. It defines the scope of knowledge and skills in financial education and personal finance management. The document (National Financial Literacy Standard, version 1.2, p. 3) states that graduates of secondary school should be able to: search, evaluate and use financial information, know the basic rules of financial management, identify risks in financial management, set financial targets and plan to achieve them, develop the ability to earn and save their own income, use efficiently financial services, meet financial

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obligations, improve and protect their property and the assets entrusted to them, understand and address the basic human and economic needs of individuals, families and businesses, appreciate the success of their own self-realisation, and be inspired by the examples of successful personalities, understand the basic concepts of each topic, navigate the financial market, be aware of consumer protection issues and be able to exercise these rights, understand the rights, obligations, benefits and risks of being an entrepreneur, draw up and present a business plan, think strategic etc.

The development of financial literacy in schools has been an issue in recent years. In the days of compulsory schooling for today's adults, almost no attention was paid to the subject. However, finance is an integral part of the market economy based on which our society operates. Therefore, it is crucial to handle them correctly in different situations in life. Financial literacy is also closely linked to several competencies considered essential for personal satisfaction and development, active citizenship, social inclusion and employment in the countries of the European Union.

Financial literacy is one of the skills that are particularly desirable for the fulfilment of entrepreneurial competencies. Its development is linked in particular to the ability to understand written texts, use different types of information sources, critical thinking skills, mathematical competencies or digital competencies.

The Slovak Republic, like other countries, bases the development of the financial literacy of its citizens primarily on the recommendations and documents of the OECD and the European Union. The documents published by the International Financial Education Network (INFE), established within the framework of the OECD, inspired the government's proposal, which resulted in the NSFG.

Both the OECD and the EU support their Member States in implementing national strategies to improve financial literacy and recommend introducing financial education in schools and promoting financial education for the general public.

Our current cultural beliefs will influence our future financial habits, so it is important to assess our current habits as soon as possible so that we can change them if necessary, to ensure that we can pass on better financial literacy to future generations (Setiawan et al., 2020).

Financial planning

The 2018 OECD survey introduces the concept of financial stress resilience as a new element in the measurement: this includes financial planning, regular monitoring of the economic situation, debt management and bankruptcy knowledge (Khan et al., 2020; Ključnikov et al., 2022), and the building up of reserves, or "financial cushions". Hungarian adults report very low-stress tolerance in most areas, below average. Still, most interestingly, 34.8% of Hungarian adults surveyed have only enough financial reserves for one week in case of a loss of income. This may indicate a lack of or inadequate savings management and a long-term perspective among the adult population (Klapper & Lusardi, 2020; Lusardi, Hasler & Yakoboski, 2021; OECD, 2020).

Financial behaviour involves many human activities. Managing economic income and achieving financial goals form the basis of financial behaviour and decision-making. It requires many competencies such as critical and strategic thinking, knowledge and consideration of risk-taking propensity, and last but not least, knowledge of financial planning, investing and many other principles.

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Strategic thinking focuses on future and long-term goals that are very different from the present, and there are many ways to achieve these goals. Strategic thinking synthesises intuition and creativity and also aims to lead to new assumptions and alternatives (Ead et al., 2021). Investing is often confused with financial planning while investing is only one activity of financial planning and aims to achieve long-term financial goals (Konečná & Andrejovská, 2020).

Gallego-Losada (2021) points out that the burst of the crisis of COVID-19 drew attention to issues raised by a lack of financial literacy since the failure to manage personal financial responsibility may result in long-term consequences for individuals and the entire society. The authors assert that citizens must be prepared to take on greater responsibility to make informed decisions about their retirement.

A separate strand of literature is devoted to the financial literacy of young adults. She, Waheed, Lim and E-Vahdati (2022) stress that economic well-being among young adults is an emerging and essential field of research. They point out that the well-being of this social group is affected by numerous factors, including skills, attitudes and financial practices. Zhang and Fan (2022) investigate the relationships among financial capability, financial education, and student loan debt outcomes. Gedvilaite et al. (2022) studied the sustainability literacy and financial literacy of young people in the Baltic States.

Vazquez-Alonzo, Garcia-Santillan and Molchanova (2022) focus on the saving habits of high-school students associated with their future retirement. Their most essential findings highlight significant part of the population analysed is unaware of basic concepts such as retirement age and institutions for retirement.

Richardson et al. (2022) analyse the interrelations between financial literacy and retirement spending of university students. The results demonstrated that there needed to be more understanding of the costs of living and the characteristics of the different pillars of the Australian retirement system. The authors stress the increasing role of knowledge and skills in the financial literacy of Australian young adults.

Self-evaluation of own literacy of young people may differ from evaluation from outside (Dundure & Sloka, 2021). Undoubtedly, the financial literacy of young people is very important for their well-being in older age (Bongini & Cucinelli, 2019). Alas, economic behaviour and attitudes peculiarities still have to be investigated more thoroughly. This research is devoted to filling in the indicated gap.

3. Research objective and methodology

As the research focuses on the financial knowledge and financial literacy of the younger generations of Slovakian households, our goal has been to reach many members of the target group and get quantitative results that could be the basis of our conclusions. To obtain quantitative results, we decided to apply quantitative research.

As primary research, a questionnaire has been applied to our study. In Horváth's formulation, one of the most critical moments of questionnaire design is the search for indicators. In this work, brainstorming can help researchers (Horváth, 2004). According to Morgan, it is worthwhile to create 3-5 focus groups on a topic (Morgan, 1997). To find the indicators, we conducted 4 focus group discussions with employees of different organisations, with 10 employees per group. According to Vicsek (2006), a focus group is a research method in which data are generated in such a way that the subjects of the research communicate in a group about a given topic. These preparatory discussions helped to understand the research problem better. Following the talks, our questionnaire was compiled, including the structure, the choice of the type of questions, the order of the questions and the layout of the questionnaire. Through the questionnaire, we have analysed the population's financial literacy and financial planning, which contains Slovakian households, especially in the case of the young generations. Our goal was to have a sample size of at least 400 people, and our sample size was 463 people.

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In the case of our research, the population contains the members of Slovakian households. We also determined another requirement: the age of the target group members has to be at least 18 years because adults have salaries – in the case of students, they have scholarships and student loans – that is why they have to make financial-related decisions. However, our research focuses on financial literacy in the case of the young generations, but we would like to compare the financial literacy of the young generations with the financial literacy of the old generations; that is why we did not determine any other strict requirements towards the population regarding the age.

Based on their guidelines, our goal was to reach at least 400 target group members. We decided to share the questionnaire via the Internet. We composed the questionnaire in Google Forms and shared it online in January: we shared it in some Facebook groups, forwarded the link to our relatives and friends, and asked them to forward it to their friends who are members of our population. As we applied snowball sampling, our research can not be considered representative, but our sample size was 463 people, which is enough to investigate the investigation. Research data was analysed in statistical software and presented by figures.

3. Results and Discussion

Financial planning

In the next part of the questionnaire, we asked the respondents about their habits regarding financial planning. Only one-quarter of the answerers (26.8%) have tried to calculate how much their household should save for retirement, but most have yet to figure it out (Figure 1).

Have you ever tried to calculate how much your household should save for retirement?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	124	26,8	26,8	26,8
	No	339	73,2	73,2	100,0
	Total	463	100,0	100,0	

Figure 1. Have you ever tried to calculate how much your household should save for retirement?

Source: primary research, own calculation

Investigating the answers by generation, we can see that in the case of the members of X generation, almost half of the respondents (41.7%) have ever tried to calculate how much their household should save for retirement. In the case of the younger generations, this ratio is lower: it is 27.5% in the case of the members of the Y generation, and it is only 2.1% in the case of the members of the Z generation.

According to the null hypothesis of the Chi-Square Tests (Figure 2), there is no relationship between the two variables: generations and whether the participants have ever tried to calculate how much their household should save for retirement. The value of Pearson Chi-Square is 21.449; its significance level is 0,000, which is lower than the significance level of 0,05, which is why we reject the null hypothesis. It means that there is a relationship between the two investigated variables.

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Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	21,449[a]	2	,000
Likelihood Ratio	27,925	2	,000
Linear-by-Linear Association	20,090	1	,000
N of Valid Cases	463		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 12,59.

Figure 2. Chi-Square Tests

Source: primary research, own calculation

The significance of Phi is 0.000, which confirms the relationship between the two variables. The Phi value is 0.215, indicating a weak relationship between the two investigated variables (Figure 3).

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	,215	,000
	Cramer's V	,215	,000
N of Valid Cases		463	

Figure 3. Symmetric Measures

Source: primary research, own calculation

We also asked the respondents whether they had planned to save for retirement. Only 25.5% of them answered "yes" to this question, meaning that most of the answerers haven't ever made a plan to save for retirement (Figure 4).

Have you ever made a plan to save for retirement?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	118	25,5	25,5	25,5
	No	345	74,5	74,5	100,0
	Total	463	100,0	100,0	

Figure 4. Have you ever made a plan to save for retirement?

Source: primary research, own calculation

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In the case of the members of the X generation, the ratio of the respondents who have ever made a plan to save for retirement was 16.7%. In the case of the members of the Y generation, the ratio was 28.7%, and it was 12.8% in the case of the members of the Z generation.

According to the null hypothesis of the Chi-Square Tests (Figure 5), there is no relationship between the two variables: generations and whether the participants have ever made a plan to save for retirement. The value of Pearson Chi-Square is 8.340; its significance level is 0,015, which is lower than the significance level of 0,05, which is why we reject the null hypothesis. It means that there is a relationship between the two investigated variables.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8,340[a]	2	,015
Likelihood Ratio	9,150	2	,010
Linear-by-Linear Association	,023	1	,879
N of Valid Cases	463		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,98.

Figure 5. Chi-Square Tests

Source: primary research, own calculation

The significance of Phi is 0.000, confirming the relationship between the two variables. The Phi value is 0.134, indicating a weak relationship between the two investigated variables (Figure 6).

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	,134	,015
	Cramer's V	,134	,015
N of Valid Cases		463	

Figure 6. Symmetric Measures

Source: primary research, own calculation

In the following question, we asked the participants who had ever made a plan to save for retirement. We wanted to know how often they could follow their plan to save for retirement. The Statistics Table (Figure 7) provides information about the valid and missing answers: we got 301 responses, and 162 people did not answer this question. We asked the respondents to mark their answers on a 5-point Likert scale, between always (1) and never (5). As this is a Scale variant, we were able to calculate the mean, the median, the mode and the standard deviation. The mean is 2.5748, which is lower than 3 and means that the answerers could instead follow their

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retirement plan. The median represents "the midpoint of the frequency distribution, " 2.00. The mode is also "2": it is the most common answer, meaning that most respondents could follow their retirement plan. The last information which can be seen in the table refers to standard deviation, and it is 1.23770. It expresses how much the sample members differ from the sample's mean.

Frequencies

Statistics

If you made a plan to save for retirement, how often could you follow the plan?

N	Valid	301
	Missing	162
Mean		2,5748
Median		2,0000
Mode		2,00
Std. Deviation		1,23770

Figure 7. If you made a plan to save for retirement, how often could you follow the plan? – frequencies, statistics

Source: primary research, own calculation

Of the most answerers, 43.5% marked "2", meaning they usually could follow their plan to save for retirement. 16,9-16,9% scored that they always followed their goal or could follow it moderately. Less than one-quarter of the answerers mentioned that they couldn't follow their retirement plan: 10.3% sometimes could follow it, but 12.3% could never follow it (Figure 8).

If you made a plan to save for retirement, how often could you follow the plan?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	51	11,0	16,9	16,9
	2,00	131	28,3	43,5	60,5
	3,00	51	11,0	16,9	77,4
	4,00	31	6,7	10,3	87,7
	Never	37	8,0	12,3	100,0
	Total	301	65,0	100,0	
Missing	System	162	35,0		
Total		463	100,0		

Figure 8. If you made a plan to save for retirement, how often could you follow the plan?

Source: primary research, own calculation

We also investigated the numbers based on the generations. In the case of the members of the X generation, the most answerers – their ratio was 50% – chose 3 for this question which means that they could follow their plan

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moderately. Approximately 10% of them could follow the plan and 40.0% usually followed it. There was nobody among the members of the X generation who sometimes followed their plan or could never follow it.

Regarding the members of the Y generation, almost half of the answerers (47.2%) of the answerers usually could follow their plan. The ratio of the answerers who always could follow it was 17.0%, while 6.8% could follow it moderately. Approximately one-quarter of the respondents could not follow their plan to save for retirement: 10.3% of them sometimes could follow it, but 15.7% never could follow it. In the case of the members of the Z generation, the ratios are the following: almost two-thirds (62.5%) of the respondents could follow their plan to save for retirement moderately while the remaining 37.5% could follow their plan.

In the case of this question, we could not apply Chi-Square Test and Phi Test concerning the Crosstable to analyse the relationship between the dependent variable and the independent variable because 26.7% of the cells have an expected count of less than 5.

In the following question, we asked the sample members about the frequency of tracking their spending. They could mark their answer on a 5 point Likert scale between always (1) and never (5). As the Statistics table (Figure 9) presents, all 463 respondents provided their answers. The mean was 2.3089, meaning the respondents usually track their actual spending. Both mode and median are 2.0, meaning that most of the answerers chose "2" for this question, and this value divides the answers into two parts based on their frequency. The standard deviation is 1.04740, which is lower than it was in the previous question.

Statistics

How often do you track your actual spending?

N	Valid	463
	Missing	0
Mean		2,3089
Median		2,0000
Mode		2,00
Std. Deviation		1,04740

Figure 9. How often do you track your actual spending?

Source: primary research, own calculation

If we investigate the answers in detail, we can see that more than one-third of the respondents usually track their actual spending (Figure 10). The ratio of people who always follow their existing spending is equal to those who track it moderately: both ratios are 23.5%. 10.8% of the answerers sometimes track their actual expenditure, and only 3.2% said they never followed their actual spending.

We also prepared a Crosstable to investigate the answers based on the generations. In the case of the members of the X generation, half of the respondents usually track their actual spending. The other half can be divided into two parts: 25% of the answerers always track their actual expenditures, and 25% track them moderately. There was nobody among the members of the X generation who followed their actual spending only sometimes or who did not track it at all. Regarding the members of the Y generation, we received the following results: approximately one-third of the respondents (35.4%) usually track their spending. 26.1% always track their actual spending, while 23.0% track it moderately. The number of answerers who follow it only sometimes is 11.2%, while 4.2% do not track it. We also examined the answers in the case of the Z generation: more than half of the

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respondents (55.3%) usually track their actual spending. The ratio of people who follow their actual spending moderately is equal to those who sometimes track it: both ratios are 21.3%. There is nobody among the members of the Z generation who ever track their actual spending.

How often do you track your actual spending?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	109	23,5	23,5	23,5
	2,00	182	39,3	39,3	62,9
	3,00	107	23,1	23,1	86,0
	4,00	50	10,8	10,8	96,8
	Never	15	3,2	3,2	100,0
	Total	463	100,0	100,0	

Figure 10. How often do you track your actual spending?

Source: primary research, own calculation

According to the null hypothesis of the Chi-Square Tests (Figure 11), there is no relationship between the two variables: generations (as an independent variable) and the frequency of tracking the actual spending (as a dependent variable). The value of Pearson Chi-Square is 32.406, and its significance level is 0,000, which is lower than the significance level of 0,05, which is why we reject the null hypothesis. It means that there is a relationship between the two investigated variables.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	32,406[a]	8	,000
Likelihood Ratio	46,888	8	,000
Linear-by-Linear Association	9,318	1	,002
N of Valid Cases	463		

Figure 11. Chi-Square Tests

Source: primary research, own calculation

The significance of Phi is 0.000, confirming the relationship between the two variables. The Phi value is 0.265, indicating a weak relationship between the two investigated variables (Figure 12).

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Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	,265	,000
	Cramer's V	,187	,000
N of Valid Cases		463	

Figure 12. Symmetric Measures

Source: primary research, own calculation

In the following question, we asked the sample members about the frequency of setting budget goals for their spending. The answerers could mark their answers on a 5-point Likert scale where 1 means always and 5 means never. Based on the Statistics table (Figure 13), all 463 respondents answered this question. The mean is 2.4773, which means that the respondents usually set budget goals for their spending. Both mean and median are 2.00: it was chosen by the most answerers; this value divides the answerers into two groups based on the frequency of setting goals for their spending. The standard deviation is higher than in the previous question: its value is 1.12191.

Statistics

How often do you set budget goals for your spending?

N	Valid	463
	Missing	0
Mean		2,4773
Median		2,0000
Mode		2,00
Std. Deviation		1,12191

Figure 13. Statistics

Source: primary research, own calculation

We also examined the answers in a detailed manner (Figure 14). Almost one-third of the respondents (31,7%) usually set budget goals for their spending. 28.7% of the answerers set budget goals with moderate frequency. Approximately one-fifth of the answerers (21.8%) always set budget goals for their spending, while 12.3% do it only sometimes. The ratio of respondents who never set budget goals for their spending is 5.4%.

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How often do you set budget goals for your spending?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	101	21,8	21,8	21,8
	2,00	147	31,7	31,7	53,6
	3,00	133	28,7	28,7	82,3
	4,00	57	12,3	12,3	94,6
	Never	25	5,4	5,4	100,0
	Total	463	100,0	100,0	

Figure 14. How often do you set budget goals for your spending?

Source: primary research, own calculation

We investigated the frequency of setting budget goals for spending based on the generation. In the case of the members of X generation, 33,3% always set budget goals for their spending and an additional 33.3% set budget goals reasonably. 16.7% usually set budget goals, while 16.7% sometimes set them. Nobody among the members of the X generation ever set up any budget goals for their spending. Analysing the respondents' answers from the Y generation, we can see that 31.2% usually set budget goals, while 28.9% moderately set budget goals. Approximately one-fifth of the respondents (21.1%) always set budget goals for their spending, while 13.2% sometimes set them. The ratio of respondents who never set budget goals for their spending is 5.6% among the members of the Y generation. The proportions are the following in the case of the members of the Z generation: approximately half of them (55.3%) usually set budget goals or their spending, while roughly one-fifth of them (21.3%) moderately set budget goals. The ratio of the respondents who always set budget goals is 12.8% among the members of the Y generation. Nobody sets budget goals only sometimes, while 10.6% of the respondents never set up budget goals.

According to the null hypothesis of the Chi-Square Tests (Figure 15), there is no relationship between the two variables: generations and the frequency of setting budget goals for spending. The value of Pearson Chi-Square is 32.021, and its significance level is 0,000, which is lower than the significance level of 0,05, which is why we reject the null hypothesis. It means that there is a relationship between the two investigated variables.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	32,021[a]	8	,000
Likelihood Ratio	39,690	8	,000
Linear-by-Linear Association	,202	1	,653
N of Valid Cases	463		

Figure 15. Chi-Square Tests

Source: primary research, own calculation

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The significance of Phi is 0.000, which confirms the relationship between the two variables. The Phi value is 0.263, indicating a weak relationship between the two investigated variables (Figure 16).

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	,263	,000
	Cramer's V	,186	,000
N of Valid Cases		463	

Figure 16. Symmetric Measures

Source: primary research, own calculation

At the end of the questionnaire, we had some demographic questions. Regarding gender, 64.1% of the respondents are men, and 35.9% are women (Figure 17).

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Woman	166	35,9	35,9	35,9
	Man	297	64,1	64,1	100,0
	Total	463	100,0	100,0	

Figure 17. What is your gender?

Source: primary research, own calculation

Regarding age, most respondents were between 25 and 32 years old. Overall, we received answers from people between 19 and 52 years old (Figure 18).

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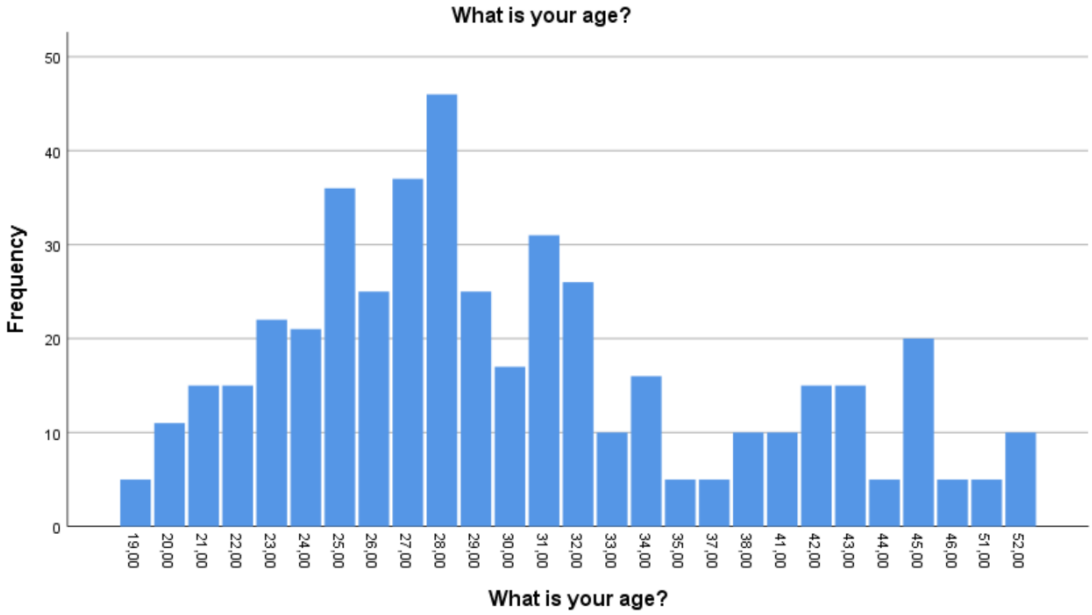


Figure 18. What is your age?

Source: primary research, own calculation

Based on the respondents' ages, we created a new variable called generation. The most answerers represent the Y generation (79.9%), 13.0% are members of the X generation, and 10.2% are members of the Z generation (Figure 19).

What is your generation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	X generation	60	13,0	13,0	13,0
	Y generation	356	76,9	76,9	89,8
	Z generation	47	10,2	10,2	100,0
	Total	463	100,0	100,0	

Figure 19. What is your generation?

Source: primary research, own calculation

We also examined the educational qualification of the respondents. 58.1% have bachelor's or Master's degrees, 41.7% are high school graduates, and 0.2% attended basic education (Figure 20).

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What is your educational qualification?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Basic education	1	,2	,2	,2
	High school graduate	193	41,7	41,7	41,9
	Bachelor's degree or Master's degree	269	58,1	58,1	100,0
	Total	463	100,0	100,0	

Figure 20. What is your educational qualification?

Source: primary research, own calculation

Regarding profession, 64.4% of the respondents are an employee. 13.2% of them work as self-employed, the 7.8% are unemployed. The ratio of the students (another category) is 14.7% (Figure 21).

What is your profession?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Self-employed	61	13,2	13,2	13,2
	Employee	298	64,4	64,4	77,5
	Unemployed	36	7,8	7,8	85,3
	Other (student)	68	14,7	14,7	100,0
	Total	463	100,0	100,0	

Figure 21. What is your profession?

Source: primary research, own calculation

In the last question, we asked the respondents in which country they live. All of the respondents live in Slovakia. We received 12 additional questionnaires from Hungary, but our research target group contains Slovakian household members, so we excluded them. In the descriptive statistics part of the paper, we only investigated the questionnaires we received from our target group members.

Conclusions

According to our survey, the older generation is better prepared for their retirement in Slovakia than the younger generation; since a higher percentage of the older generation answered positively to our question, "have you tried to calculate how much you should save for your retirement" and "have you made a financial plan for your retirement?". A chi-square test and Crammer's V index support the relationship between these questions.

Since, in real life, it is essential not only to make plans but also to follow them, our next question was aimed at this. Among those who had already made a plan for their retirement, we asked the following question about how often they could follow their plan. For this question, neither the older nor the younger generation can pursue their strategy precisely.

We know that the basis of our finances is to be aware of our spending; therefore, we asked the respondents, "how often do you track your spending" from this question, we could conclude that the younger generation tracks their spending better. However, the older generation had a higher percentage when asked how often they set budget goals.

Based on our research, we can conclude that while the older generation is more attentive to planning for their retirement, even if they cannot always stick to the plan they have set, they also design their spending goals to a greater extent. On the other hand, the younger generation is more attentive to their spending, tracking it to a greater extent but setting targets to a lesser extent. Completers who plan for their retirement are more likely to stick to the financial plans they set for themselves.

Among our respondents, the older generation appeared more prepared for retirement, but younger completers were more likely to track their current financial spending.

Our research is aimed at individuals and organisations working to improve financial literacy. Last but not least, we recommend this research to researchers who want to survey a country or group of their choice on a similar topic. As a unique feature, depending on the generation, there are specific forms of financial planning. On the other hand, we have to stress the limitations of our results that are obtained by the methodology we applied to gather the answers for our survey: as the 463 respondents were collected in a snowball method, there can be a sample selection bias; thus the survey answers may not be representative. However, mostly the respondents completed the questionnaire who have some interest to finance; therefore, if our results are biased, then they upward biased.

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THE DEGREE OF USE OF MOTIVATIONAL FACTORS DEPENDING ON THE SECTOR AND SIZE OF ENTERPRISES*

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Abstract. The paper aims to examine the impact of an enterprise size (by the number of employees) and the enterprise's industry on the level of using individual types of motivation factors. For the set goal, a questionnaire survey was selected, which was distributed to the research sample. The formulated research questions were answered using the statistical relationships of the Chi-squared test, Shapiro-Wilk test, and Kruskal-Wallis test. In terms of the enterprise size by the number of employees, the validity of the expected trend was confirmed, i.e., the level of using individual motivation factors grows with the number of employees; enterprises with 250 and more employees most use motivation factors. Most of these enterprises chose between 4 and 5 points on the 5-point scale where 1 indicates the lowest level, while 5 the highest level using motivation factors. In terms of classification by industry, the impact of industry on the level of using motivation factors was analysed. The highest level of using motivation factors was identified in enterprises focused on transportation and logistics. For these enterprises, the level of using motivation factors was even higher than in manufacturing enterprises or enterprises active in the services industry. Furthermore, the results show that regarding the classification of enterprises by the number of employees, only career and social motivation factors are statistically significant. Statistical significance was confirmed only for relational motivation factors in the classification of enterprises by industries.

Keywords: employee motivation; company motivation; motivational factors; company size; company sector

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JEL Classifications: O35, L25, J21

1. Introduction

Motivation enhances the creativity, innovation, and professional development of employees. It is a key to high business standards (Žunac et al., 2019), especially work motivation is an essential factor affecting the overall performance of enterprises. If properly motivated, employees show better performance and are more effective and

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productive. Employee motivation is not of the same importance for every enterprise or organisation (Stefko et al., 2016). Management, remuneration, and motivation have a positive and important impact on employee performance (Gavurova et al., 2018; Mulyani et al., 2019; Agapito et al., 2022). Eliciting excellent employee performance is the major challenge for managers of organisations in the current hypercompetitive business environment. Although few studies have confirmed the influence of intrinsic motivation on work performance, the role of mediators, such as employee creativity, has not been sufficiently examined in this relationship (Jnaneswar & Ranjit, 2022; Belas et al., 2022). Even though the most powerful employee motivation instrument might seem to be wage, research shows that is unambiguous and employees are motivated by many other motivation factors, such as the possibility for career growth or using suitable working conditions or working environment and atmosphere (Gavurova et al., 2020; Tahiri et al., 2022). For example, in terms of competition, manufacturing enterprises are increasingly more focused on employee performance and motivation, which seems to be a prerequisite for long-term employee performance and thus, the sustainable success of the enterprise (Olah et al. 2021; Krajčík, 2021). A demanding and most important task of managers is managerial decision-making, another phenomenon attracting scholars' attention (Belas et al., 2019; Habaník et al., 2020). Motivating employees and strengthening their confidence at work can also affect their perception of the working environment, especially if they work with others. In this context, Yoon (2020) states that the intensity of the mediated relationship between customer incivility and the performance of a given service by an employee varies based on employee self-evaluation. According to the author's research, the negative indirect effect of customer friendliness through intrinsic motivation on the performance of services was weaker for employees with a high level of self-esteem than employees with a low level of self-esteem.

The paper is the response to the current demand for examining motivation factors in the working environment and their impact on employee performance in different size categories, and industries enterprises operate in. Determining specific groups of motivation factors depending on the industry and size of enterprises can benefit these enterprises. It can help them motivate their employees to a large extent in a better and less costly way.

The paper aims to determine the currently most widely used motivation factor depending on the different size categories of enterprises and the industry they operate in.

1. What size category of enterprises uses motivation factors most?
2. What type of enterprises, by their line of business, use motivation factors most?

2. Theoretical background

Entrepreneurship is essential for a country's economic growth and wealth (Wang et al., 2022a; Wang et al. 2022b; Xu et al., 2021). Entrepreneurs are responsible for generating income for themselves as well as for others in the form of creating job opportunities (Khairuddin et al., 2019; Hur and Bae, 2021; Košč et al., 2021). An enterprise is where an activity contributing to the enterprise's success takes place. When an enterprise wants to succeed and achieve its goals and development, employees must be the focus of its attention. The current trends indicate that human resources are considered the most important of all enterprises' assets. Employee motivation may lead to high performance, effectiveness, quality, and subsequent success of the organisation and its development (Hitka et al., 2020; Kovaříková et al., 2021). Organisations need to improve and increase employee self-development in the rapidly changing business world to achieve sustainable development. The study by Zhou et al. (2019) aims to determine how and under which circumstances job autonomy enhances employee self-development. Human energy is often perceived as a limited source consumed by the efforts expended at work and thus needs to be replenished during or after work. However, according to the self-determination theory of motivation, individuals differ in the degree to which they perceive work as exhausting; autonomous motivation makes work seem effortless, while controlled motivation is perceived as effortful (Parker et al., 2021).

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Work motivation plays an essential role in the development of organisations, as it increases employee productivity and effectiveness (Privara 2019a; Lavičková et al., 2021; Kmecová, 2021; Vo et al., 2022). Employee motivation is critical for a successful organisation; therefore, every company should focus on motivating human resources to remain competitive in the market and avoid problems such as losing employees, which would negatively affect its business. A successful company should thus have established effective motivation practices. Implementing motivational methods adjusted to the environment of a given organisation and its employees increases the satisfaction of its employees, who will feel more motivated to top performance (Ližbetinová et al., 2017; Parjoleanu, 2021; Kabir, 2021). Motivation plays a crucial role in employee productivity (Škare et al., 2013; Grumstrup et al., 2021; Al-Omoush et al., 2022). Although organisations are generally interested in motivating their employees, they are not always aware of what motivates them (Privara et al., 2018; Uka & Prendi, 2021; Nováková et al., 2022).

Motivation is considered one of the essential prerequisites of success and effectiveness of the resulting performance. In a company, it usually applies only the perspective of employee motivation from the side of the enterprise. However, employee motivation is also influenced by the external environment, i.e., the macro environment (Hitka et al., 2021). The performance of employees and, thus, the whole enterprise is determined by human resources management. A crucial factor is the impact of motivation and satisfaction of the needs of employees on improving performance at the desired level (Hitka et al., 2020; Přívara & Rievajová, 2021; Liu et al., 2021).

Superiors and managers play an increasingly more critical role in employee motivation (Kaabomeir et al., 2022; Privara, 2022; Habes et al., 2021; Rowland et al., 2021). Theoretically and practically, it is vital to understand how leaders can enhance the pro-social motivation of pro-active employees and encourage them to support organisations by taking the lead (Xu et al., 2021; Galstyan et al., 2021; Nikolova et al., 2022). Employee relations arise from "working relationships" in the industrial environment. The industry provides the environment for employee relationships. Production and productivity depend on the type of employee relationships within a given organisation. Existing positive employee relationships influence the overall performance of an organisation. The key factors affecting relationships include the internal communication system, trust among employees, best HR/IR management policies, leadership style, and goals of individuals and organisations (Koneru, 2019; Přívara, 2019b; Vorobeva & Dana, 2021; Sun et al., 2022). In his research, Umarani (2022) confirmed a direct relationship between employee motivation and job performance. Enterprises should focus on motivating employees by all possible means to improve their performance.

Employee perception of the organisation has a substantial effect on their motivation for public service. Literature on the inspiration for public service is focused mainly on how motivation for public service influences the results related to an organisation's performance and public service outcomes (van der Voet & Steijn, 2019; Sahoo & Pradhan, 2021; Klatt & Fairholm, 2022). How does the perception of working people influence their intrinsic motivation? It has been found that working non-standard hours (weekends/holidays) vs standard working hours (Monday–Friday, 9–5) undermines people's intrinsic motivation for their professional and academic pursuits. Working non-standard hours decreases intrinsic motivation because it makes people consider better use of their time. This means that people generate more upward counterfactual thoughts, which causes working hours to reduce intrinsic motivation (Přívara, 2021; Vochozka et al., 2021; Giurge & Woolley, 2022). Appropriate leadership has a positive effect on innovative employee behaviour through autonomous motivation. It has been found that a positive relationship between spiritual leadership and autonomous motivation was more robust if the focus on remote working employees was high (Zhang, 2020; Vochozka et al., 2020; Štefančík et al., 2021).

According to Manzoor et al. (2021), intrinsic rewards positively and significantly impact employee performance. Specifically, employee motivation mediates the relationship between intrinsic motivation and employee performance. Paais and Pattiruhu (2020) state that work motivation and organisational culture have a positive and

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important effect on performance but do not significantly influence employee job satisfaction, while leadership positively and significantly influences employee job satisfaction but does not have an important effect on performance. Al Altheeb (2020) argues that leaders motivate employees by employing implementing structures aimed at fully exploiting the employee potential, organisational resources, and directing, which, however, can cause difficulties in instilling trust, achieving corporate goals, promoting alignment, and fostering the environment for cooperation.

3. Research objective and methodology

The data for this paper were obtained through a questionnaire survey conducted in SMEs in the Czech Republic and through research activities (Industry 4.0) implemented in cooperation with the Slovak Academic Association for Personal Management (SAAPM). A total of 610 enterprises participated in the research. The data collection was conducted in the first half of 2020 using the method of interviewing. The questionnaire comprised 8 areas (A – H), with each area including scaled questions. For each set of questions, its actual applicability ad importance for the future of the company was assessed.

The data obtained from all 610 enterprises were analysed. Out of the 610 enterprises, three did not specify the industry they operate in, and 26 enterprises stated they operate in more than one industry. These enterprises will be excluded from the sample to increase the informative value of the analysis results. The resulting sample thus consists of 581 enterprises.

The results will be developed based on the formulas below:

Chi-square test of independence:

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{s}\frac{(O_{ij} - E_{ij})^2}{E_{ij}} \tag{1}$$

where O_{ij} = observed cell frequencies a E_{ij} = expected (expected) cell frequencies and the sum goes over all s x r cells in the table, where r = number of rows and s = number of columns in the table.

Shapiro-Wilk test:

$$W = \frac{\left(\sum_{i=1}^{n} a_i x_{(i)}\right)^2}{\sum_{i=1}^{n}(x_i - \overline{x})^2}, \tag{2}$$

where $x_{(i)}$ (with parentheses enclosing the index of index i; not to be confused with x_i) is *i*th order statistics, i.e. *i*th- the smallest number in the sample; $\overline{x}$ = (x_1 + … + x_n) / n is the sample mean.

Kruskal-Wallis test:

$$H = \frac{12}{N(N+1)}\sum_{i=1}^{C}\frac{R_i^2}{n_i} - 3(N+1) \tag{3}$$

where C = number of classes, n_i = number of observations in the i-th class, N = $\sum n_i$, number of observations in all classes, R_i = the sum of ranks in the i-th class.

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4. Results and discussion

4.1 The effect of company size on the use of motivational factors

The enterprise's size and the assessment of motivational factors are categorical variables. Their relationship will be verified using the chi-square test of independence. Good approximation conditions must be met for this test. These conditions were verified using tables of expected frequencies (see Table 1).

Table 1. Contingency tables of observed frequencies: Company size x Career motivation factors

Contingency tables of observed frequencies: Company size x Career motivation factors								
Point evaluation			1	2	3	4	5	Total
Size of the company	1-9	The number of % depending on the size of the company	11	15	23	39	17	105
			11%	14%	22%	37%	16%	100%
	10-49		5	26	25	66	15	137
			4%	19%	18%	48%	11%	100%
	50-249		3	27	40	60	19	149
			2%	18%	27%	40%	13%	100%
	250 and above		2	24	33	77	54	190
			1%	13%	17%	41%	28%	100%
Total			21	92	121	242	105	581
			4%	16%	21%	42%	18%	100%

Source: own

Depending on the number of employees, all types of companies apply career motivation, most often partially. It is always around 40% of businesses with a given number of employees. Companies with more than 250 employees usually apply this motivation (see Table 2).

Table 2. Contingency tables of observed frequencies: Company size x Work motivation factors

Contingency tables of observed frequencies: Company size x Work motivation factors								
Point evaluation			1	2	3	4	5	Total
Size of the company	1-9	The number of % depending on the size of the company	1	8	23	44	29	105
			1%	8%	22%	42%	28%	100%
	10-49		3	8	32	59	35	137
			2%	6%	23%	43%	26%	100%
	50-249		1	9	24	76	39	149
			1%	6%	16%	51%	26%	100%
	250 and above		6	8	24	85	67	190
			3%	4%	13%	45%	35%	100%
Total			11	33	103	264	170	581
			2%	6%	18%	45%	29%	100%

Source: own

Depending on the number of employees, all types of enterprises apply work motivation, most often partially. For companies with 50-249 employees, even more, than half of the companies partly use the work motivation factor. Companies with more than 250 employees often apply this motivation (Table 3).

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Table 3. Contingency tables of observed frequencies: Company size x Social motivation factors

Contingency tables of observed frequencies: Company size x Social motivation factors								
Point evaluation			1	2	3	4	5	Total
Size of the company	1-9	The number of % depending on the size of the company	4	17	27	36	21	105
			4%	16%	26%	34%	20%	100%
	10-49		5	17	45	52	18	137
			4%	12%	33%	38%	13%	100%
	50-249		7	23	43	47	29	149
			5%	15%	29%	32%	20%	100%
	250 and above		1	22	38	76	53	190
			1%	12%	20%	40%	28%	100%
Total			17	79	153	211	121	581
			3%	14%	26%	36%	21%	100%

Source: own

Depending on the number of employees, all types of enterprises apply social motivation, most often partially. It is always at least above 30% of companies of a given size. Companies with more than 250 employees often apply this motivation (Table 4).

Table 4. Contingency tables of observed frequencies: Company size x Financial motivation factors

Contingency tables of observed frequencies: Company size x Financial motivation factors								
Point evaluation			1	2	3	4	5	Total
Size of the company	1-9	The number of % depending on the size of the company	2	9	19	41	34	105
			2%	9%	18%	39%	32%	100%
	10-49		4	10	21	54	47	136
			3%	7%	15%	40%	35%	100%
	50-249		3	19	18	69	40	149
			2%	13%	12%	46%	27%	100%
	250 and above		4	9	26	73	78	190
			2%	5%	14%	38%	41%	100%
Total			13	47	84	237	199	580
			2%	8%	15%	41%	34%	100%

Source: own

Depending on the number of employees, all businesses apply financial incentives, most often partially. It is always at least around 40% of companies of a given size. Companies with more than 250 employees usually apply this motivation (Table 5).

Table 5. Contingency tables of observed frequencies: Company size x Relationship motivation factors

Contingency tables of observed frequencies: Company size x Relationship motivation factors								
Point evaluation			1	2	3	4	5	Total
Size of the company	1-9	The number of % depending on the size of the company	2	4	17	42	40	105
			2%	4%	16%	40%	38%	100%
	10-49		3	13	25	52	43	136
			2%	10%	18%	38%	32%	100%
	50-249		2	21	25	60	41	149
			1%	14%	17%	40%	28%	100%
	250 and above		1	14	26	85	64	190
			1%	7%	14%	45%	34%	100%
Total			8	52	93	239	188	580
			1%	9%	16%	41%	32%	100%

Source: own

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Depending on the number of employees, all companies apply relational motivation, most often partially. It is always at least around 40% of companies of a given size. Companies with more than 250 employees usually apply this motivation (Table 6).

Table 6. Results of chi-square tests - company size

Chi-square test results		
Motivational factors	Test criterion value	p-value
Career	44,785	0,000
Working	16,342	0,176
Social	23,421	0,024
Financial	15,405	0,220
Relational	14,345	0,279

Source: own

A statistically significant dependence on the size of the company and the application of the motivation factor was confirmed for the career and social motivation factors ($p<0.05$). The size of the business, therefore, matters for these two factors.

According to the contingency tables, the career motivation factor is applied significantly more often by large enterprises with more than 250 employees than by smaller enterprises. Furthermore, companies differ according to the application of the social factor. Completely is applied significantly more often by companies with more than 250 employees than companies with up to 49 employees. Among enterprises with more than 250 employees and from 50 to 249 employees, the application of the social factor at the highest level was not confirmed.

Overall assessment of the application of motivational factors concerning the size of the enterprise

First, we verify the assumption of a normal distribution of the average assessment of the application of motivational factors in groups according to company size using the Shapiro-Wilk test (Table 7).

Table 7. Tests of Normality – company size

Tests of Normality				
	Size of the company	Shapir-Wilk		
		Statistic	df	Sig.
Motivational factors	1-9	0,971	105	0,022
	10-49	0,958	137	0
	50 - 249	0,976	149	0,011
	250 and above	0,945	190	0

Source: own

All p-values (Sig.) are lower than the chosen significance level of 0.05, and the assumption of normality for parametric tests is not met. We will use the non-parametric Kruskal-Wallis test to verify the relationship (Table 8).

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Table 8. Ranks – company size

Ranks			
	Size of the company	N	
		105	273,5
Motivational factors	10-49	137	271,04
	50 - 249	149	265,33
	250 and above	190	335,19
	Total	581	

Source: own

According to the average rating, motivational factors are the most applied by companies with more than 250 employees (Table 9).

Table 9. Test Statistics[a,b] – company size

Test Statistics[a,b]	
Motivational factors	
Kruskal-Wallis H	19,886
df	3
Asymp. Sig.	0

a. Kruskal Wallis Test
b. Grouping Variable: Company size
Source: own

According to the p-value (Sig.) of the test, which is smaller than the chosen significance level of 0.05, we confirm a statistically significant difference between at least one pair of enterprises according to size in the average rating of motivational factors. We will determine which businesses differ using multiple comparison tests (Table 10).

Table 10. Pairwise Comparisons of Company Size

Pairwise Comparisons of Company Size				
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.
50 - 249-10 - 49	5,718	19,792	0,289	0,773
50 - 249-1 - 9	8,179	21,305	0,384	0,701
50 - 249-250 a více	-69,867	18,297	-3,818	0
10 - 49-1 - 9	2,461	21,687	0,113	0,91
10 - 49-250 a více	-64,148	18,741	-3,423	0,001
1 - 9-250 a více	-61,687	20,333	-3,034	0,002

Source: own

Companies with 250 or more employees evaluate the application of motivational factors statistically significantly better than companies with fewer employees.

4.2 The influence of the business sector on the use of motivational factors

Both industry and rating of motivational factors are categorical variables. We will verify their relationship again using the chi-square test of independence. Good approximation conditions must be met for this test. These were verified using tables of expected frequencies. Assessment variants 1 and 2 had to be combined for two motivational factors due to low frequencies (Table 11 and Table 12).

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Table 11. Contingency tables of observed frequencies: Company sector x Career motivation factors

Contingency tables of observed frequencies: Company sector x Career motivation factors								
Point evaluation			1	2	3	4	5	Total
Company sector	Production	The number of % depending on the size of the company	6	40	45	83	36	210
			3%	19%	21%	40%	17%	100%
	Services		8	28	49	108	45	238
			3%	12%	21%	45%	19%	100%
	Transport and logistics		2	9	9	16	12	48
			4%	19%	19%	33%	25%	100%
	Other		5	15	18	35	12	85
			6%	18%	21%	41%	14%	100%
Total			21	92	121	242	105	581
			1%	9%	16%	41%	32%	100%

Source: own

Companies of all surveyed industries most often rate the application of the career factor as partial. They are most often rated as completely applied by companies operating in transport and logistics (25%).

Table 12. Contingency tables of observed frequencies: Company sector x Work motivation factors

Contingency tables of observed frequencies: Company sector x Work motivation factors							
Point evaluation			1-2	3	4	5	Total
Company sector	Production	The number of % depending on the size of the company	14	35	93	68	210
			7%	17%	44%	32%	100%
	Services		16	56	101	65	238
			7%	24%	42%	27%	100%
	Transport and logistics		5	5	24	14	48
			10%	10%	50%	29%	100%
	Other		9	7	46	23	85
			11%	8%	54%	27%	100%
Total			44	103	264	170	581
			8%	18%	45%	29%	100%

Source: own

Companies of all surveyed industries most often rate the application of the labour factor as partial. They are consistently rated as partial by more than 40% of surveyed companies across fields. Companies operating in transport and logistics (29%) most often place them as wholly applied (Table 13 and Table 14).

Table 13. Contingency tables of observed frequencies: Company sector x Social motivation factors

Contingency tables of observed frequencies: Company sector x Social motivation factors								
Point evaluation			Point evaluation	2	3	4	5	Total
Company sector	Company sector	The number of % depending on the size of the company	7	34	58	69	42	210
			3%	16%	28%	33%	20%	100%
	Services		6	32	60	91	49	238
			3%	13%	25%	38%	21%	100%
	Transport and logistics		1	5	14	15	13	48
			2%	10%	29%	31%	27%	100%
	Ostatní		3	8	21	36	17	85
			4%	9%	25%	42%	20%	100%
Total			17	79	153	211	121	581
			3%	14%	26%	36%	21%	100%

Source: own

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Companies of all surveyed industries most often rate the application of the social factor as partial. They are consistently rated as partial by more than 30% of surveyed companies across fields. Companies operating in transport and logistics (27%) often place them as wholly applied.

Table 14. Contingency tables of observed frequencies: Company sector x Financial motivation factors

Contingency tables of observed frequencies: Company sector x Financial motivation factors								
Point evaluation			Point evaluation	2	3	4	5	Total
Company sector	Company sector	The number of % depending on the size of the company	5	19	32	82	71	209
			2%	9%	15%	39%	34%	100%
	Services		6	19	36	100	77	238
			3%	8%	15%	42%	32%	100%
	Transport and logisti		0	4	4	24	16	48
			0%	8%	8%	50%	33%	100%
	Other		2	5	12	31	35	85
			2%	6%	14%	37%	41%	100%
Total			13	47	84	237	199	580
			2%	8%	15%	41%	34%	100%

Source: own

Companies of all surveyed industries most often rate the application of the financial factor as partial. Around 40% of surveyed companies across fields consistently place them as partial. In transport and logistics, it is even half of the companies. They are most often rated as completely applied by companies doing business in other fields (41%) (Table 15).

Table 15. Contingency tables of observed frequencies: Company sector x Relationship motivation factors

Contingency tables of observed frequencies: Company sector x Relationship motivation factors							
Point evaluation			Point evaluation	3	4	5	Total
Company sector	Company sector	The number of % depending on the size of the company	32	34	89	54	209
			15%	16%	43%	26%	100%
	Services		18	41	94	85	238
			8%	17%	40%	36%	100%
	Transport and logistics		7	5	13	23	48
			15%	10%	27%	48%	100%
	Other		3	13	43	26	85
			4%	15%	51%	31%	100%
Total			60	93	239	188	580
			10%	16%	41%	32%	100%

Source: own

Companies operating in production, services and other fields often rate the relationship factor application as partial. Companies operating in transport and logistics evaluate the application of the relationship factor most often as fully applied (Table 16).

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Table 16. Results of chi-square tests - business sector

Results of chi-square tests		
Motivational factors	The value of the test criterion p-value	The value of the test criterion p-value
Career	10,092	0,608
Working	15,719	0,073
Social	6,578	0,884
Financial	6,439	0,892
Relational	24,245	0,004

Source: own

A statistically significant dependence of the sector and application of the motivation factor was confirmed only for the relational motivation factor ($p<0.05$). So this factor depends on the industry.

Companies doing business in transport and logistics evaluate the relational motivation factor as partial significantly less often than companies doing business in other surveyed fields. Companies doing transport and logistics rate the relational motivation factor as completely applied significantly more often than companies doing business in other surveyed areas.

Overall assessment of the application of motivational factors concerning the size of the enterprise

First, we verify the assumption of a normal distribution of the average rating of the application of motivational factors in groups by industry using the Shapiro-Wilk test (Table 17).

Table 17. Tests of Normality – a company sector

Tests of Normality				
	Industry	Shapiro-Wilk		
		Statistic	df	Sig.
Motivational factors	Production	0,974	210	0,001
	Services	0,966	238	0,000
	Transport and logistics	0,908	48	0,001
	Other	0,971	85	0,052

Source: own

All p-values (Sig.) except one are below the chosen significance level of 0.05; the assumption of normality for parametric tests is not met. To verify the relationship, we will use the non-parametric |Kruskal-Wallis test (Table 18).

Table 18. Ranks – a company sector

Ranks			
	Industry	N	Mean Rank
	Production	210	278,22
Motivational factors	Services	238	295,03
	Transport and logistics	48	318,58
	Other	85	295,70
	Total	581	

Source: own

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According to the average rating, motivational factors are the most applied by companies engaged in transport and logistics (Table 19).

Table 19. Test Statistics[a,b] – company sector

Test Statistics[a,b]	
Motivational factors	
Kruskal-Wallis H	2,738
df	3
Asymp. Sig.	0,434

a. Kruskal Wallis Test
b. Grouping Variable: Company sector
Source: own

According to the p-value (Sig.) of the test, which is higher than the chosen significance level of 0.05, we do not confirm a statistically significant difference between companies by sector in the average rating of motivational factors.

The first set of results concerns the relationship between enterprise size and the level of using individual motivation factors.

The results indicate that career motivation factors are used in both small and large enterprises; however, there is a difference in the level of using career motivation actors. According to the results, the highest level of using career motivation factors was recorded mainly in enterprises with 250 and more employees, with more than 65 % of the enterprises selecting the value 4 or 5.

Career motivation factors are used mostly in enterprises with 50–249 employees, which mostly chose the value 4, and in large enterprises with 250 and more employees, which mostly chose the value of 4 or 5.

The third type of motivation factors, social motivation factors, is again used mainly in large enterprises, and its use decreases proportionally with the decreasing number of employees. Nearly 80 % of the addressed large enterprises with more than 250 employees chose 4 or 5 points in the responses to this set of questions.

The analysis of the use of financial motivation factors provided clear results. Even this type of motivation factors is used mainly in large enterprises with more than 250 employees when a point score 4 or 5 was chosen by nearly 80 % of them.

The last type of motivation factors, relational factors, showed the same results, i.e., even this motivation factor was most used in large enterprises with more than 250 employees, with almost 80 % of responses scoring 4 or 5.

The subsequent summary analysis confirmed the statistical significance of the statement that the use of career and social motivation factors depends on company size.

Another finding is that large enterprises with more than 250 employees generally use individual motivation factors to a much greater extent than enterprises with a smaller number of employees.

In conclusion of this section, the statistically significant difference between at least one pair of enterprises by size in terms of the average rating of motivation factors depending on the size has been confirmed.

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The second part of the results deals with analysing the effect of industry on the level of using individual types of motivation factors.

The results show that in the case of career motivation factors, their dominant use was recorded in enterprises operating in the transport and logistics industries, with a percentage of responses with 4 and 5 points is higher than 50 %.

Work motivation factors are similar to career motivation factors, achieving very similar results. Even in this case, the level of using this type of motivation is highest in enterprises operating in the transport and logistics sectors, with the percentage share of responses with a point score 4 or 5 exceeding 75 %.

The level of using social motivation factors follows the trend set by the above motivation factors. It has again been confirmed that the highest level of using this type of factors is in enterprises operating in the transport and logistics industries, with the percentage of responses with a point score of 4 or 5 exceeds 50 %.

As for financial motivation factors, a different trend is noticed, as this type of motivation factors is most used in enterprises operating in other industries. The percentage of responses with a point score of 4 and 5 exceeds 80 %. In contrast, as for relational motivation factors, the level of their use was again highest in the transport and logistic companies.

However, the summary analysis shows that only the use of relational motivation factors is significantly essential. This means that the kind of industry an enterprise operates in is meaningful only in this type of motivation factor. It has also been found that transport and logistic enterprises generally use any motivation factors to a much larger extent compared to enterprises operating in other industries.

The identified difference in the average use of various motivational factors in dependence on the industry is thus not statistically significant.

1. What size category of enterprises uses motivation factors most?
The above results confirm that the overall level of using all types of motivation factors in enterprises grows with the size of an enterprise (by the number of employees). The finding that the above motivation factors are used most in enterprises with 250 and more employees confirms this trend.

2. What type of enterprises by their line of business use motivation factors most?
In general, in terms of the classification of enterprises by the industry they operate in, motivation factors are used similarly. However, the results have shown that transport and logistic enterprises use the above motivational factors to the greatest extent.

Similar results were also found by (van der Voet and Steijn., 2019; Klatt and Fairholm, 2022), who found that it is also crucial to how the employees perceive the efforts of the company they work for to educate them.

5. Conclusions

The paper aimed to determine the currently most widely used motivation factor depending on size, category and industry.

The first step to achieving the set goal was formulating research questions and data collection. The data were further analysed and divided according to the selected methodology of the paper. The data were collected

through a questionnaire in the context of Industry 4.0. The collected data were subject to statistical analysis and evaluated using Chi-squared test, Shapiro-Wilk test, and Kruskal-Wallis test.

The results of the research show that motivation factors are generally used in enterprises to a large extent, regardless of the size of the company or the industry it operates in. Regarding the classification of enterprises by their size, it has been found that the level of using motivation factors grows with the company size (by the number of employees). These results had been anticipated; the reason could be the higher budget for human resources management in larger enterprises, which means larger enterprises can offer their employees interesting training. As for the classification of enterprises by their line of business, interesting findings have been obtained, indicating that the highest level of using motivation factors is in enterprises operating in the transport and logistics industries. This is an astonishing finding, as the higher level of using motivational factors had been anticipated for other industries, especially the manufacturing sector and services.

The results can be used to get a general overview of motivation factors in enterprises. They can help small enterprises realise that employee motivation is essential even in small enterprises and that investment in quality training programs can increase the company's profit. The research's limitation is the selected method, a questionnaire survey, precisely the number of questions and respondents).

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THE IMPACT OF TOP MANAGEMENT EDUCATION ON THE SOCIALLY RESPONSIBLE MANAGEMENT OF LOCAL GOVERNMENT IN THE CONTEXT OF INVESTMENT DEVELOPMENT*

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Abstract. The limited public budgets of local governments, socio-economic crises, and environmental and waste issues create increased demands on their spending. In this context, there is a need to manage the available resources economically and responsibly, which is also an effective communication tool. The scientific study focuses on researching the correlation between the educational attainment of the top management of local government and responsible leadership in the conditions of the Slovak Republic. As a primary indicator, we examine total debt per capita, which we do not primarily perceive as an element of irresponsible management but rather as a tendency of the statutory and parliamentary body to enter into credit relationships because of development activities and investments. We perceive investment activities in the context of educational attainment as a positive communicative tool that creates appropriate conditions for future responsible and sustainable management. The scientific objective of the scientific state is to point out, in terms of theoretical foundations, the role of education and knowledge in the management and achievement of economic and social effects based on the analysis of the relationship between selected indicators of education and total debt as a result of the development of investments. The uniqueness and rareness of the scientific study are the size of the research sample and understated interest in addressing the relationship between education and economic development. We used regression and correlation analysis models to find out these relationships. The results confirmed the predicted relationships but were not universal in considered regions. Based on the results, it was possible to define a barrier to education's positive effects: the local government's size.

Keywords: governance, top management; social responsibility; education; knowledge; human resources; local government; communication; investment

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1. Introduction

The positive effects of education and training on economic growth via good performance have been investigated during the latest decades. The role of education in economic development has been addressed by Azariadis and Drazen (1990). Baldacci, Clements, Gupta and Cui (2008) examined the effects of education on economic development in several countries. The issue of economic growth dynamics in the context of education spending has been addressed by Benos and Karagiannis (2010). The subject of their investigation was the different regions of Greece. Barro (1991, 1996, 2001) has systematically dealt with the effects of education and human capital. The regional aspects of the investigation of the links between education and the level of economic growth have been dealt with by Bloom, Sachs, Collier and Udry (1998), Collins and Bosworth (1996), Durlauf and Johnson (1995), Galor and Tsiddon (1997), who examined the principles of human capital distribution in relation with economic growth. Gemmel (1996) has also conducted comparative research with an assessment of the effects of human capital on economic growth, as did Gould and Ruffin (1995). A specific approach to investigating the relationship between education and economic growth has been the measurement of human capital levels and nonlinearities in economic development by Kalaitzidakis, Mamuneas, Savvides and Stengos (2001). Among other authors, the issue has been addressed by Kindleberger and Herrick (1977), Levine and Renelt (1992), who later published an analysis of the sensitivity of economic growth based on regression analysis. Maudos, Pastor and Serrano (1999) also examined the effects of productivity and human capital on economic growth in OECD countries. Murphy, Schleifer and Vishny (1991) and Rezk et al. (2019) studied education as an essential factor of economic growth. Education as a financial barrier problem, a fundamental human right that significantly influences the level of a country, has been studied by Pritchett (2001), Ramcharan (2002), and Ranis, Stewart and Ramirez (2000). Within the Slovak and Czech scientific approach, this topic has been investigated by Žižková et al. (1989), Goulliová (1998), Münich and Švejnar (2000), Kameníček (2003), Vomáčková (2007), Tiruneh et al. (2011).

The most known Slovak author was Benčo (1992, 2000, 2005), who researched the possibilities of quantifying the effects of expenditure on education for a long time. His research tasks quantified education's positive effects on different education levels. The problem with measuring the impact of education is the volatility of the observed results, which change over time due to the changing conditions of the education system and the labour market. Socio-economic crises also distort positive education effects.

2. Education as a fundamental determinant of local economic development, socially responsible management and effective communication

Just as education has effects at the macroeconomic level, its positive results can also be expected to be felt in the local government environment. Since few authors have addressed the educational attainment of elected officials at the local level and the context of local government economic indicators (Mihályi, 2019), we have to rely on the research conducted at the economy level.

One of the leading economists was Barro (1996). He focussed in his studies on examining the determinants of economic growth. In a 2003 (OECD) study, he addressed the topic of the relationship between education and economic development. Barro considered human capital as a determinant of economic growth and examined the links between the quality of human capital and education.

Within the Central European area, Dudova (2009) examined variations in education levels and economic growth rates in selected countries around the world. Using statistical dependency models, she found a relationship between economic growth and the number of tertiary graduates. Past analyses showed that university graduates were better valued in the labour market than those with less education. The high competitive pressure within the

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higher education market and the recent increase in the number of workers with a university degree have devalued such educated workers and brought about a shortage of workers with lower vocational (mainly craft) education. For this reason, there have been visible distortions compared to the conclusions addressed in the past. However, the effects of education are not only economic but also non-economic. Education and its impact also have several positive outcomes that are difficult to quantify economically but have apparent positive effects on society (social, cultural, environmental, crime, health and active leisure). Therefore, the general thesis on the positive impacts of education and socio-economic growth is still valid. Ramcharan (2002) concluded that no country had achieved significant economic growth without investing in education. However, the structure of this expenditure is also important. Ramacharan's research found that in countries where secondary education was underdeveloped, economic growth rates were lower than in other countries. Examining the optimal ratio of allocated resources according to labour market indicators is necessary for deciding on the appropriate allocation of resources.

Another study that can confirm the thesis on the importance of education in the local government environment is the study by Jarecki (2009). The author examined the importance of higher education and its impact on the country's economic indicators.

From a microeconomic perspective, from the level of the local governments we have studied, the neoclassical economists Mankiw, Romer and Weil (1992) have also confirmed positive effects. According to them, human capital has a positive impact on profits. A recent study by Ntshangase and Msosa (2022) point to inefficiencies in service delivery of municipalities caused by human factor.

Blakemore (2010) examined the evolution in real GDP concerning the education of the labour force. His findings led to the conclusion that improvements in living standards are directly related to the quality of human resources and the evolution of real wages. Living standards improve with increasing education, systematic training, and expanding knowledge base. He argues that regional development is also directly linked to an increase in the quality of human resources and a consequent rise in wages. Countries with high levels of human capital have significantly better living standards than countries with lower levels of human capital (Tiruneh et al., 2011). Ramos, Surinach and Artís (2009) identified an unmet demand for highly educated workers.

Also, in recent years, several theoretical and empirical studies have examined the interrelationship between education, human capital and economic growth. Many studies look at the effects of education on the domestic economy and its international spillovers. We review these studies in the discussion section.

The main objective of this paper is to highlight, in terms of theoretical foundations, the role and importance of education and knowledge in managing and achieving economic, social and societal effects through analyses of the links between education and total debt perceived as a result of development investments. The research is carried out in the basic spatial units in the Slovak Republic, i.e. municipalities or local governments, which are classified according to the NUTS classification into NUTS 3. The scientific study's originality and uniqueness are presented by the research sample size (all basic spatial units of territorial self-government forming administrative regions of the Slovak Republic), the unsolved problem of solving the relationship between education and economic development.

3. Materials and methods

We used several methods of testing statistics in the area of dependency tightness to identify the relationships between the achieved education of the top management of the local government and selected management indicators. For the needs of the scientific study, we chose to examine the relationship between the total debt of the local government (which primarily arises due to development investments) and the achieved education of top

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management. We see investing in development activities as the basis for future good management and achieving positive economic results.

We proceeded in part analogously to the studies already carried out. The main problem in formulating the starting points was the need for such focused research. We, therefore, proceed only from the analogy of the examined relations between education and economic development and the methodologies used by the authors. Most authors who dealt with this issue used regression and correlation statistical models with the least squares method. Romer (1989) and Azariadis & Drazen (1990) quantified interdependence relationships using the least squares method and the Instrumental Variables method.

Regarding the impact of education, they have shown that literacy positively affects the country's economic and social growth. Using the same method, Barro (1991) concluded that GDP per capita growth correlated with the number of people educated and the population's educational level. Indirect linear dependence has been demonstrated concerning the indicator of the number of students per teacher and economic growth. Murphy, Shleifer and Vishnu (1991) used the least squares method to show an equally positive relationship between student numbers and economic development. Levine and Renelt (1992) also revealed the positive impact of education on per capita GDP growth using the Extreme Bounds Analysis method. Mankiw, Romer, and Weil (1992) confirmed a similar effect. Their study examined the percentage of the working-age population participating in tertiary education and its impact on the country's economic indicators.

Another method was used by Durlauf and Johnson (1995). Using the regression tree method, they found a positive linear relationship between the proportion of the working-age population who were part of tertiary education and GDP growth. This relationship has only been proven in developed countries. Other authors who used the least squares method were Lee (1995), contrast, Bloom et al. (1998) and Temple (1999), Hanushek and Kimko (2000) and Hanushek and Kimko (2000). All authors examined the relationship between education parameters and GDP growth. Another method that was used to explore the interrelationships was 3SLS (Three-stage least squares) (Gemmel, 1996; Collins & Bosworth, 1996). Siddiqui (2006) identified a weak linear relationship between the length of education and economic growth using Feasible Generalized Least Squares (FGLS). Using the Error Correction Model using the "one step" procedure, Odit, Dookhan and Fauzel (2010) showed a positive effect on the length of school attendance (length of education) on GDP growth per capita.

In examining the issues in this paper, we have only partially relied on the above studies. Correlation analysis is applied in this case to assess the intensity (tightness) of free (statistical) dependence between total debt per capita and level of education.

We used the Spearman coefficient method to determine their degree of dependency. We defined the Spearman correlation coefficient as a selection correlation coefficient calculated from pairs. Using the ordinal regression method, we defined the factors that strongly impact local government performance. It is assumed that the trend f (t) depends (linearly or nonlinearly) on the unknown parameters β0, β1, ..., βk and the known functions φ0 (t), φ1 (t), ..., φk (t), which no longer contain any unknown parameters, t. j. f (t) = g (β0, β1, ..., βk; φ0 (t), φ1 (t), ..., φk (t)). The relations for regression and correlation analysis are given in the following form: for y dependent on x, the relation holds:

$$a = \frac{\Sigma[(x - \bar{x}]) \,.\, (y - y)}{\Sigma(x - \bar{x})^2} \qquad (1)$$

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Construction method of scientific observation for y dependent on x
the constant b is in the form:

$$b = \bar{y} - a\bar{x} \tag{2}$$

Constant in the form b

For x dependent on y the relation holds:

$$a = \frac{\Sigma[(y - \bar{y}]) . (x - \bar{x})}{\Sigma(y - \bar{y})^2}, \qquad b = \bar{x} - a\bar{y} \tag{3}$$

Construction method of scientific observation for x dependent on y.

The regression coefficient expresses the direction of the regression line, i.e. the slope of the line to the x-axis. It characterizes the change in total debt per capita, by changing the level of education of top management by one unit. Suppose the value is positive, with the growth of education, as the variable X. In that case, there is also an average increase in the total debt as a dependent variable Y. We call this dependence positive, resp. direct dependence. If the regression coefficient is negative, when the values of the independent variable X (education) increase, the values of the total debt as the vertical belt Y decrease on average indirect dependence.

According to the Statistical Office of the Slovak Republic, local territorial self-government in Slovakia consists of 2,890 municipalities (cities and villages), of which 2,640 are municipalities with less than 3,000 inhabitants, i. 91.34%, which inhabit 38.34% of the population of the Slovak Republic.

At the same time, 0.95% of the population lives in municipalities classified in the size category of up to 200 inhabitants. 4.54% of people live in the size category of 200-500 inhabitants, which consists of 710 municipalities. Even more, 755 municipalities from a size group had 500-1,000 inhabitants. 570 municipalities, inhabited by 26.12% of people, are from 1000 - 2000 inhabitants; 190 municipalities, inhabited by 19.72%, are among 2000 - 3000 inhabitants.

There are 109 municipalities with more than 3,000 inhabitants in Slovakia. Another category is cities; currently, 141, of which 22.46% of the population live in cities of size group over 50,000, and the total number of such cities is 10. The settlement structure of the Slovak Republic is shown in Figure 1.

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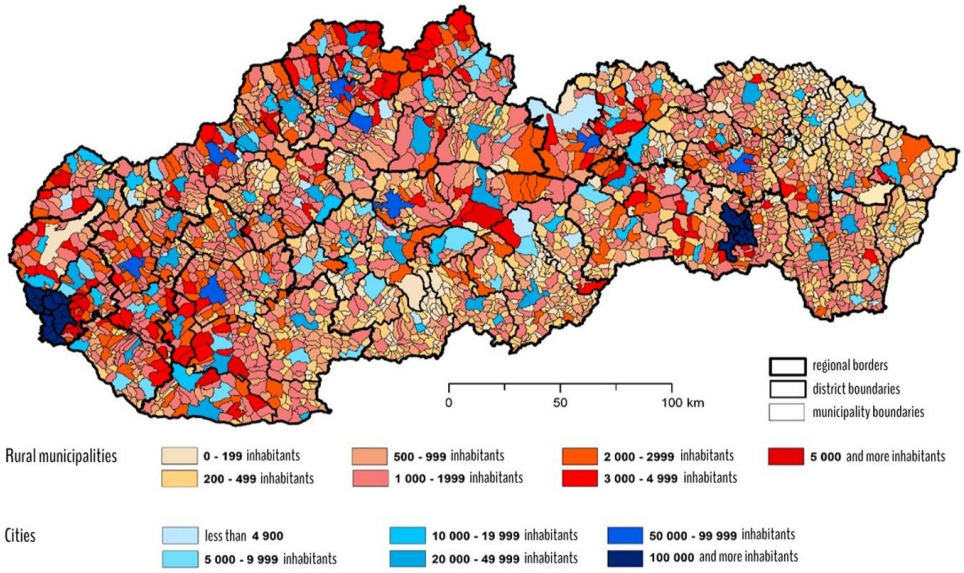


Figure 1. Territorial arrangement of the Slovak Republic

Source: New Municipal Management (Kaliňák et al., 2021)

Individual municipalities, regardless of their size grouping, have different economic backgrounds, budget sizes, revenues, and the ability to obtain external financial resources for the budget. A more detailed categorization is shown in Table 1.

Table 1. Local territorial self-government in Slovakia by size group of municipalities

*Municipality size group**	*Number of municipalities in the group*	*in %*	*Number of municipalities total*	*Number of inhabitants*	*in %*	*Total inhabitants and in %*
0 – 99	142	4,91	2640 municipalities/villages	9 217	0,17	2 092493 38,34%
100 – 199	273	9,45		42 526	0,78	
200 – 499	710	24,57		247 719	4,54	
500 – 999	755	26,12		538 214	9,86	
1000 – 1999	570	19,72		800 062	14,66	
2000 – 2999	190	6,57		454 755	8,33	
3000 – 3999	76	2,63	109 villages 141 cities Total: 250 municipalities	263031	4,82	3 365380 61,66%
4000 – 4999	39	1,35		171224	3,14	
5000 – 9999	63	2,18		425207	7,79	
10000 – 19999	34	1,18		480213	8,80	
20000 – 49999	28	0,97		799759	14,65	
50000 – 99999	8	0,28		549627	10,07	
nad 100000	2	0,07	Bratislava, Košice	676319	12,39	
Total:	2890	100,00	2890	5 457873	100,00	

Source: New Municipal Management (Kaliňák et al., 2021)

The hierarchical division of the country into territorial units was introduced by Eurostat for the member states of the European Union in 1988 for the needs of statistical monitoring and analysis of the economic and social situation in individual regions and the needs of the regional economy, is according to the NUTS classification of

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statistical territorial units. The NUTS classification consists of at least three subdivisions. In the Slovak Republic, the following NUTS classification is:

Table 2.NUTS classification in the Slovak Republic

Level NUTS	*English acronym / Slovak acronym*	*Territory*
Regional levels	NUTS 1 / RŠÚJ 1	Slovak Republic
	NUTS 2 / RŠÚJ 2	Areas: 4- Bratislava Region, Western Slovakia, Central Slovakia, Eastern Slovakia
	NUTS3 / RŠÚJ 3	Regions: 8
Local levels	LAU 1 / LŠÚJ1	Districts: 79
	LAU 2 / LŠÚJ 2	Municipalities, including urban districts: 2890

Source: The Statistical Office of the Slovak Republic, 2022

The analysis was based on a core set of 2890 local authorities, providing a sufficiently relevant view of the context under study. The total number was corrected based on test statistics. The resulting structure of the research sample is presented in the table below.

Table 3. Research sample by educational attainment of top management

size of the municipality	*-199*		*200 - 499*		*500 - 999*		*1000 - 1999*		*2000 - 4999*	
education	Number	%	Number	%	Number	%	Number	%	Number	%
primary/secondary school	286	73,7	501	67,6	428	55,7	237	40,9	96	33,0
1st level of higher education	15	3,9	14	1,9	19	2,5	14	2,4	9	3,1
2nd level of higher education	80	20,6	217	29,3	302	39,3	289	49,8	163	56,0
3rd level of higher education	7	1,8	9	1,2	19	2,5	40	6,9	22	7,6
Total	388	100,0	741	100,0	768	100,0	580	100,0	291	100,0
size of the municipality	*5000 - 9999*		*10000 - 19999*		*20000 - 49999*		*50000 - 99999*		*100000+*	
education	Number	%	Number	%	Number	%	Number	%	Number	%
primary/secondary school	16	24,6	5	13,9	9	20,9	3	33,3	2	100,0
1st level of higher education	1	1,5	0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
2nd level of higher education	42	64,6	23	63,9	24	55,8	5	55,6	0,0	0,0
3rd level of higher education	6	9,2	8	22,2	10	23,3	1	11,1	0,0	0,0
Total	65	100,0	36	100,0	43	100,0	9	100,0	0,0	0,0

Source: own elaboration, 2022

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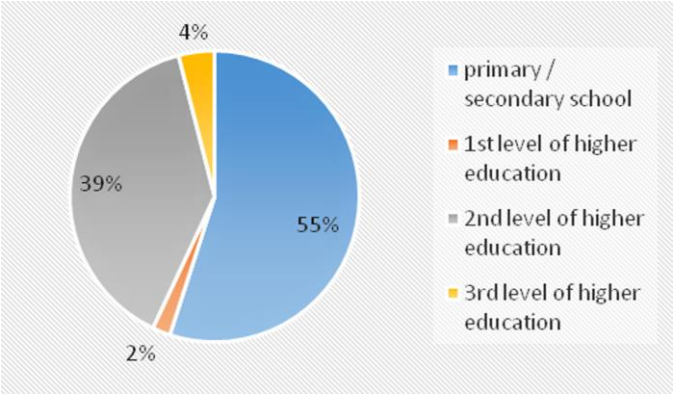


Figure 2. Structure of municipalities by educational attainment of top management

Source: own elaboration, 2022

The summary results of the sub-regional analyses by individual indicators are presented in the following text of the scientific state.

4. Results

In the present research study, to prove the impact of education on selected economic indicators, we investigated the relationship of educational attainment of the top management of local government (mayor/mayor) on the total debt per capita, which is the result of large-scale investments. We assume that the resulting debt results from the ability and willingness of local governments' statutory and parliamentarians (as top management) to enter into credit relationships because of development activities. Local governments cannot secure financing for investment activities from their resources alone. One way is to use repayable financial resources (KZ 52 - bank loans). In this respect, local government indebtedness cannot primarily be seen as a manifestation of poor and irresponsible management but rather as a consequence of investing in future development.

Total debt per capita is thus influenced by the intensity of local government development, the willingness of statutory authorities to enter into long-term commitments or the ability or inability to finance capital needs from their resources.

Table 4. Dependency analysis of total debt by income size and NUTS regions

Total debt per capita	up to 199	200 - 499	500 - 999	1000 - 1999	2000 - 4999	5000 - 9999	10000 - 19999	20000 - 49999
NUTS 3 BanskáBystrica	0,059	0,096	0,107	-0,117	0,075	0,235	0,804	
NUTS 3 Bratislava			-0,037	0,140	-0,125	0,237	0,620	-0,499
NUTS 3 Košice	-0,079	0,194	0,082	-0,099	0,078	-0,177		0,246
NUTS 3 Nitra	0,012	-0,070	0,121	-0,131	-0,336	-0,049	0,759	0,099
NUTS 3 Prešov	-0,088	0,077	-0,037	0,091	-0,195	-0,388	-0,266	-0,760
NUTS 3 Trenčín	0,142	0,061	-0,141	0,108	0,113		0,228	-0,522
NUTS 3 Trnava		-0,242	-0,025	0,052	0,184	-0,282	-0,079	-0,089
NUTS 3 Žilina	-0,167	-0,073	-0,098	-0,073	0,096	-0,328		-0,242

Source: own elaboration, 2022

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Those relationships could not be proven in all cases. Direct and indirect linear relationships have been demonstrated, especially in larger groups that can manage sustainable repayment of the loans taken out. The highest values of the correlation coefficients (indirect linear dependence) were obtained in the NUTS 3 municipalities of Trenčín and BanskáBystrica for municipalities between 5000 and 9999 and municipalities with a population above 20000 inhabitants. In this case, it can be assumed that practical experience rather than educational attainment prevails in top management. The dependence of the three variables is shown in the following figure.

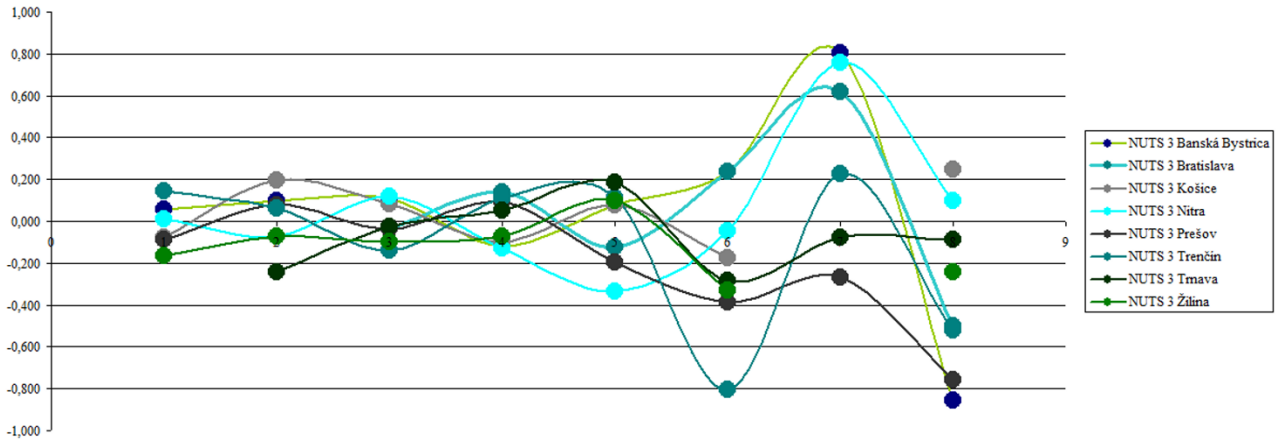


Figure 3. Dependency breakdown of municipalities by total debt, size groups and NUTS 3

Source: own elaboration, 2022

As presented in the previous graph, the correlation between education or experience has been demonstrated mainly for large local governments. The correlations in smaller municipalities are more or less independent of education and experience and are influenced by other environmental factors. Another reason may be the size of the municipality itself. In the case of small municipalities, where top management has a higher level of education, there are no positive effects due to budgetary constraints and the impossibility of repaying loan commitments. The financial constraints of local government, therefore, stifle higher management activity.

Table 5. Total debt per capita by the level of education and NUTS regions

	BB	BA	KE	NR	PO	TN	TT	ZI
Primary and secondary education	36,7	48,5	55,9	77,0	67,4	59,7	52,1	55,5
1st level of higher education	94,3			83,9		46,8	122,5	97,2
2nd level of higher education	56,9	160,7	37,9	49,9	78,6	100,9	99,4	55,7
3rd level of higher education	58,6	60,5	84,4	78,8	43,0	101,5	48,7	67,3

Source: own elaboration, 2022

The previous table presents the relationship between per capita debt values and educational attainment. The absolute lowest values were achieved in the education group - university degree I.

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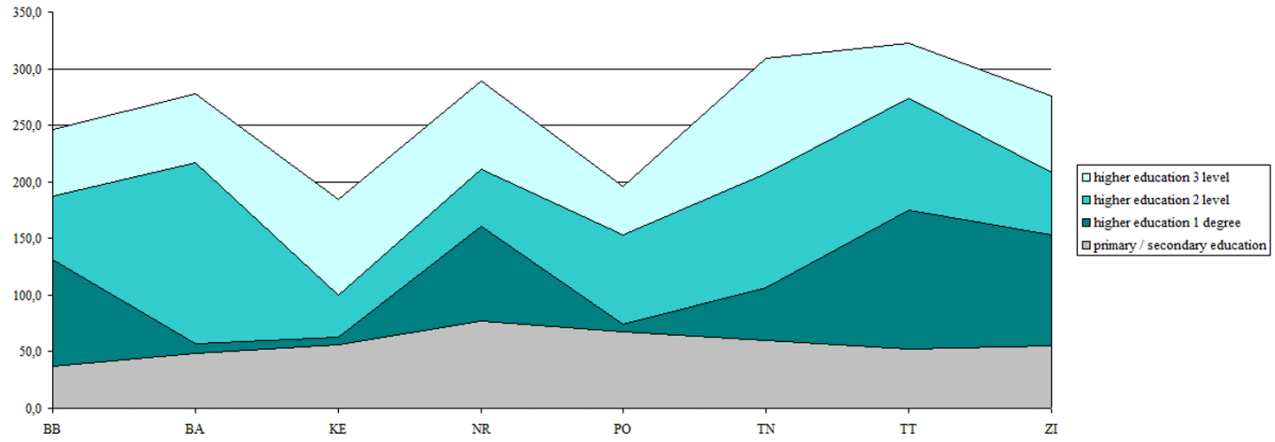


Figure 4. Distribution of local governments by unit debt and educational attainment of top management in NUTS 3

Source: own elaboration, 2022

Starting from a basic premise, high debt per capita does not necessarily imply social irresponsibility in management. As long as its creation is associated with increased investment in infrastructure, which is essential for local government to deliver its core agenda, it is explicitly desirable. We assume that higher indebtedness will be associated with higher education and the overall qualification of top management. A regression analysis made a partial confirmation of the thesis possible. The regression model is presented in the following table.

Table 6. Regression model of the relationship between education and total debt

Region		*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*
		B	*Std. Error*	*Beta*		
NUTS 3 Bratislava	Constant	45,045	112,260		0,401	0,689
	Education	158,116	156,150	0,108	1,013	0,314
NUTS 3 Trnava	Constant	36,868	6,369		5,788	0,000
	Education	11,335	8,499	0,080	1,334	0,183
NUTS 3 Trenčín	Constant	42,702	7,532		5,669	0,000
	Education	21,523	10,158	0,133	2,119	0,035
NUTS 3 Nitra	Constant	35,392	4,831		7,326	0,000
	Education	16,154	6,700	0,128	2,411	0,016
NUTS 3 Žilina	Constant	31,717	5,514		5,752	0,000
	Education	6,270	7,861	0,045	0,798	0,426
NUTS 3 BanskáBystrica	Constant	27,775	3,983		6,974	0,000
	Education	12,865	6,316	0,090	2,037	0,042
NUTS 3 Prešov	Constant	38,276	3,633		10,536	0,000
	Education	2,871	5,493	0,020	0,523	0,601
NUTS 3 Košice	Constant	44,111	6,197		7,118	0,000
	Education	-7,354	10,327	-0,033	-0,712	0,477

Source: own elaboration using SPSS

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The implemented regression model proved its validity only in isolated cases in the Trenčiansky, Nitriansky and Banskobystricky regions. If the education of top management changes by one unit (increase), the debt per capita rises by 21.523 €. In the BanskáBystrica region, with an increase in education of one degree, the total debt will increase by € 12,865. The regression models indirectly show that total debt rises only with the increase in the level of education. More educated statisticians are more likely to incur local government debt for rational reasons. The group with higher educational attainment can be expected to be more active in development projects and, consequently, in capital expenditures requiring co-financing from repayable sources.

5. Discussion

Examining the direct impact of the education of statutory bodies on specific local government areas, such as total debt, investment, and capital investment, needs to be addressed in foreign sources. For this reason, comparing the results found with foreign countries is impossible. This topic was discussed partially by Mihályi (2019), who used regression and correlation models in the example of a research sample of about 200 local governments. The uniqueness of the scientific study lies in the fact that it was conducted on a core set of local governments and thus provided unbiased results. The research focused on a core set of 2930 local government units. From a methodological point of view, we are based on foreign research on the positive impact of education on the economic indicators of states and selected regions.

In 2021, a study was conducted by the authors to examine the impact of education exports on the country's economic growth. The authors conducted the study using Australia as an example, given that the country is one of the leading destinations for international students. International education has played an essential role in the economy of many countries in recent decades. This sector supports job creation in these countries and represents a necessary source of skilled labour, favouring economic growth. This study analyses in detail the impact of the internationalization of education on the Australian economy based on quarterly data from 1974 to 2019 (Chowdhury, 2021). The results suggest a long-run positive relationship between international education on economic growth and employment, directly linked to investment. The authors also formulate several economic policy recommendations for adopting proactive, flexible and innovative approaches to attract international students that enhance economy-wide socio-economic spillovers. The study proposes a set of concrete measures to promote the internationalization of education to foster economic growth (Chowdhury, 2021).

Next, we draw on the Anglo-American school, which has examined the changes in the structure of high-skilled occupations in the US economy over the past 50 years. It analyzed the convergence in the occupational distribution between 1960 and 2010 on total productivity. It looked at talent allocation and its impact on productivity and economic growth (Hsieh et al. 2019).

Another study we draw on in our research paper is Soo-Wan and Ahn (2020). The authors examine theoretically and empirically whether public spending on education, health care, and social services functions as efficient investments in the welfare state. The authors analyze the impact of these investments on enhancing human capital formation, promoting labour market participation, and creating new jobs. The results confirmed that public spending on education, health care, and social services had positive medium- and long-term effects on economic performance (Kim & Ahn, 2020). Regarding our problem, we examine the ex-post impact of education spending stemming from educational attainment. We predict that the propensity to engage in development activities will be greater for top local government executives with higher educational attainment than those with lower educational attainment (we start from the premise that, due to the constraints of public budgets, more intensive local government development is not possible without investment and temporary debt). Closer to our view of the issue is the study by Ojha, Ghosh, and Pradhan (2021). The authors analyzed the role of public spending on secondary and higher education in achieving inclusive economic growth in a country.

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The findings suggest that increasing public expenditure on education leads to higher economic growth and lower social inequality. They also point to the fact that exogenous technological progress increases the positive effects of public spending on education, which has positive spillovers across multiple spheres of the economy (Ojha et al., 2021). In our research study, we examine the downstream effects of spending manifesting themselves in the practical realm of top management's performance, namely the propensity to invest in development projects (we examine through the temporary debt effect).

We identified partial starting points in the study by Rehme (2007). He examined how education simultaneously affects economic growth and income inequality. He arrives at a finding that does not support the standard thesis based on human capital theory. He argues that higher education does not necessarily reduce income inequality. Other authors on whose conclusions we draw have analyzed investment in human capital and its impact on the type of human capital, its quantity, and the intensity of its use. For us, the most important conclusions were based on examining technological change in a skills-based economy. They addressed their impact on economic growth and socio-economic inequality (Murphy and Topel, 2016).

The central premise of our research study is also based on the work of Patricio and Ruffini (2021), who examined the links between additional time spent in primary and secondary school and economic well-being. The approach relied on human capital, and the findings show that large-scale investment in public education can yield positive long-term economic effects (Patricio & Ruffini, 2021). The main idea of our research is that top executives who attain higher education are more willing to enter into the credit relationships necessary to make more significant investments, even at the cost of temporarily indebting local government. In light of the above, another fascinating study where the authors developed a dynamic model of the global economy. This takes into account demographic and educational aspects. By quantitative analysis, they highlighted the effects of human capital accumulation and income. These manifest themselves gradually and cumulatively (as in the case of investments made in local government). Another study examines the intensity of short- and long-term effects and the convergence of income in relation to human capital (Marco, Docquier & Machado, 2018).

Conclusions

Socially responsible behaviour is becoming an increasingly discussed topic in the local government environment, an essential communication tool, and the number of organizations applying the principles of socially responsible behaviour is growing. These activities must correspond with responsible local government management.

The scientific study investigated the relationship between education as a fundamental element and factor influencing the propensity to act responsibly in local government. The uniqueness of the scientific state lies in the fact that the researchers analyzed the results of 2890 local governments in the Slovak Republic, which represents a basic set and a vast number of basic spatial units on the territory of the Slovak Republic. As research with this focus has yet to be conducted, we relied on studies showing education's positive impact on the economy's development. Although many foreign and domestic studies confirm the positive effect of education and responsible management, in our case, this relationship was only confirmed in some cases.

One of the critical factors that represent a barrier to the positive effects of education is the size of the local government and the associated budget constraints and inability to repay the obligations arising from external financing of development investments.

This problem aside, the emphasis on education is crucial from a social responsibility perspective. Still, in this case, the synergy of formally acquired knowledge and practical experience must be harnessed to eliminate this constraint partially. Combining the above variables gives each senior local government manager a knowledge

base that enables them to manage responsibly and efficiently while ensuring sustainable growth. The regression model run on the base set confirmed that total debt per capita does not imply irresponsible management in most cases but rather a propensity to undertake more demanding investment activities. These values were positively correlated with educational attainment, but only in some regions.

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EMPLOYEE DATA RETENTION PERIODS IN IMPLEMENTING THE RIGHT TO BE FORGOTTEN: THE SITUATION IN LITHUANIA

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Abstract. The General Data Protection Regulation (Regulation, 2016) (hereinafter – the GDPR, Regulation) establishes the basic principles of personal data protection and the data subject's rights. The right to be forgotten is established in Article 17 of the GDPR. It allows the data subject, under certain conditions, to obtain from the controller the erasure of personal data concerning him or her upon the termination of the employment relationship. The study was conducted mainly in the context of labour law, i.e. the actions of the employer (as the data controller) and the employee (as the data subject) in processing (protecting) personal data and implementing the right to be forgotten are analysed. However, the public sector was assessed and compared for a more objective and detailed disclosure of the situation in the subject's data retention activities. In the relationship between employers and employees, there are discussions about how long the employer must store the employee's personal data, as well as disputes regarding the period after which the data subject acquires the right to obtain from the controller the erasure of personal data concerning him or her. The GDPR does not provide personal data retention periods – these periods are established in the national legislation of the European Union (EU) Member States. It should be noted that after the provisions of the GDPR came into force, the national legislation regulating personal data retention periods were not changed. This leads to possible non-compliance with the provisions of the GDPR stipulating that the periods for which personal data are stored must be optimal and not too long and must not violate the interests of the data subject. During the study, by analysing case law as well as legal regulation in the Republic of Lithuania and other EU countries, the content of the right to be forgotten is revealed, and optimal personal data retention periods that allow a sustainable relationship between the data subject and the data controller to be maintained are proposed.

Keywords: rights of data subjects; right to be forgotten; employee data retention periods; obligations of employers

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1. Introduction

Document retention periods and compliance with them affect the sustainability of employment relations and assurance of employees' rights and legitimate interests. Compliance with the retention periods for employee documents is inextricably linked to the implementation of the right to be forgotten, as whether or not the person acquires the right to exercise it depends on the period for which the data will be stored. If the right to be forgotten is infringed, so is not only the GDPR, but also the rights enshrined in Article 8 of the European Convention on Human Rights (Convention, 1950) (hereinafter - ECHR) and Article 8 of the Charter of Fundamental Rights of the European Union (Charter, 2016) (hereinafter - Charter). On the other hand, data about employees must be stored to ensure the rights and legitimate interests (guarantees) of the very employees, e.g. proving their length of employment, entitlement to a longer holiday, disability guarantees and guarantees for raising children, or occupational health-related and subsequent benefits. Employee data are thus a unique group of data, the preservation of which requires a precise legal regulation that justifies the need for specific data while assessing the risks that may arise from their loss. However, the still widespread practice among employers in Lithuania of keeping everything about employees almost forever by creating personal files for them should not be continued. The main problem raised in this study is the excessive accumulation of personal data in workplaces, primarily out of fear and not knowing what specific personal data must or may be retained about the employee and for how long. The objective of the study is to analyse court practice and legal regulation in the Republic of Lithuania and other EU countries to reveal the content of the right to be forgotten and propose optimal personal data retention periods that allow a sustainable relationship between the data subject and the data controller to be maintained. Several tasks have been formed to achieve this objective: reveal the concept and content of the right to be forgotten; investigate the circumstances when the employer (the data controller) must store the personal data of the employee (data subject), and the employee cannot demand the erasure of personal data concerning him or her; analyse the practical specifics of realising the data subject's right to be forgotten, and propose optimal personal data retention periods. During the study, the document analysis method was used to analyse legislation, court practice and scientific sources revealing the content of the right to be forgotten and the specifics of its implementation. Based on the comparison method, the (procedural) document retention periods established in various pieces of legislation were compared. Using the generalisation method, the authors made substantiated and reasoned conclusions and generalisations. The article was written with references to other work on the topic by (Erdos, 2021), (Moore, 2017) (Petraitytė, 2013), (Grigonienė2020) and other sources.

2. The essence and content of the right to be forgotten

The right to be forgotten was formulated and developed by the Court of Justice of the European Union in the 2014 case of *Google Spain SL, Google Inc. v Agencia Española de Protección de Datos (AEPD)* (Case No. C 131/12, 2014). In this case, the court found that the data subject may, in the light of his fundamental rights under Articles 7 and 8 of the Charter of Fundamental Rights of the European Union (Charter, 2016), request that the information in question no longer be made available to the general public by its inclusion in such a list of results. These rights override, as a rule, not only the economic interest of the operator of the search engine but also the general public's interest in finding that information upon a search relating to the data subject's name. It should be noted that the right to be forgotten is not absolute – it can only be exercised when the information is excessive, irrelevant, inadequate or inaccurate. The public interest and the public's right to receive information have a higher priority in some instances than the individual's right to respect one's private and family life under Article 8 of the ECHR or under the regulation.

As Erdos D. notes, the “right to be forgotten” is clearly imperative. There is an understanding that data protection can and should enable individuals, especially in the context of online dissemination, to restrict access or otherwise exercise at least *ex post* control over personal data (to prevent actual or potential harm), provided that there are no

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legitimate and overriding reasons to oppose such restriction or control (Erdos, 2021). The CJEU has stressed that "the right to the protection of personal data is not an absolute right, but must be considered in relation to its function in society and be balanced against other fundamental rights, following the principle of proportionality."(Case No 3C-507/17, 2019). That the right to the protection of personal data is not absolute is also emphasised in Recital 4 of the GDPR, which states: "The processing of personal data should be designed to serve humanity. The right to the protection of personal data is not an absolute right; it must be considered in relation to its function in society and be balanced against other fundamental rights, in accordance with the principle of proportionality."(Regulation, 2016).

To ascertain the essence of the employee's right to be forgotten in the context of the right to the protection of personal data, the reasons for the implementation of the data subject's right to be forgotten and the content of the information that employees could demand the deletion of must be analysed. The right to obtain the erasure of personal data only arises where one of the grounds listed in Article 17(1) of the GDPR applies:

(a) the personal data are no longer necessary in relation to the purposes for which they were collected or otherwise processed;

(b) the data subject withdraws consent on which the processing is based according to point (a) of Article 6(1), or point (a) of Article 9(2), and where there is no other legal ground for the processing. It should be noted that in employment relationships, consent is a relatively rare legal basis for processing personal data, because only in rare cases can such consent be considered freely given (due to the power imbalance between the employee and the employer). This is therefore an extremely rare reason to obtain the erasure of personal data;

(c) the data subject objects to the processing pursuant to Article 21(1), and there are no overriding legitimate grounds for the processing, or the data subject objects to the processing pursuant to Article 21(2);

(d) the personal data have been unlawfully processed;

(e) the personal data have to be erased for compliance with a legal obligation;

(f) the personal data have been collected in relation to the offer of information society services referred to in Article 8(1).

According to the Information Commissioner's Office (ICO), individuals have the right to have their personal data erased if:

- the personal data is no longer necessary for the purpose which you originally collected or processed it for;
- you are relying on consent as your lawful basis for holding the data, and the individual withdraws their consent;
- you are relying on legitimate interests as your basis for processing, the individual objects to the processing of their data, and there is no overriding legitimate interest to continue this processing;
- you are processing the personal data for direct marketing purposes, and the individual objects to that processing;
- you have processed the personal data unlawfully (i.e. in breach of the lawfulness requirement of the 1st principle);
- you have to do it to comply with a legal obligation; or
- you have processed the personal data to offer information society services to a child (ICO, 2022)

Depending on the grounds given, a person can acquire the "right to be forgotten" and the information used in real-time. For example, data subjects have the right to withdraw their consent at any time, either if they believe that the data controller no longer needs their personal data, or when it becomes clear that the personal data has been processed unlawfully, and so on. In this context, the right to be forgotten can be considered as an element of informational self-determination, since the right to be forgotten is not conditioned by the criterion of the elapsing of time (de Terwangne, 2013). In the context of personal data protection, the right to be forgotten is not only the duty of the data controller to constantly assess the expediency of the processing of personal data (in terms of scope, purpose and time) – it is also the ability of the data subjects to control how and where their personal data is

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processed. One of the purposes of this right is to protect the individual against potentially negative consequences that may arise when certain information is too readily available.

Suzanne Moore, a columnist for *The Guardian*, called the right to be forgotten "the right to have an imperfect past" (Moore, 2017). An imperfect past in an employment relationship could be associated with violations of job duties (or what was previously called "employee discipline"), the employee's negative or satisfactory work performance evaluations, or other data (telephone call recordings, video material, electronic correspondence, etc.) that could allow inappropriate (imperfect) employee conduct to be established. And even if such data were collected legally and transparently (after properly informing the employee), it is worth coming back to justify the necessity and proportionality of such data and the retention periods set by the state or the data controller.

As stated in Recital 39 of the GDPR, personal data should be processed only when the purpose of the processing of personal data cannot reasonably be achieved by other means. To ensure that personal data are kept only as long as necessary, the controller should establish time limits for the erasure or periodic review of the data. The cases provided for in the regulation when the right to be forgotten cannot be exercised are:

(a) for exercising the right of freedom of expression and information;

(b) for compliance with a legal obligation which requires processing or for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller;

(c) for reasons of public interest in the area of public health in accordance with points (h) and (i) of Article 9(2) as well as Article 9(3);

(d) for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes in accordance with Article 89(1) in so far as the right referred to in paragraph 1 is likely to render impossible or seriously impair the achievement of the objectives of that processing; or

(e) for the establishment, exercise or defence of legal claims (Regulation, 2016)

Even considering the reasonable interest of the public or law enforcement authorities to know, in the 2020 case *Gaughran v. the United Kingdom* (Case No. 45245/15, 2022) the European Court of Human Rights established a violation of Article 8 of the ECHR due to the procedure in force in Northern Ireland, where the private data (DNA profile, fingerprints, photographs) of previously convicted persons were stored indefinitely in the databases of law enforcement authorities. So according to the GDPR, even criminals have the right to be forgotten, thus begging the question: Is the employee's right to be forgotten really properly implemented in Lithuanian legislation?

3. Employee data retention periods

As previously mentioned, the right to be forgotten is not absolute. Article 17(3) of the GDPR provides exceptions where, rather than being obliged to delete personal data without undue delay, the data controller must store the data for a certain period. One of the conditions obliging the data controller not to delete data is for compliance with a legal obligation which requires processing by Member State law to which the controller is subject (Article 17(3)(b) of the GDPR). The general obligation to store documents arises from the Civil Code of the Republic of Lithuania (Official Gazette, No 74-2262, 2000)[*]. Laws and other legislation also set specific document retention periods. According to the provisions of the Republic of Lithuania Law on Documents and Archives (Official Gazette, No 57-1982, 2004),"retention period" means the length of time that documents must be retained (Article 2(20)); state and municipal institutions, agencies and enterprises, persons authorised by the state, non-governmental organisations, and private legal persons must retain their activity documents for the period necessary to ensure evidence of the activities and protect the rights of natural and legal persons related to the said

[*] For example, Article 2.4(3) of the Civil Code of the Republic of Lithuania stipulates that “all persons engaged in business or professional activities must manage their property and everything else related to their business or professional activities, and store documents and other information about their property, business or professional activities, in such a way that every person who has a legal interest can at any time receive comprehensive information about the property rights and obligations of the person in question.”

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activities, and must also retain for the required period the activity documents of other natural and legal persons that were taken over in accordance with the procedure established by this law and other regulations (Article 12(1)(2) and (3)); and it is the head of the state or municipal institution, agency or enterprise, non-governmental organisation, or private legal person who is responsible for retaining the activity documents for the period necessary (Article 12(2)). Accordingly, the Code of Administrative Offences (Official Gazette, 2015-11216, 2015) provides for liability for document management violations. For example, Article 522(1) of the Code of Administrative Offences foresees liability for infringement or non-execution of the regulatory acts governing the management and/or use of documents from the National Document Fund. In contrast, Article 505(1) foresees liability for obstructing officials authorised by law to exercise their rights or to perform their duties and for not complying with their lawful requirements or instructions or the decisions of collegial institutions or public officials. Consequently, the head of the agency is responsible for retaining the agency's documents for the required period.

The 15 December 2021 ruling of the Supreme Administrative Court of Lithuania stated that the data controller must not only store documents for a certain period of time, but also set clear document retention periods. The data controller must distinctly define the period for which the personal data will be stored, and legal regulation or assessment of the need of the circumstances cannot be considered sufficient and transparent criteria that can help define the duration of the retention period for personal data that is available for the purposes of processing. The court agrees with the court's assessment of the first instance that the period for which the personal data will be stored is not clearly defined in the response (Case No eA-2108-822/2021, 2021). It should be emphasised that the data subject (employee) must be informed about the data retention period (Guidelines, 2017).

From the above information, it follows that a person's right to obtain the erasure of personal data – or right to be forgotten – is directly related to the principle of limiting the duration of the retention period for personal data. The personal data of current or former employees must be kept and stored for a certain period of time. In view of this, the employer is obliged to ensure the storage of personal data for a certain period of time, and to assume all of the risks related to storage, and the employee/former employee cannot demand the erasure/deletion of personal data concerning him or her. The principle of limiting the period for which the personal data are stored is related to two important criteria: the purpose of storage (the question must be raised as to whether storing the data is necessary at all and why) and the duration of storage (there must be a clear justification as to why specific data need to be stored for the set period of time).[†] According to Petraitytė, I. storage is one of the actions of processing personal data, so if personal data is stored, it cannot be said that these data are no longer being processed (Petraitytė, 2013). The GDPR establishes that personal data must be "kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed." The regulation's preamble also talks about the need to carefully assess the goals and periods of data retention, and to set the shortest ones possible: The personal data should be adequate, relevant and limited to what is necessary for the purposes for which they are processed. This requires, in particular, ensuring that the period for which the personal data are stored is limited to a strict minimum." (Regulation, 2016).

During this study, the aim was to analyse the main pieces of legislation regulating the duration of the retention period for the personal data of employees in Lithuania. The Index of General Document Retention Periods (Official Gazette, No. 32-1534, 2011) (hereinafter - Index) approved by order of the Chief Archivist of Lithuania establishes the general main retention periods for the personal data of employees, while the retention periods for the personal data of individual categories of employees or specific personal data are established by the legislation of individual ministries or other institutions. Under Law on Documents and Archives of the Republic of Lithuania (Official Gazette, No 57-1982, 2004), if the data retention periods are not officially established, the obligation to

[†] In this case, a distinction should be made between the purpose of collecting personal data and the purpose of storing such data. Even with the legitimate purpose of collecting personal data, storing personal data is only sometimes justified.

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establish the data retention period rests with the head of the institution or company: "State and municipal institutions, agencies and enterprises, non-governmental organisations and private legal persons shall establish the retention periods for activity documents in compliance with the requirements of laws and other regulatory acts. If these requirements are not set out, the document retention period is to be established taking into account the obligations and legitimate interests of the state and municipal institutions, agencies and enterprises, non-governmental organisations, private legal persons and other persons concerned." It should be noted that the personal data retention periods set out in the Index were not changed after the regulation entered into force. They are mandatory for documents of state and municipal institutions, agencies and enterprises and persons authorised by the state, which are drawn up during internal administration and other general functions. Furthermore, the minimum retention periods established in the Index also apply to the activity documents of non-governmental organisations and private legal entities that are prepared in accordance with regulatory acts.

The justification for the purpose and duration of storage of the listed personal data is not separately stated in the legislation. In other words, legislation only provides for a data retention period without discussing other circumstances (purpose, categories of personal data, etc.), so it is more difficult to assess which period applies to a specific document or personal data processing operation. The more abstract the provision, the greater the responsibility of the data controller is to justify the personal data retention period chosen. It is logical to assume that these periods must be associated with periods already established in legislation, such as limitation periods, procedural terms, or other juridical facts and circumstances. However, the links could be more apparent, more understandable and more pronounced, as required by the principle of transparency enshrined in the regulation. According to the Labour Code of the Republic of Lithuania (Official Gazette, No. 2016-23709, 2016) the general limitation period is three years, while according to the Civil Code of the Republic of Lithuania (Official Gazette, No 74-2262, 2000) it is 10 years, so in the opinion of the authors, the key personal data retention periods should also be linked to these terms. Since the basis and subject of labour disputes are often relationships, objects and values regulated by civil law, priority should reasonably be given to the regulation provided for in the Civil Code. According to Grigonienė, R., the 50-year retention period established for employment contracts (which begins to be calculated after the contract expires) was previously associated with human lifespan, and the employer's obligation to store the specified documents was based on important purposes such as calculating the person's length of employment and pension. Currently, the electronic notifications about employment relations in the Sodra database eliminate the validity of the previously set purposes (Grigonienė, 2020). The same can be said about the retention periods for personal payroll records at the workplace. Storing this kind of personal data for 50 years increases the risk of unauthorised disclosure of personal data. It creates a substantial bureaucratic burden for employers who must retain these documents for the specified period.

Another group of personal data – employee job duty violation and misconduct investigation documents – also requires clearer substantiation of the storage duration and purpose. These documents must be stored for five years (Official Gazette, No. 32-1534, 2011). The choice of this data retention period takes on special importance, since the employee's statement on the alleged violation of job duties (as well as the accompanying supporting documents and the decision of the data controller) may mention information concerning the employee's health, family circumstances, children and so on, so their storage may pose additional risks. The Labour Code stipulates that an employment contract may be terminated due to either a gross violation of the employee's job duties or a second instance of the employee committing the same job duty violation over the past 12 months (Official Gazette No. 2016-23709, 2016). In this case, it would be sufficient to store these documents for 12 months to prove the repetition of the violation and the legal grounds for dismissal. Taking into account the limitation period for labour disputes, the storage period for these documents could be extended to three years. However, longer periods (like personal files – 10 years) raise reasonable doubts about the necessity, proportionality and assurance of adequate protection of employees' personal data in general. Specific data retention periods not provided for in legislation prevent data controllers from even considering the assumptions of the need for such data. According to Petraitytė, I. the fact that the permitted duration of the processing of personal data must correspond to the purposes of

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processing means that only the data controller can determine the optimal period for the processing of personal data that is compatible with the adequacy aspect of the principle under consideration (Petraitytė, 2013). The narrowing of this right, and at the same time, the duty of the data controller by establishing the period of personal data processing in legislation, can only be justified in exceptional cases, taking into account the specifics of the personal data and the possible impact on the person, and after assessing the threat that the data controllers will not act fairly and diligently in establishing the period of personal data processing. The period of personal data processing established in legislation must unconditionally comply with the principle of data minimisation.

In the above-mentioned Index, a 50-year retention period is established for internal legislation regarding the employee's hiring, dismissal and so on generally referred to as "personnel orders". As a rule, the manager writes an order to give an employee (civil servant) a penalty. The Labour Code was amended as of 1 July 2017, and now penalties have been cancelled for employees (except civil servants), but job duty violations are also recorded by order. The question arises as to whether, in cases like these, an employee can exercise the right to be forgotten in one, three, five or ten years if legislation requires them to be retained for 50 years. From a legal point of view, the employer cannot question the periods specified in legislation. Legislators should decide the question of time periods. Given that in some instances, the duration of personal data retention could be linked to the general limitation period, it can be assumed that a retention period of 10 years would be enough for internal legislation regarding the employee's hiring, dismissal and so on.

Depending on their type, the purpose of processing and other circumstances, the retention periods for some personal data should be less than 10 years. The State Data Protection Inspectorate (hereinafter - SDPI) has repeatedly spoken about the proportionality of the personal data retention period after performing inspections of data controllers. According to the SDPI, the data retention period must be specific and substantiated. It must be determined by assessing the need to process the personal data taking into account the purposes of data processing (Article 5(1)(e) of the GDPR) (Summary, 2018). After carrying out inspections, the SDPI established that some companies either do not have specific personal data retention periods, or have unreasonably long personal data retention periods, specifying that personal data will be stored “as long as you have a valid customer card and 10 years after its last use” or “ for 10 years after the end of participation in the loyalty programme”, and that “the data will be deleted once and for all five years after the transfer to the archive” or will be “stored for the duration of the Company’s activities” and so on. These companies were given instructions to eliminate the violations identified by the SDPI.

Another "potentially forgotten" group of employee personal data is performance evaluation documents, which are stored for 10 years, even if the information is not relevant to anyone after one year and does not create legal effects. The authors believe that the optimal retention period for such documents would be three years.

The question of the validity of the retention period's duration for employees' personal data also arises when analysing employee leave data. Until the Labour Code in force until 2017, annual leave was accumulated, and the employee had the opportunity to use it for the entire working period, even if it was for 10 years. Article 127(5) of the current version of the Labour Code establishes that "the right to take one's entire annual leave or part thereof (or to receive monetary compensation therefor in the case established by this Code) shall be lost three years after the end of the calendar year during which the right to full annual leave was acquired, except for cases when the employee was, in actuality, unable to take it." This means that data on accrued leave days are not relevant after three years, except in rare, isolated cases, like if the labour inspectorate conducts an investigation into the granting of leave after a period of more than three years. The practice of not accumulating leave days is rapidly forming, where employers are obliged, and it is in the interest of employees to use annual leave during the same year. However, item 7.12 of the Index obliges employers to store leave data for 10 years. It is proposed that a three-year retention period be set for documents concerning annual, unpaid, educational and other leave, and a 10-year retention period can only be provided for if the employee has unused leave for more than three years. This

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proposal also correlates with the latest practice of the Court of Justice of the European Union, in which it is interpreted that the employee's right to paid annual leave that is time-barred and conditional under national legislation cannot, in certain cases, be lost upon expiry of the three-year time limit for exercising this right – for a specific period of work (Case C-120/21, 2022). In the Index, personal account cards are also meant to be stored for a long time – 50 years. Currently, when all financial documents are submitted to state institutions electronically into databases, and wages are paid directly to the employees' bank accounts, obliging the employer to additionally store employee account cards or payroll records for 50 years is an excessive requirement. All the more so when the Index of General Document Retention Periods does not regulate the storage of personal data in special state databases but provides storage requirements for agencies and enterprises. Suppose the longer storage of such data at the state level can be legally justified. In that case, this regulation imposes too much of an administrative burden on the employer and does not ensure the employee's right to be forgotten. In summary, information about changing the retention periods for individual documents could be presented in Table 1 below.

Table 1. Retention periods

Numbering in the Index	Document	Periods provided for in the Index	Proposed periods
7.1.1.	Regarding hiring, transfer, substitution, dismissal, salary, child care leave, paternity leave;	50	10 years. This period is linked to the general limitation period provided for in the Civil Code of 10 years (after the contract expires).
7.3.	Employment contracts and appendices (agreements on supplementary employment contract terms and so on)	50 (after the contract expires)	This period is linked to the general limitation period provided for in the Civil Code of 10 years. A more extended period entails a high risk of data disclosure and is a vast bureaucratic burden for employers and archives.
10.20.1.	Personal account cards	50	It is suggested not to save as it is an redundant requirement
7.2.	Personal file documents (documents related to the beginning, course and end of service/work at the workplace or copies thereof)	10 (after the termination of the service/employment relationship)	12 months to 3 years (after the termination of the service/employment relationship). More extended periods raise reasonable doubts about the necessity, proportionality and assurance of adequate protection of employees' personal data.
7.14.	Employee job duty violation and misconduct investigation documents	5 years	3 years This is a sufficient period for proving the repetition of the violation.
7.9.2.	Direct line manager conclusions, civil servant qualification evaluation questionnaires, evaluation commission conclusions, documents confirming an employee's refusal to sign an evaluation conclusion	10 years	3 years The subsequent information is not relevant to anyone and does not create legal effects.
7.1.2	Concerning annual, unpaid, educational and other leave;	10 years	3 years, and a 10-year retention period can only be included if the employee has unused leave for more than 3 years.
10.20.1	Personal account cards	50 years	No retention period since this is an excess requirement.

Source: Compiled by the authors

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4. Specifics of processing data subject requests related to the right to be forgotten

Even though the data controller (employer) must store the data subject's data for a certain period of time, this does not exempt the data controller from the duty to comply with the requirements set out in the GDPR, including those related to the realisation of the data subject's rights, including those related to the right to be forgotten. The GDPR provides for the duty of the data controller to assess the data subject's request to delete data. Article 12(3) of the GDPR establishes that "the controller shall provide information on action taken on a request under Articles 15 to 22 to the data subject without undue delay and in any event within one month of receipt of the request. That period may be extended by two months where necessary, considering the complexity and number of the requests. The controller shall inform the data subject of any such extension within one month of receipt of the request, together with the reasons for the delay." Article 12(4) of the GDPR stipulates that "if the controller does not take action on the request of the data subject, the controller shall inform the data subject without delay and at the latest within one month of receipt of the request of the reasons for not taking action and on the possibility of lodging a complaint with a supervisory authority and seeking a judicial remedy." Hence, by not providing any information regarding a request received on the right to erasure (implemented/partially implemented/not implemented), i.e. by not responding to an applicant's request, the data controller is not properly implementing the requirements of Article 12 of the GDPR (transparent information, communication and modalities for the exercise of the rights of the data subject) and is violating the rights of the data subject.

Accordingly, to realise the right to be forgotten, the employee does not have to comply with the formal requirements for such a request or specifically indicate the documents the employer must delete. In administrative case No eA-2108-822/2021, it is specified that it would be wrong for a data subject's request for the exercise of his or her rights to be disregarded simply because the request is not of the format and content expected by the data controller. The GDPR does not provide requirements for the specific content of the request that the data subject must submit to the data controller. Furthermore, individuals may simply request that their personal data be deleted without explicitly naming them, and the requirement to specifically call them disproportionately limits the exercise of their right to the "right to be forgotten" (Case No. eA-2108-822/2021, 2021).

The legal regulation of the duration of storage of job candidate data is unique in its own right. The report of the Committee of Ministers to Member States on the processing of personal data during recruitment states that "personal data submitted in support of a job application should normally be deleted as soon as it becomes clear that an offer of employment will not be made or is not accepted by the job applicant." (Recommendation, 2015). When such data is stored to provide more employment opportunities, the data controller must base such processing on at least one condition for the lawful processing of personal data (Article 6 and, where applicable, 9 or 10 of the GDPR). The data subject must be informed accordingly regarding for what purpose, on what legal basis, and how the personal data will be processed. If the legal basis is the consent of the individual, the data subject should make a decision of his or her own free will as to whether to give such consent (in this case, in the absence of consent, the personal data could not be further processed when inviting to new interviews). Furthermore, even after giving consent, the data subject can withdraw it at any time and request that the personal data be deleted.

It should be noted that even if the person does not request it, the data controller still has to regularly assess the erasure of personal data and decide whether circumstances that make it necessary to delete the personal data have arisen. This is required by the accountability principle enshrined in Article 5(2) of the GDPR, i.e. the employer must ensure compliance with the principles related to the processing of personal data, such as the principle of data minimisation and the principle of storage limitation.

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It should be noted that before a person starts participating in a recruitment process, he or she must be properly informed about data processing. In Lithuania, the by-laws still in force limit the ability of a candidate who has not been selected for a job to obtain the erasure of personal data concerning him or her without undue delay. At present, the legislation does not allow the documents of unsuccessful candidates to be stored for less than one year: "Applications and other documents submitted by applicants for a job competition are to be stored for one year (after the hiring deadline)." (Official Gazette, 2011). Analysing the provisions of the Index, this requirement cannot be applied to private data controllers. Pursuant to Article 17(1)(a) of the GDPR, at the end of the selection period, the personal data should be deleted because they are "no longer necessary in relation to the purposes for which they were collected or otherwise processed." Taking this into account, it can be concluded that the private and public sectors are subject to different requirements for storing the data obtained during a recruitment process. It was mentioned that in the public sector, data must be stored for another year after the selection process, but they cannot be used, for example, to invite the data subject to a selection. Meanwhile, there is no such imperative in the private sector, which means that the same purpose is not relevant in the private sector. It is proposed that the same requirements for storing data obtained in the recruitment process be applied in the public sector as in the private sector, i.e. that, pursuant to Article 17(1)(a) of the GDPR, the personal data be deleted at the end of the selection period because they are no longer necessary in relation to the purposes for which they were collected or otherwise processed, except if the further processing of the personal data is based on another condition of lawful data processing.

Conclusions

The right to be forgotten is not absolute – it can only be exercised when the information is excessive, irrelevant, inadequate or inaccurate. The public interest and the public's right to receive information have a higher priority in some instances than the individual's right to respect one's private and family life. In the context of personal data protection, the right to be forgotten is not only the duty of the data controller to constantly assess the expediency of the processing of personal data (in terms of scope, purpose and time) – it is also the ability of the data subjects to control how and where their personal data is processed.

Rather than being obliged to delete personal data without undue delay, the data controller must store the data for a certain period of time. One of the conditions obliging the data controller not to delete data is for compliance with a legal obligation which requires processing by Member State law to which the controller is subject. A person's right to obtain the erasure of personal data – or right to be forgotten – is directly related to the principle of limiting the duration of the retention period for personal data. If the data retention periods are not officially established, the obligation to establish the data retention period rests with the head of the agency or enterprise.

The personal data retention periods set out in national legislation were not changed after the regulation entered into force. Legislation usually only provides for a data retention period, without discussing other circumstances (purpose, categories of personal data, etc.), so it is more difficult to assess which period applies to a specific document or personal data processing operation. The more abstract the provision, the greater the responsibility of the data controller is to justify the personal data retention period chosen. Personal data retention periods must be associated with periods already established in legislation, such as limitation periods, procedural terms, or other juridical facts and circumstances.

Even though the data controller (employer) must store the data subject's data for a certain period of time, this does not release the data controller from the obligation to respond to the data subject's requests, including requests to be forgotten. Personal data submitted in support of a job application should normally be deleted as soon as it becomes clear that an offer of employment will not be made or is not accepted by the job applicant. It is proposed that the exact requirements for storing data obtained in the recruitment process be applied in the public sector as in the private sector, i.e., the personal data be deleted at the end of the selection period.

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GREEN ECONOMY: CONTENT AND METHODOLOGICAL APPROACHES*

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Abstract. The existing economic development model needs to fit into the sustainable development framework due to the continuing depletion of natural resources and the continuing disproportions in economic growth. Therefore, a new concept was introduced, a "green economy", which emphasises improving the population's quality of life while minimising the use of resources and preserving nature for subsequent generations. However, discussions about the green economy measurement methodology continue. Based on the literature analysis, the authors clarified approaches towards the concept under consideration. They developed a novel approach to a green economy in the context of the basic principles of sustainable development.

Keywords: green economy; sustainable development; methodology; indexes

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1. Introduction

A series of global forums in the second part of the 20th century and the beginning of the 21st century devoted to sustainable development stimulated scientific interest. Sustainable development as a concept burst into scientific considerations of a broad spectrum of disciplines in the late 1980s due to the publication of the report "Our Common Future" in 1987. The report summarised the achievements and failures of humanity in the 20th century identifying sustainable development as a possible way of improving the existing situation (Brundtland, 1987).

What the Brundtland Report defined as "Our Common Future" received an institutional framework with the adoption of Millennium Development Goals (MDGs) in 2000, and what is more important – Sustainable Development Goals (SDGs) set by the United Nations General Assembly in 2015, developed as a result of Rio+20 conference (the United Nations Conference on Sustainable Development, UNCSD) held in 2012. Two agenda items for Rio+20 were: "Green Economy in the Context of Sustainable Development and Poverty Eradication" and "International Framework for

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Sustainable Development". As we see, the term green economy was used in the context of sustainable development. The paper's authors adopt the same approach and focus on the green economy content and its measurement in the context of sustainable development.

As mentioned above, moving towards a green economy has become a strategic policy agenda for sustainable development. A green economy recognises that the goal of sustainable development is improving the quality of human life within the constraints of the environment, which include combating global climate change, energy insecurity, and ecological scarcity. However, a green economy must be focused on more than eliminating environmental problems and scarcity. It must also address the concerns of sustainable development with intergenerational equity and eradicating poverty (UNEP, 2011).

The European Union has contributed significantly to the activities of international structures related to sustainable development. The EU countries have hosted most of the decisive environmental forums. The European Commission finds the green economy to be more than a sum of existing commitments. It has the potential to introduce a new development paradigm and a new business model in which growth, development, and the natural environment are deemed mutually supportive. Increasing resource efficiency, promoting sustainable consumption and production, preventing climate change, protecting biodiversity, combating desertification, reducing pollution, and managing natural resources and ecosystems in a responsible manner are necessities and a simultaneous driving force ensuring the transition to a green economy (Ryszawska, 2013; Kasztelan, 2021). Bogovic et al. (2020, p.1) “conclude that transitioning towards a green economy, i.e., implementing specific green economy policies, can push sustainable development in the EU while simultaneously contributing to the implementation of the strategic goals of the European Green Deal”.

In line with the commitment to develop a green economy, the EU emphasises attaining Sustainable Development Goals (SDGs). The EU made a positive and constructive contribution to the development of the 2030 Agenda, is committed to implementing the SDGs in all policies and encourages EU countries to do the same (European Commission, 2022).

Against this background, it is notable that the analysis of existing literature has demonstrated that only a few scholars have conducted research dedicated to assessing the performance of the green economy in the European Union, especially in the context of sustainable development and SDGs. Such a state of affairs is discordant with the ambitious goals and political actions of the European Union in terms of the green economy.

A wide range of modern scientists worldwide is engaged in research on the theoretical and methodological basis of the green economy. Alcalde-Calonge et al. (2022, p.1). “the literature on the topic has grown from 12 scientific articles published in 2008 to 2355 in 2020, which represents an almost two hundredfold increase in around a decade”. The fact that most natural resources are non-renewable, a significant increase in environmental damage, and the growth of the world population highlight the need to develop a green economy that promotes environmentally sustainable investments (Bergius et al., 2020).

With many countries striving to improve resource efficiency, introduce environmentally-friendly production methods, combat climate change etc., it is clear that the concept of a green economy remains high on the agenda nowadays, especially taking into account the high energy prices the world economy is has faced recently.

Promoting a more resource-efficient, greener and more competitive economy was the priority for the EU, the "European Green Deal" – a plan to achieve carbon neutrality by 2050 outlined by European Commission in December 2019 (European Commission, 2020). Regions and many separate states also retain an interest in promoting greener economies on a national level.

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Decision-makers in most European countries have acknowledged this imperative, which lies at the core of EU common policies and implement it on the country level through so-called National Energy and Climate Plans. These plans provide, among other things, targets for the decommissioning of those technologies that have a more profound impact on our carbon footprint and for the development of new renewable capacity.

Anyway, it must be admitted that a particular gap in the research on the green economy and its connection with the concept of sustainable development still exists: a scientific problem of measuring a country's/ region's progress towards a greener economy. Even though there are several models, as it will be shown further in this study, they seem to consider only some spheres related to the issue.

2. Evolution of green economy research in the context of sustainable development

Meaning, which different authors puts into “green economy", along with which accompanying definitions such as "green technologies", "eco-innovation", "green innovation", "and green growth", slightly differ.

Fulai (2010) claimed that green economy was typically understood as an economic system, which was compatible with the natural environment, was environmentally friendly, ecological, and for many groups, was also socially just. Others, such as the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), define green growth as a policy focus that emphasises "environmentally sustainable economic progress to foster low-carbon, socially inclusive development" (Greening the economy, 2011, p.3).

The definitions of “green growth" provided by the OECD are characterised by a broad approach described by promoting economic growth while reducing pollution and greenhouse gas emissions, as well as minimising waste and inefficient use of natural resources and conserving biodiversity (OECD, 2017).

Green growth can be defined as economic growth focusing on environmentally sustainable (safe for the environment) and socially inclusive development. The essential features of such change are that it does not affect the environment and does not ensure better economic prospects for contemporaries at the expense of future generations.

To reach green growth without hampering economic prospects (particularly the growth of GDP), humanity utilises green innovations, meaning the creation or implementation of new or modified processes, practices, systems and products which benefit the environment and contribute to environmental sustainability.

According to Swart and Groot (2020), the term "green economy" emphasises a friendly attitude toward the natural environment. Chavula et al. (2022) agree that a low-carbon, resource-efficient, and socially inclusive economy is referred to as green.

Other scientists pay special attention to the well-being aspect, claiming that "the green economy is an alternative vision for growth and development; one that can generate economic development and improvements in people's lives in ways consistent with also advancing environmental and social well-being" (Söderholm, 2020, p.1).

For Chen Lai et al. (Chen et al., 2006, p. 332), green innovation "is hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management.

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Kemp et al. (Kemp and Pearson, 2007 p.7) associate green innovations with "the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives".

Green innovations, according to Oltra and Saint Jean (Oltra and Saint Jean, 2009, p.567), "are innovations that consist of new or modified processes, practices, systems and products which benefit the environment and contribute to environmental sustainability".

Nuryakin et al. (2022, p.1) established "the mediating role of green product innovation and green product competitiveness advantage on green marketing performance".

Leal-Millán et al. (2017) claimed that green innovations contribute to creating products, services or processes while optimising the use of natural resources to improve human well-being and can also contribute to sustainable development".

Scientists claim that green innovations produce positive spillovers in both the introduction and diffusion stages; they are intrinsically more risky and uncertain than other investments because they involve technologies that are in the initial stage of their development and therefore suffer from the existence of increasing returns (from knowledge, competencies, and infrastructure) in established, carbon-intensive technologies; finally, the evolution of and frequent changes in environmental regulation make the profitability of the eco-innovative projects uncertain (Cecere et al. 2020; Andersén, 2021). As a result, green stocks may be very volatile in their market performance (Rybalkin, 2022). As it has already been stated, green innovations, irrespective of the economic sector introduced, are one of the main tools to facilitate green growth, which is also conducive to the green economy.

Similarly to green innovations, eco-innovations embrace "the introduction of any new or significantly improved product (good or service), process, organisational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole lifecycle" (Sobczak et al., 2022, p.1). The nature of the eco-innovations includes the product, process, and organisational eco-innovations (Eco-Innovation Observatory, 2012).

Eco-innovation is the creation or implementation of new or significantly improved products (goods and services), processes, marketing methods, organisational structures and institutional arrangements which – with or without intent – lead to environmental improvements compared to relevant alternatives.

Thus, the analysis performed by the authors of the present study shows that the green economy is an economic system that is compatible with the natural environment, is environmentally friendly, is ecological, and for many groups, and is also socially just – it can be regarded as the final goal of green growth.

How are the concepts of "green economy", "green growth", and "green innovation" related to the notion of "sustainable development"?

Sustainable development ensures economic growth, which makes it possible to harmonise human-nature relations and safeguard the environment for present and future generations (Vertakova et al., 2017).

Ryszawska identifies sustainable development (Ryszawska, 2015) as social, economic and political development to preserve the natural balance and environmental access for future generations.

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The concept of sustainable development is usually considered from two perspectives. In a narrow sense, the focus is mainly on its ecological component. Still, in a broad sense, sustainable development is interpreted as a process that denotes a new type of civilisation functioning. Therefore, sustainable development can be seen as an objective requirement of our time (Medvedkina, 2020; Khan, 2021). Having emerged with Blueprint for a green economy for the UK's Department for the environment, the concept of sustainable development attracted the particular interest of researchers in the aftermath of the 2008–2009 global financial crisis, which, in the first place, made it apparent for decision-makers that studying this phenomenon is inevitable since there was an urgent need for the shift in the existing economic model and finding new ways of elaborating a new green economy paradigm. Fulai (2010), Oliinyk (2020), Trushkina (2022), for instance, articulate the relationships between the notion of a green economy with other related concepts such as a low-carbon economy, a circular economy, sustainable consumption and production (SCP), green growth, sustainable development, the Millennium Development Goals (MDGs) etc. Green economy can improve the growth of the country's economy and at the same time achieve sustainability goals (Alsmadi et al., 2022).

The one performed by Ryszawska (2017) possesses specific value because it both compares and analyses several definitions of green economy and green growth provided by UNEP (2011), OECD (2011) etc. Some authors analysed the relationship between a *green economy*, *green growth* and *sustainable development*.

Kazstelan (2017) concluded that the co-existence of the trio "green economy – green growth – sustainable development" is reasonable due to the complementary and synergistic nature of correlations between these concepts. The author argues that the restructuring of the economy aiming at the so-called "green" solutions (green economy), based on the assumptions of the strategy of green growth, is the primary condition for entering the path of sustainable development. In the economic dimension, green economy and green growth have to enable the overall increase in welfare; in the social aspect, it will translate into improvement in life quality, while in the environmental dimension, they will contribute to reducing pressure on the environment and improving the effectiveness of how natural capital is utilised (Kazstelan, 2017). The primary assumption of a green economy or green growth is not replacing the concept of sustainable development. Still, the conviction that is achieving sustainable development should be based on an adequately oriented economy. Building a green economy based on the assumptions of the strategy of green growth must become an integral element of economic policy on the way towards sustainable development. Finally, Kazstelan (2017) proposes the following definition of green growth: economic growth which contributes to rational utilisation of natural capital, prevents and reduces pollution, and creates chances to improve the overall social welfare by building a green economy, and finally makes it possible to enter on the path towards sustainable development. Such treatment makes it possible for the author to emphasise the integrity of the trio: green growth – green economy – sustainable development. Taking the abovementioned findings into account, the definition of the green economy (to put it in the context of sustainable development) should be enlarged: the green economy is based on sustainable development principles and lays the basis for SD.

These are education (new or modified processes, assimilation etc.), economy (products, goods, services, corporate management, business method, energy use etc.), politics (organisational structures, energy security, just system etc.) and environment (reduction of environmental risk, pollution; pollution-prevention, waste recycling, biodiversity etc.). These findings point to the five-spheres model, the Quintuple Helix.

"Quintuple Helix" model of sustainable development is based on the quality management of development, restoring balance with nature and preserving Earth's biological diversity. Moreover, it can solve existing problems by applying knowledge and know-how, as it focuses on the social (public) exchange and transfer of knowledge within the subsystems of a particular or national state (Barth, 2011; Arsova et al., 2021). The innovative Quintuple Helix Model explains how knowledge, innovations, and the environment (natural environment) are interrelated (Carayannis and Campbell, 2010; Barth, 2011;

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Carayannis et al., 2021; Cai, 2022). The Quintuple Helix model is both interdisciplinary and transdisciplinary: the complexity of the five-spiral framework implies that a complete analytical understanding of all spirals requires the continuous involvement of the entire disciplinary spectrum, ranging from Natural Sciences (due to the presence of natural environment factors) to Social Sciences and Humanities, to promote and visualise the system of collaboration between knowledge, know-how and innovations for more sustainable development (Carayannis et al., 2010; Kholiavko et al., 2021). The first subsystem of the Quintuple Helix is the education system, where the necessary human capital is formed. The second subsystem – the economic one – concentrates on the economic capital (e.g., entrepreneurship, machines, food, technologies and money). The third subsystem – the political one, i.e., the political and legal capital (e.g., ideas, laws, plans, policies, etc.). The fourth subsystem unites two forms of capital – social capital and information capital. The fifth subsystem – the environment – is crucial for sustainable development, as it provides people with natural capital (e.g., resources, plants, animal diversity, etc.).

To combine all the findings of the present chapter, it is necessary to work out a definition of green economy that would fit both into the context of the Quintuple Helix Model and sustainable development. In line with such requirements, the study's authors propose that *a green economy* should be defined in the following way: the green economy is an economic system based on sustainable development principles, laying the basis for sd. it ensures economic growth while being compatible with the natural environment and environmentally friendly. It is for many groups and socially comprehend the implementation of specific policy instruments targeted at the environment and disseminate their ideas through the education system.

The Green Growth Index comprises 25 to 30 indicators that characterise four main groups: environmental and resource efficiency of the economy (carbon and energy efficiency, resource efficiency: materials, nutrients, water, multifactor productivity), natural asset base (renewable resources: water, forests, fisheries resources, non-renewable stocks: minerals, biodiversity and ecosystems), the environmental aspects of quality of life (environmental conditions and risks, ecosystem services and environmental benefits), and the economic opportunities and policy instruments that determine green growth (technology and innovation, environmental goods and services, international financial flows, prices and transfers, skills and training, regulations and management approaches). In addition, indicators reflecting the socio-economic context and characteristics of growth (economic growth and economic structure, productivity and trade, labour markets, education and income, as well as socio-demographic characteristics) have been identified. The proposed set of indicators is still being determined. Each country can adapt the set to national circumstances (OECD, 2014).

Measuring progress towards a Green Economy 2012 Indicators at different stages of green economy policies consists of 3 indicators: indicators for environmental issues and targets (Initial stages), indicators for policy interventions (Intermediary Stages), indicators for policy impacts on well-being and equity (Final stages) (United Nations Environment Programme, 2012).

Table 1 presents the main areas and associated indicators for environmental issues and targets.

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Table 1. The first stage indicator

Issues	Indicators
climate change	carbon emissions (ton/year), renewable energy (share of power supply) (%), energy consumption per capita (Btu/person)
ecosystem management	forestland (ha), water stress (%), land and marine conservation area (ha)
resource efficiency	energy productivity (Btu/USD), material productivity (ton/USD), water productivity (m3/USD), CO2 productivity (ton/USD),
chemicals and waste management	waste collection (%), waste recycling and reuse (%), waste generation (ton/year) or landfill area (ha)

Source: United Nations Environment Programme, 2012, p.15

Table 2 presents the main areas and their indicators for policy interventions.

Table 2. The second stage indicator

Issues	Indicators
green investment	R&D investment (% of GDP), EGSS investment (USD/year)
green fiscal reform fossil fuel taxation	fossil fuel, water and fishery subsidies (USD or %), fossil fuel taxation (USD or %), renewable energy incentive (USD or %)
pricing externalities and valuing ecosystem service	carbon price (USD/ton), value of ecosystem services (e.g., water provision)
green procurement	expenditure in sustainable procurement (USD/year and %), CO2 and material productivity of government operations (ton/USD)
green job skill training	training expenditure (USD/year and % of GDP), number of people trained (person/year)

Source: United Nations Environment Programme, 2012, p.17

Economic indicators characterising a significant part of the Stage 3 indicator are crucial in the Green Economy approach. Investing in green activities will lead to capital accumulation and job creation while stimulating economic growth through more sustainable production and consumption.

Table 3. The third stage indicator

Issues	Indicators
employment	construction (person, %), operation and management (person, %), income generated (USD/year), Gini coefficient
EGSS performance	value added (USD/year), employment (jobs), CO2 and material productivity (e.g., USD/ton)
total wealth	value of natural resource stocks (USD), net annual value addition/removal (USD/year), literacy rate (%)
access to resources	access to modern energy (%), access to water (%), access to sanitation (%), access to health care (%)
health	level of harmful chemicals in drinking water (g/litre), number of people hospitalised due to air pollution (person), road traffic fatalities per 100 000 inhabitants (transport-related)

Source: United Nations Environment Programme, 2012, p.20

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Considering the structure of other indicators found in the literature is interesting. The types of systems for these indicators are illustrated below, using specific indicators as examples.

The construction of the **Green Economy Index by Bożena Ryszawska** (Ryszawska, 2015, 2017) began with an overview of the definitions of a green economy presented in selected strategic documents. The measurement of a green economy covers the assessment of the environmental condition, the pressure exerted on the environment by human activity, and the policies pursued by governments which support actions in favour of a green economy (Ryszawska, 2015, p.45).

Table 4. Areas and indicators for the synthetic Green Economy Index

Area	Indikator
I. Ecosystems/biodiversity / natural capital	
Changes within forests and other woodlands	1
Common birds occurrence	2
II. Emissions, pollution, waste	
Greenhouse gases emissions per capita	3
Amount of hazardous waste generated per capita	4
Sulphur oxides (SOx) per capita 5	5
III. Consumption of resources	
Primary energy use per capita	6
Resource productivity	7
IV. Poverty and social inequalities	
People at risk of poverty or social exclusion	8
Gini coefficient of equivalent disposable income	9
Subjective well-being	10
V. Economy	
Unemployment rate	11
Gross Domestic Product	12
Competitiveness	13
VI. Environmental policy and strategies	
Share of environmental taxes in total tax income	14
Green public procurement	15
Public expenditure on environmental research and development	16
The surface of protected areas	17
VII. Green economy sectors	
Ecological/sustainable agriculture	18
Renewable energy production	19
Recycling	20
Green patents per capita	21

Source: Ryszawska, 2015, p.45

The Global Green Economy Index (Global Green Economy Index, 2014) includes subcomponents: Environment and natural capital, Market and investment; Efficiency sectors, Leadership and climate change. Thirty-two underlying indicators and datasets define the performance index of the 2014 GGEI. Table 5 presents a general structure of these four main dimensions and their associated subcomponents (Global Green Economy Index, 2014, p.8).

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Table 5. The performance index of the 2014 GGEI

Dimension	Indicators	Weighting
Leadership & Climate Change	Head of State	20%
	Media Coverage	10%
	International Forums	20%
	Climate Change Performance	50%
Efficiency Sectors	Buildings	25%
	Energy	25%
	Tourism	25%
	Transport	25%
Markets & Investment	Renewable, Energy, Investment, Attractiveness	25%
	Cleantech Innovation	30%
	Cleantech Commercialisation	20%
	Green Investment Facilitation	25%
Environment & Natural Capital	Agriculture	17%
	Air Quality	17%
	Water	17%
	Biodiversity & Habitat	17%
	Fisheries	17%
	Forests	17%

Source: Global Green Economy Index, 2014, p.26

The Green GDP Index (Stjepanović et al., 2019) considers three methodological approaches to calculating environmentally adjusted domestic product: 1) includes consideration of reduction of natural capital; 2) takes into account the degradation of the environment due to the accumulation of pollutants and waste, since they affect both economic activity and natural capital; 3) implies a further deduction of the costs of combating environmental degradation, as these adjusted accounts should show defence costs depending on their impact on natural capital. Stjepanović, Tomić and Škare (2019) proposed an alternative approach to sustainability and green growth, which represents a crucial step towards transforming global economic thinking by ensuring applicable methodology and correct information for the assessment of economic progress. "By following their work and keeping common Green GDP accounting framework (a quantitative position), we have applied a general methodological algorithm that is suitable for the assessment of and comparison between different countries, as well as other surveys" (Stjepanović et al., 2019, p.6).

The Environmental Performance Index in 2020 evaluates only Environmental Health (40%) and Ecosystem Vitality (60%) (Wendling et al., 2020). The 2020 EPI framework organises 32 indicators into 11 issue categories and two policy objectives, with weights shown at each level as a percentage of the total score (Wendling et al., 2020). The 2022 EPI framework organises 40 indicators into 11 issue categories and three policy objectives, with weights shown at each level as a percentage of the total score. The Environmental Performance Index in 2022 evaluates Environmental Health (20%), Climate change (38%) and Ecosystem Vitality (42%) (The Environmental Performance Index, 2022).

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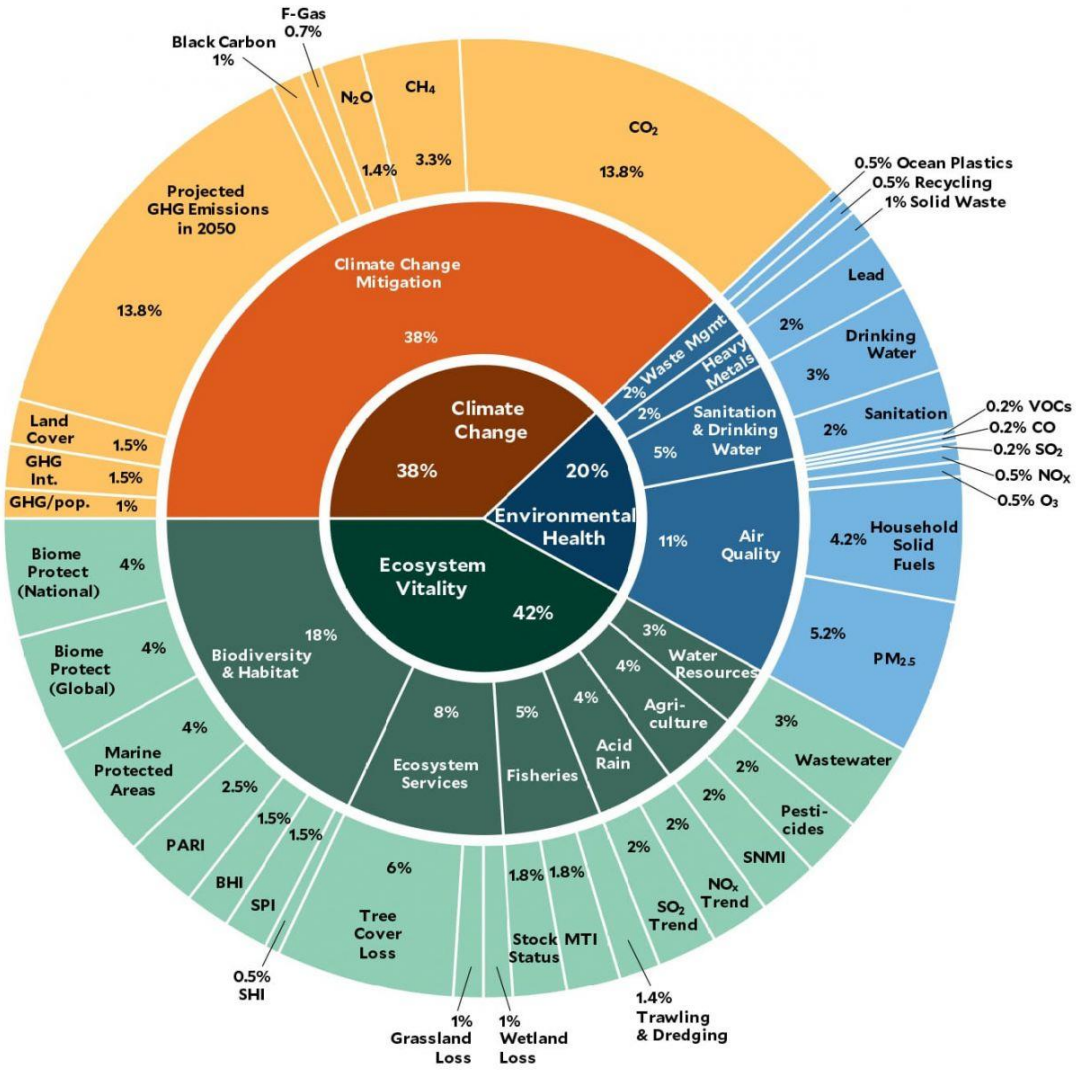


Figure 1. The Environmental Performance Index 2022
Source: The 2022 Environmental Performance Index (EPI)

Other authors also believe that the green economy represents a catalyser for sustainable development in its three dimensions -economic, social and environmental- aiming to improve human well-being and social equity and reduce ecological risks (Chaaben et al., 2022).

The Greenness of Stimulus Index 2021 (Greenness of Stimulus Index, 2021, p.20) is constructed by combining the flow of stimulus into five key sectors with an indicator of each sector's environmental impact, the latter accounting for both historical trends and specific measures taken under the country's stimulus. The five sectors are chosen for their historical impact on climate and environment: agriculture, energy, industry, waste and transport.

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Table 6. The Greenness of Stimulus Index 2021. Summary of positive policy archetypes

Sector	Archetype
Agriculture	Bailouts with green strings attached Nature-based solutions Loan and grants for green investments Conservation and wildlife protection programmes
Energy	Bailouts with green strings attached Loan and grants for green investments Green R&D subsidies Subsidies or tax reductions for green products
Industry	Bailouts with green strings attached Loan and grants for green investments Green R&D subsidies Subsidies or tax reductions for green products
Transport	Bailouts with green strings attached Loan and grants for green investments Green R&D subsidies Subsidies or tax reductions for green products
Waste	Bailouts with green strings attached Loan and grants for green investments Green R&D subsidies Subsidies or tax reductions for green products

Source: Greenness of Stimulus Index, 2021, p.21-22

The overall GSI is an indicator of the total fiscal spending in response to COVID-19, categorised as either a positive or negative environmental impact. The final index for each country is an average of sectoral impact, normalised to a scale of -1 to 1 (Greenness of Stimulus Index, 2021, p.20).

Table 7. The Greenness of Stimulus Index 2021. Summary of negative policy archetypes

Sector	Archetype
Agriculture	Subsidies or waived fees for environmentally harmful activities Deregulation of environmental standards Environmentally related bailout without green strings Subsidies or tax reductions for environmentally harmful products
Energy	Subsidies or waived fees for environmentally harmful activities Environmentally harmful infrastructure investments Deregulation of environmental standards Environmentally related bailout without green strings Subsidies or tax reductions for environmentally harmful products
Industry	Subsidies or waived fees for environmentally harmful activities Environmentally harmful infrastructure investments Deregulation of environmental standards
Transport	Subsidies or waived fees for environmentally harmful activities Environmentally harmful infrastructure investments Deregulation of environmental standards Environmentally related bailout without green strings Subsidies or tax reductions for environmentally harmful products
Waste	Subsidies or waived fees for environmentally harmful activities Environmentally harmful infrastructure investments Deregulation of environmental standards Environmentally related bailout without green strings

Source: Greenness of Stimulus Index, 2021, p.23-24

The Greenness of Stimulus Index 2021 (Greenness of Stimulus Index, 2021) covers the areas of "Natural environment", "Educational subsystem", "Economic subsystem", and "Political subsystem". However, it does not consider a social aspect at all. "Natural environment subsystem" may include Nature-Based Solutions, Conservation and wildlife protection programmes, Subsidies for

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environmentally harmful activities, Environmentally harmful infrastructure investments, and Environmentally related bailouts without green strings; "Educational subsystem" may include Green R&D subsidies; the "Economic subsystem" - Subsidies or tax reductions for environmentally harmful products, Green infrastructure investments, Subsidies or tax reductions for green products; "Political subsystem" - Deregulation of environmental standards.

The EEPSE Green Economy Index is consistent with the "Quintuple Helix" model of sustainable development (Rybalkin, 2022). "Natural environment subsystem" may include the state of natural environment and resources: forest cover change, water and air pollution etc. (10 indicators); “Educational subsystem” - Level of “green” (ecological) education and R&D (10 indicators); “Economic subsystem” - share of renewable sources of energy, CO2 emissions per capita etc. (10 indicators); “Political subsystem” - political stimulus for green economy development, global climate change partnership (10 indicators); “Societal subsystem” - social and gender inequality, society’s involvement into the green economy matters (10 indicators) (Annex 1).

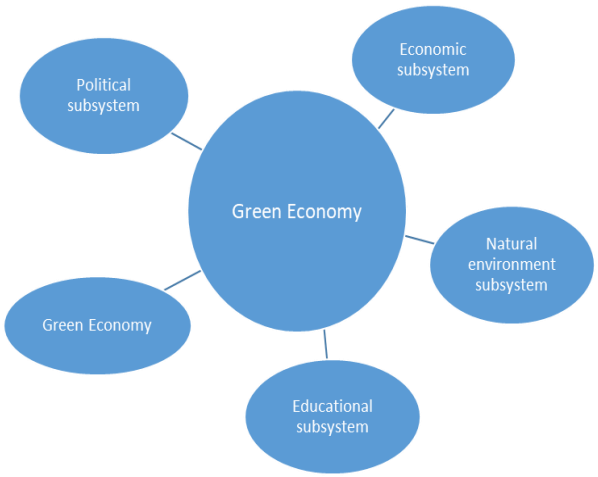


Figure 2. Structure of the EEPSE Green Economy Index
Source: authors

The role of an educational factor in the green economy has long been acknowledged. As early as in Brundtland Report (Brundtland, 1987) there was an appeal, among other things, to educational institutions and the scientific community, which had played indispensable roles in creating public awareness and political change in the past. It was suggested that they would play a crucial part in putting the world onto sustainable development paths. It is also essential that knowledge has been widely recommended as a critical resource to support innovativeness and hence green economy research (Leal-Millán et al., 2017). Indeed, the knowledge base after effective supply chain networking becomes vital for enhancing the green economy (Ibid).

Education can supply the job market with new specialists for the green economy and retrain some existing specialists. As the 'green' spheres in the job market develop, the demand for specialists in new professions known as 'the green collars' grows, too. Specialists in the rapidly evolving energy efficiency policy and savings could be an example of such 'green collars' (Arnett et al., 2009). The role of the economic subsystem can hardly be overestimated due to the importance of the business environment and activities taken by companies, which have to play their proactive role in averting the global climate crisis. Green development has become a strategic issue for firms seeking to achieve environmental improvement and profitability while actively replying to growing environmental pressures and demands.

Still, being concerned about the potential loss of assets due to environmental damage, major asset owners are starting to stimulate the companies in their portfolios to address climate change. This trend is

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economically justified since the long-term returns of the world's largest investors are threatened by climate change. The same tendency is observed in the European Union itself, which is the object of the present research. At the beginning of 2020, sustainable European funds held €668 bn of assets, up 58% from 2018. Helping to propel the growth is an increase in new products, with 360 sustainable funds launched in the year, bringing the total number across Europe to 2405. Some 50 sustainable funds established in 2019 had a specific climate-oriented mandate (Black, 2020).

As the clean-energy industry, which can be seen at the core of the economic subsystem described above, is gaining momentum, governments and public bodies are waking up to climate change. Politicians worldwide, particularly in Europe, square up to ecological challenges backing green-infrastructure plans. As early as in the Brundtland Report it has been highlighted that sustainable development is not a fixed state of harmony but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs. […] Painful choices must be made (Brundtland, 1987). Thus, sustainable development must rest on political will, prior approval procedures for investment and technology choice, foreign trade incentives and all components of development policy.

The role of politics and the state in promoting a green economy is underlined by the fact that the transition towards sustainable development needs to be publicly funded, at least partially, because of the weak competitiveness of clean technologies (at present) compared to the conventional alternatives and the uncertain effectiveness of regulation and other public policies mechanisms (Cecere et al., 2020). As mentioned in Brundtland Report, sustainable development requires changes in values and attitudes towards environment and development – indeed, towards society and work at home, on farms and in factories (Brundtland, 1987).

Such ideas were inherited by the Global Compact – an international initiative launched in July 2000 by United Nations Secretary-General Annan, bringing companies together with UN agencies, labour and civil society to support ten principles of sustainable development (United Nations, 2006). These standards address respect for human rights as set out in the major international instruments, avoidance of complicity in human rights abuses, freedom of employees to associate and engage in collective bargaining, elimination of forced labour and child labour, non-discrimination, a precautionary approach to environmental harm; promotion of environmental responsibility, developing and spreading of environmentally sound technology, avoidance of corrupt practices (United Nations, 2022). Thus, forming environmentally responsible behaviour models for the population and business is essential. This will reduce both unsustainable production and negative environmental impacts—the rest results from the inhabitants' social and ecological activity (Vertakova et al., 2017).

Last but not least subsystem of the new index should be the natural environment. Several factors underline its importance. Paragraph 53 of the Brundtland Report points out that species diversity is necessary for the normal functioning of ecosystems and the biosphere. The genetic material in wild species contributes billions of dollars yearly to the world economy in the form of improved crop species, new drugs and medicines, and raw materials for industry. But utility aside, there are also moral, ethical, cultural, aesthetic, and purely scientific reasons for conserving wild beings. Paragraph 54 states that the priority is establishing the problem of disappearing species and threatened ecosystems on political agendas as a significant economic and resource issue. Sustainable development requires views of human needs and well-being that incorporate such non-economic variables as education and health enjoyed for their own sake, clean air/water and the protection of natural beauty.

Even though all the models mentioned above contribute to the progress towards sustainable development, many indices still need to reflect all the components of SD: societal, economic, political, educational and environmental. Even though particular indices (such as OECD indicator, Greenness of Stimulus Index (Vivid Economics, 2021) and Green Economy Index by Ryszawska (2015) seem to be the most comprehensive and inclusive, they still miss certain aspects of sustainable development:

societal in first two cases and educational in the third. Against this background, it can be concluded that the integrated indicator EEPSE Green Economy Index most accurately characterises green economy in the context of sustainable development, its principles and components.

3. Conclusions

The content of the categories “green economy", "green technologies", "eco-innovation", "green innovation", "and green growth" confirm the growing interest in the green economy, suggesting potential directions of development towards the establishment of a consistent set of indicators, since the critical problem at this point lies in the lack of their homogeneity. Each organisation employs their own set of indicators, frequently based on quite divergent definitions.

The analysis of scientific literature within the present research allowed us to identify the characteristic features of the green economy and its relationship with the concept of sustainable development. In line with that, the authors' interpretation of the concept of "green economy" was given: the green economy is an economic system based on sustainable development principles, laying the basis for SD. It ensures economic growth while being compatible with the natural environment and environmentally friendly. It is for many groups and socially comprehend the implementation of specific policy instruments targeted at the environment and disseminates their ideas through the education system. Moreover, different models and indices dealing with the green economy were analysed through the prism of the newly developed definition.

Discussions about the green economy usually take place in the context of the concept of sustainable development. There is a perception in the information space that these concepts are identical; many articles in this field of knowledge make this point explicitly and implicitly. However, it would be a mistake to consider them synonyms.

As a tool for sustainable development, the green economy indices reflect certain aspects of sustainable development that are most important, according to the authors of the indices. Thus, the structure of these indices varies and depends on the concept of sustainable development adopted by the authors. Some indices reflect only the area of the natural environment, others the economic area or the economic, social and political areas, etc. Consequently, the structure of the indices depends on the authors' approach to sustainable development.

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Annex 1
Indicators used for each of the subsystems of the Quintuple Helix

Subsystem 1. Education:
S_1_1 Research institutions prominence 0–100 (best) (Global competitiveness report (further – GCR) 2019);
S_1_2 Scientific publications score (GCR, 2019);
S_1_3 Gross expenditure on R&D, % of GDP (Global Innovation Index, 2020);
S_1_4 Total number of documents in Scopus, Environmental science, cumulative, 1996 – 2019 (SJR — SCImago, 2021);
S_1_5 Citable documents, 1996 – 2019 (SJR — SCImago, 2021);
S_1_6 Citations (SJR — SCImago, 2021);
S_1_7 Self-citations (SJR — SCImago, 2021);
S_1_8 Citations per document (SJR — SCImago, 2021);
S_1_9 h-index, (SJR — SCImago, 2021);
S_1_10 Patents by origin/bn PPP$ GDP (Global Innovation Index Report, 2020);
Subsystem 2. Economic aspects:
S_2_1 GDP per unit of energy use (Global Innovation Index Report, 2020);
S_2_2 ISO 14001 environmental certificates per bn PPP$ GDP (Global Innovation Index Report, 2020);
S_2_3 Resource efficiency index (The global sustainable competitiveness index, 2020);
S_2_4 Greenhouse gas emissions score (Climate Change Performance Index, 2021);
S_2_5 Share of renewable energy in gross final energy consumption by sector, % (Eurostat, 2019)
S_2_6 The global sustainable competitiveness index (2020);
S_2_7 Circular material use rate, % of material input for domestic use (Eurostat, 2019);
S_2_8 Efficiency sectors (Global Competitiveness Report, 2019);
S_2_9 growth of innovative companies 1–7 (best) (Global Competitiveness Report, 2019);
S_2_10 Energy transition index (Energy transition index 2020 by World Economic Forum);
Subsystem 3. Political system:
S_3_1 Stringency of environmental regulations, index (Travel and Tourism Competitiveness Report, 2019);
S_3_2 Enforcement of environmental regulations, index (Travel and Tourism Competitiveness Report, 2019);
S_3_3 Environment-related treaties in force count (out of 29 possible) (Global Competitiveness Report, 2019);
S_3_4 Climate policy, index – covers both national and international climate policy performance (Climate change performance index, 2021);
S_3_5 Climate Change Performance Index (Climate change performance index, 2021);
S_3_6 Environmental performance, index (Global Innovation Index, 2020);
S_3_7 Environmental tax revenues, % of GDP (Eurostat, 2018);
S_3_8 Intellectual property protection 1–7 (best) (Global Competitiveness Report, 2019);
S_3_9 population covered by the Covenant of Mayors for Climate & Energy signatories – percentage of total population (Eurostat, 2019, for the UK – 2018);
S_3_10 Renewable energy regulation 0–100 (best) (Global Competitiveness Report, 2019).
Subsystem 4. Civil society:
S_4_1 Attitude of European citizens towards the environment – percentage of population who consider environmental issues to be important (Eurobarometer, 2017);
S_4_2 World Press Freedom Index (Reporters without borders, 2020)*;
S_4_3 Democracy index (The Economist Intelligence Unit, 2020);
S_4_4 Civil liberties (The Economist Intelligence Unit, 2020);
S_4_5 Social Capital Index (The global sustainable competitiveness index, 2020);

S_4_6 Incidence of corruption 0–100 (best), (Global Competitiveness Report 2019);
S_4_7 Internet users % of adult population, (Global Competitiveness Report, 2019).
S_4_8 People at risk of poverty or social exclusion, Eurostat (2019), except for Ireland, Italy, the UK (2018);
S_4_9 Share of busses and trains in total passenger transport, % of total inland passenger-km (Eurostat, 2018);
S_4_10 Females employed with advanced degrees, % (Global Innovation Index, 2020).
Subsystem 5. Natural environment:
S_5_1 Environmental performance index (Environmental performance index report, 2020);
S_5_2 Air quality (Environmental performance index report, 2020);
S_5_3 Water resources (Environmental performance index report, 2020);
S_5_4 Biodiversity and habitat (Environmental performance index report, 2020);
S_5_5 Forest cover change, % (The Travel & Tourism Competitiveness Report, 2019)*;
S_5_6 Wastewater treatment, % of total (The Travel & Tourism Competitiveness Report, 2019);
S_5_7 Total protected areas, % of territory (The Travel & Tourism Competitiveness Report, 2019);
S_5_8 Natural capital (The Global Sustainable Competitiveness Index, 2020);
S_5_9 Ecological sustainability, index (Global Innovation Index Report, 2020);
S_5_10 Agriculture (Environmental performance index report, 2020);

* *a negative indicator (inverse relationship with sustainable development).*

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THE BIG PICTURE OF CLIMATE CHANGE RESEARCH IN THE ARAB WORLD: INSIGHTS FROM BIBLIOMETRIC ANALYSIS*

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Abstract. Global impacts of climate change are wide-ranging and unprecedented in scope, ranging from shifting weather patterns that threaten a permanent change of the ecosystem on earth (which may severely affect human life, including water and food security), to major events directly affecting human lives, such as natural / climate-related disasters, rising sea levels, etc. With the organization of two successive conferences of the parties (COP) in the Arab region, it became evident that there is extensive attention from governments and regional bodies in the Arab region towards issues related to climate change. In this study, we aim to analyze the research performance of Arab scholars on climate change based via a bibliometric analysis of published research articles in 22 Arab countries. We have used a multivariate approach for data analysis and bibliometric indicators characterization. Many indicators are used to examine scientific performance, as well as the trends of a growing number of publications, number of citations, number of authors, etc. Using a predefined set of keywords related to climate change and UN climate change themes, we were able to assemble a dataset of 68,193 documents (published papers) that were further analyzed to set the scene and show the status of scholarly publications from authors of the Arab world. Saudi Arabia comes on top of the Arab countries in terms of the number of publications in climate change research-related publications, followed by Egypt, Morocco and the United Arab Emirates, while IEEE, Energy Procedia and Arabian journal of geosciences are the top three choices for publications related to climate change among the Arab researchers.

Keywords: climate change; research productivity; bibliometric analysis; Arab countries.

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1. Introduction

The 22 countries of the Arab region (Figure 1) are considered the most vulnerable regions of the world to negative impacts of climate change, as it faces challenges such as extreme heat, threats to coastal areas, increased drought and desertification, scarcity of water resources, seawater intrusion to groundwater, the spread of epidemics, pests, and diseases (IPCC, 2014).

Climatic changes in the Arab world affected water resources, sea level and coastal areas, human health and development, food production, biodiversity, land use and urban planning, tourism, and national security and conflict control, among other aspects of daily life (Al-Mebayedh 2013; El-Kassas et al., 2022).

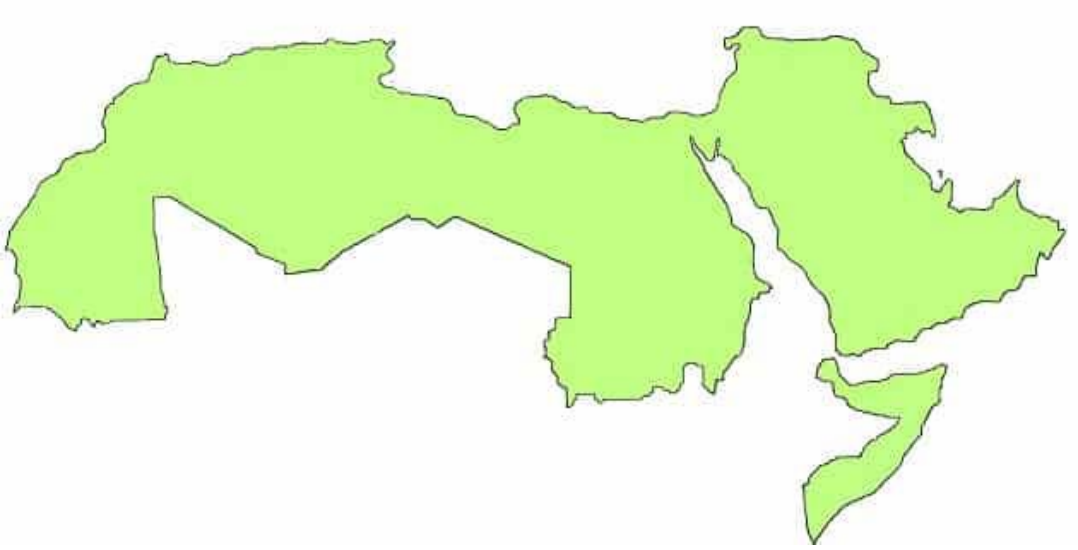


Figure 1. Map of the 22 Arab countries

The Arab region has the largest food deficit and imports the most food globally (UNDP, 2018) and is already one of the most water-scarce regions in the world; the annual per capita share of renewable water resources is less than 500 m^3 in 70 per cent of the region where the average per capita share is 800 m^3 (below the global water poverty line, estimated by the United Nations, 1,000 M^3), where 19 of the 22 Arab countries faces from water scarcity, and desertification and land degradation affect 17 countries (AOAD, 2017). This would indirectly affect the region's education, income, health and brain circulation (Radwan and Sakr, 2018; Rezk et al., 2020).

Over the past 10 years, many Arab countries have implemented several adaptation and mitigation strategies to reduce the negative effects of climate change, such as Initiatives to convert old cars and renovation of roads, installation of electric trains, agricultural water pumping using PVs and Natural gas utilization (Karim, 2018; Djoundourian, 2021).

There is also a political commitment of Arab countries towards climate change, which is demonstrated by the participation of 16 Arab countries in the United Nations Sustainable Development Summit in New York in 2015, the Climate Summit in Paris, the hosting of Egypt and the United Arab Emirates for the 27th and 28th versions of the "Conference of the Parties, COP (Ghaemi et al., 2022; Mantlana et al., 2022).

At the level of the Arab Summits, interest in climate change has emerged through Arab strategies, plans and programs for sustainable consumption and production (2009), food security (2010 and 2017), water security (2012), climate change (2012), disaster risk reduction (2012 and 2018), health and environment (2012), renewable

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energy (2013), housing and sustainable urban development (2016 and 2019), and environmental dimensions of the sustainable development goals (2016 and 2019).

Hence, On November 2022, the United Nations Climate Change Conference (UNFCCC) Conference of the Parties in its 27th version (COP27) will take place at Sharm Elsheikh – Egypt, while it is expected that the United Arab Emirates will organize the COP28 in November 2023. Those trending activities, in number, prove an increasing interest of countries of the region to deal with climate change issues and tools for remediation (Rachid et al., 2020; Tomaszkiewicz, 2021; Khiyat, 2022).

Therefore, this paper aims to assess the Arab world's commitments to Research and Development on climate change and to recognize the research trends over the past ten years, to assist in directing future policies and improving research activities in climate change research. The assessment is conducted by investigating peer-reviewed literature on climate change published by Arab researchers and indexed in Scopus.
We have used bibliometric data analysis techniques, which offer valuable quantitative and qualitative indicators for a well-informed understanding of the Arab scientific outputs of climate change research. While conducting the research, we have also consulted other studies that assessed the scientific output of the Arab world and Africa in specific domains, such as the development trends of Environmental Impact Assessment (Zyoud, 2021), bibliometric assessment of drinking water research in Africa (Wambu, 2016), mapping of climate change research in the Arab world (Zyoud et al., 2020) and mapping environmental impact assessment research landscapes in the Arab world using visualization and bibliometric techniques (Zyoud and Zyoud, 2021).

2. Bibliometric data

Bibliometric analysis is a quantitative method that deals with many publications and scientific literature. For this analysis, the data of climate change publications were extracted from the Scopus database (Scopus, 2022), with a search query involving 80 Keywords derived from "Elsevier 2021 SDG mapping" and based on SDG number 13 for climate actions keywords (Rivest et al., 2021), in addition to few keywords stemming as a reflection to thematic areas of COP26 in Glasgow. Those additional keywords are: "renewable energy", "nature conservation"," biodiversity", "endangered plant", "endangered animal", "green technologies", "green cities", "recycling", water desalination", and "environment". The search is limited to the 22 Arab countries shown in Figure 1. The data extraction from Scopus and SciVal covers the last ten years, from 2012 to 2021, based on available data.
The search in the title and abstract using the list of keywords resulted in identifying 68,128 publication entries (unique publications with no duplications) as follows:

- 43799 Journal articles,
- 17657 Conference papers,
- 3245 Reviews,
- 2986 Book and chapters,
- 441 other types of publications (e.g. reports)

Publications with at least one author affiliated with one of the Arab countries' research institution were selected. The data extracted included publication year, authorship, institutions, countries/regions of the institutions, journal title, abstract, journal category, publication types, language, publication count and citation count.
The analysis of the collected data was performed using various tools and software, including MS Excel® v16.0, SPSS® v22.0, VOS viewer® v1.6.18, Tableau® v2022.1 and R® v.4.2.1.

The VOS viewer software was used to analyze the terms used in titles and abstracts of the included publications and displays the findings as a "term map", a form of presentation where the bubble size reflects how frequently a term is mentioned in the included publications. The bubble colour, on the other hand, reflects how often a publication mentioning the term is cited on average, while the distance between two bubbles reflects how

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frequently two terms are mentioned in the same publications. (Yeung et al., 2017; Yeung et al., 2019; Almulhim et al., 2021, Korshid et at., 2020)

3. Bibliometric Data Analysis

Overview of the data points

The data covered the publications of Arab countries researchers that were published in the last ten years (2012-2021). The total number of publications indexed in Scopus (TP) is 68,128. These articles are primarily published in English (67,507; 98.9%), French (652; 0.95%), and Arabic language (114; 0.16%). The total number of authors (AUS) for all the articles is 185,800, and the total citations (TC) received by all publications is (902,806), while the Field weighted citation impact (FWCI)† is 1.28, and the Citations per Publication (C/P) is 13.3. The percentage of international collaboration publications (IC)‡ is 53.2%, and the collaborative publications between academia and industry are only 1.9% of all the publications.

The document types on climate change research by Arab researchers are shown in Table 1. Most of the publications are in the form of articles (TP= 43,799; TC= 648,271), followed by conference papers (TP= 17,657; TC= 648,271) and books and chapters (TP= 2,986; TC= 14,213). Notably, the field weight citation impact and citation per publication for the review types are higher than the other publications (FWCI = 1.69; C/P= 50.8).

Table 1. Types of publication on climate change published by Arab researchers (2012 to 2021)

Document Type	TP[1*]	TC[2*]	FWCI[3*]	C/p[4*]	IC[5*]
All Scholarly Output	68,128	902,806	1.28	13.3	53.2
Articles	43,799	648,271	1.28	14.8	143,454
Conference	17,657	69,486	1.14	3.9	40,993
Book and Chapters	2,986	14,213	1.4	4.8	45.2
Review	3,245	164,827	1.69	50.8	67.8

[1*]TP: Total number of publications, [2*]TC: Total citations, [3*]FWCI: Field weight citation impact, [4*]C/P: Citation per publication, [5*]IC: Percentage of International Collaboration publications

Publications and citation Trends

While the total number of publications of Arab countries' scholars in the climate change domain is 68,128 publications during the last ten years, the number of publications followed an ascending trend from 3,012 publications in 2012 to 13,339 publications in 2021 (Table 2 & Figure 2). The average annual growth rate of publication represents 18.4%, while the highest growth rate was in 2019, representing 28.7% followed by 23.3% in 2021. Comparing the ascending trend in number of publications in the Arab world to the same trend observed in the whole world revealed that while both trends are following the same pattern of yearly relative increase and decrease, but on average, the growth rate of publications in the Arab world is 2-3 folds that of the world average (Table 2).

† FWCI: A statistic defined as the ratio of the citations received by an entity's outputs and the average number of citations received by all other similar outputs
‡ IC: A statistic defined as co-authored publications with institutions in other countries/regions

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Table 2. Publications and citation trends of climate change by researchers 2012-2021

Year	TP	TC	FWCI	C/P	IC	AUS	Growth Rate	TP (World)	Growth Rate (World)
2012	3,012	62,425	1.05	20.7	46.8	9,623		151700	
2013	3,603	77,765	1.05	21.6	50.9	15,455	19.6%	162081	6.8%
2014	3,935	85,327	1.11	21.7	53.5	17,291	9.2%	167075	3.1%
2015	4,685	96,017	1.14	20.5	52.5	17,595	19.1%	172491	3.2%
2016	5,487	100,649	1.14	18.3	52.5	20,332	17.1%	184120	6.7%
2017	6,339	113,179	1.23	17.9	54.2	27,000	15.5%	198393	7.8%
2018	7,403	109,279	1.2	14.8	51.3	27,104	16.8%	218128	9.9%
2019	9,531	106,679	1.32	11.2	50.3	36,525	28.7%	244534	12.1%
2020	10,807	94,538	1.37	8.7	52.8	42,701	13.4%	260575	6.6%
2021	13,326	56,948	1.54	4.3	58.5	52,928	23.3%	293710	12.7%
Total	68,128	902,806					Average: 18.1%		Average: 7.7%

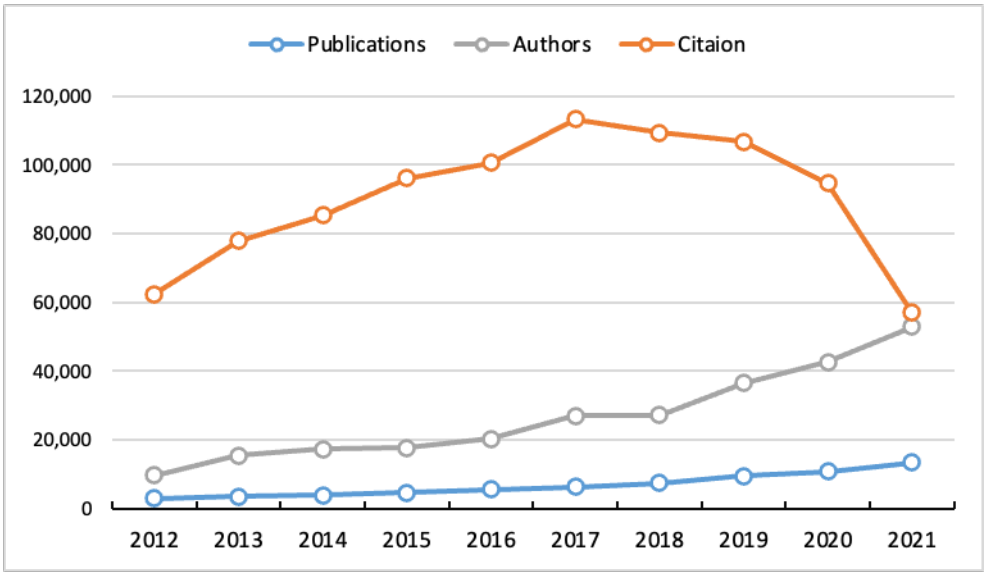


Figure 2. Publications, Citations and Authors trends (2012-2021)

Top leading Arab Countries in Climate Change Research

Table 3 shows the ranking of Arab countries' publications in climate change research from 2012 to 2021 in descending order. The top five countries are Saudi Arabia (TP=16,851, AUS=54,898), Egypt (TP=12,607, AUS=39,147), Morocco (TP=6,664, AUS=26,363), United Arab Emirates (TP=6,634, AUS=21,945), and Algeria (TP=6,301, AUS=16,293). Those five countries alone represent a cumulative 65% of the number of publications and 64% of the authors (cf. Table 3).

In terms of citations, the publications from Saudi Arabia have received the highest number of citations (TC=333,032), followed by Egypt (TC= 174,114), United Arab Emirates (TC=87,248), Tunisia (55,121), Morocco (TC=61,918), and Qatar (TC=55,700). Qatar comes at the top of Arab countries in Field Weight Citation Index (FWCI=1.76), followed by Saudi Arabia (FWCI=1.65) and United Arab Emirates (FWCI=1.45). Saudi Arabia comes as the top Arab countries in terms of total publication per million people (5750.2), followed by Qatar (560.9) and United Arab Emirates (555.8).

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Table 3. Rank of Arab countries on Climate change research, 2012-2021

Rank	Country	TP	Cumulative TP	TC	FWCI	C/P	IC	AUS	Cumulative AUS	TP/million People
1	Saudi Arabia	16,851	22.3%	333,032	1.65	19.8	71.3	54,898	22.1%	5750.2
2	Egypt	12,607	39.0%	174,114	1.36	13.8	54.7	39,147	37.8%	282.6
3	Morocco	6,664	47.9%	61,918	1.14	9.3	41.3	26,363	48.4%	178.4
4	United Arab Emirates	6,634	56.7%	87,248	1.45	13.2	63.2	21,945	57.2%	555.8
5	Algeria	6,301	65.0%	53,673	0.87	8.5	43.5	16,293	63.8%	14.2
6	Tunisia	5,684	72.5%	66,121	1.03	11.6	55.2	17,739	70.9%	311.0
7	Iraq	5,315	79.6%	40,438	1.16	7.6	42.7	13,503	76.3%	51.0
8	Jordan	3,121	83.7%	32,881	1.16	10.5	50.3	8,611	79.8%	75.8
9	Qatar	2,930	87.6%	55,700	1.76	19	71.1	12,829	84.9%	560.9
10	Lebanon	2,234	90.6%	35,375	1.41	15.8	62.3	7,838	88.1%	516.1
11	Oman	1,913	93.1%	24,759	1.42	12.9	64.1	5,905	90.4%	400.6
12	Kuwait	1,690	95.3%	17,909	1.1	10.6	53.4	5,056	92.5%	164.6
13	Bahrain	663	96.2%	4,549	0.95	6.9	52.3	1,684	93.2%	379.2
14	Palestine	661	97.1%	8,004	1.25	12.1	65.1	8,004	96.4%	129.6
15	Sudan	619	97.9%	8,531	1.36	13.8	76.7	2,502	97.4%	13.8
16	Libya	555	98.6%	5,242	0.98	9.4	72.8	2,117	98.2%	107.1
17	Yemen	452	99.2%	5,895	1.38	13	88.7	1,552	98.8%	14.8
18	Syria	427	99.8%	5,449	1.05	12.8	12.4	1,691	99.5%	26.1
19	Mauritania	85	99.9%	1,213	0.92	14.3	96.5	702	99.8%	12.2
20	Djibouti	30	100.0%	573	1.26	19.1	96.7	175	99.9%	29.9
21	Somalia	28	100.0%	234	0.89	8.4	85.7	169	99.9%	0.8
22	Comoros	2	100.0%	22	0.81	11.0	100.0	128	100.0%	2.3

Figure 3 and Figure 4 below show combined illustrations of the number of publications, number of citations and number of authors. Figure 3 describes the relationship between the number of publications and number of citations with the best fit of polynomial 4th order (R^2=0.99, and P-Value <0.0001), while Figure 4 shows a discretization of the same graph on a lg-log scale (to identify all the 22 countries).

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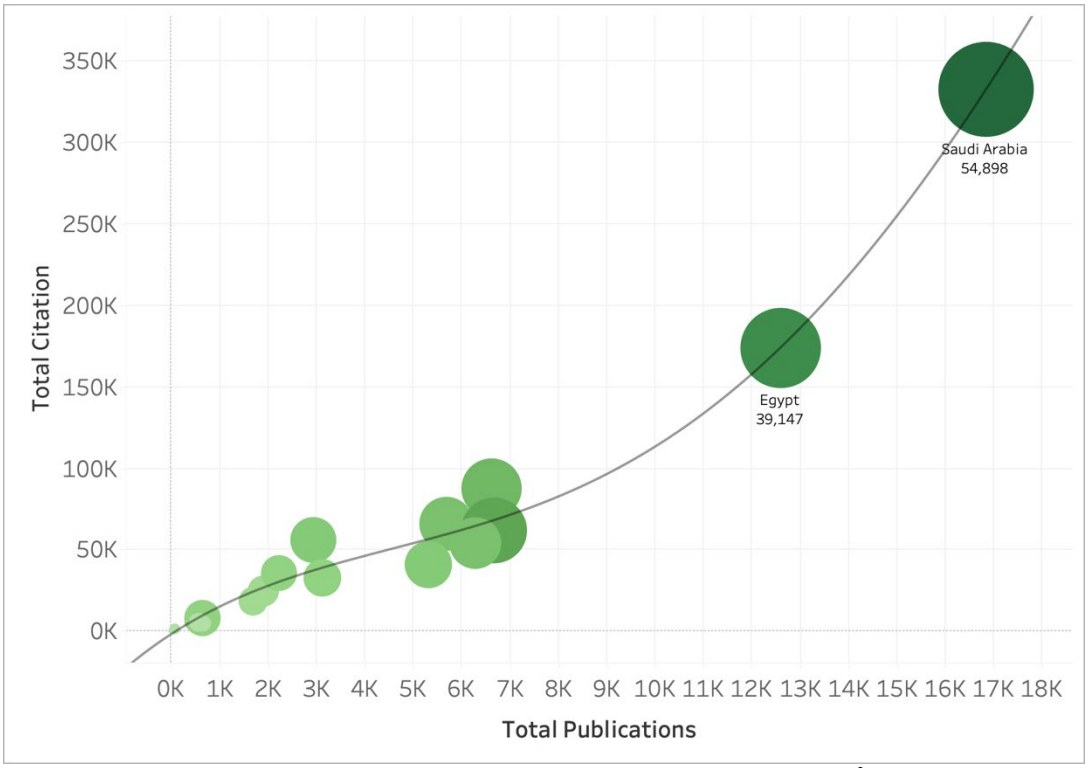


Figure 3. Trend curve for the number of publications vs. number of citations (Polynomial 4th order, R^2=0.99, P-Value <0.0001)

Deviating from the general trend of Figure 3 are the United Arab Emirates, Tunisia and Qatar, where the data points are "above" the curve (the number of citations is higher than the general trend). On the other hand, Iraq shows a number of citations that is "below" the curve. Those observations should be explained using extra data points and characteristics in further studies, as the pattern of citation in those four countries is different than in other countries in the region.

Focusing on environmental science, renewable energy and recycling research (as shown partially in Figure 5), the bibliometric analysis shows that the total number of publications in environmental science, including pollution, water science and technology, environmental chemistry, waste management and disposal, nature, and the landscape was 13,443 for Arab countries during 2012-2021, the total number of authors (AUS) was 46,031, and the total citations received by all publications in environmental science was 227,658. While for renewable energy research, the total amount of publications was 17,951, the total number of authors (AUS) was 17,951, and the total citations received by all publications was 130,255 and for recycling research, the total amount of publications was 4,176 during 2012-2016, the total number of authors (AUS) was 13,386, and the total citations was 77,572.

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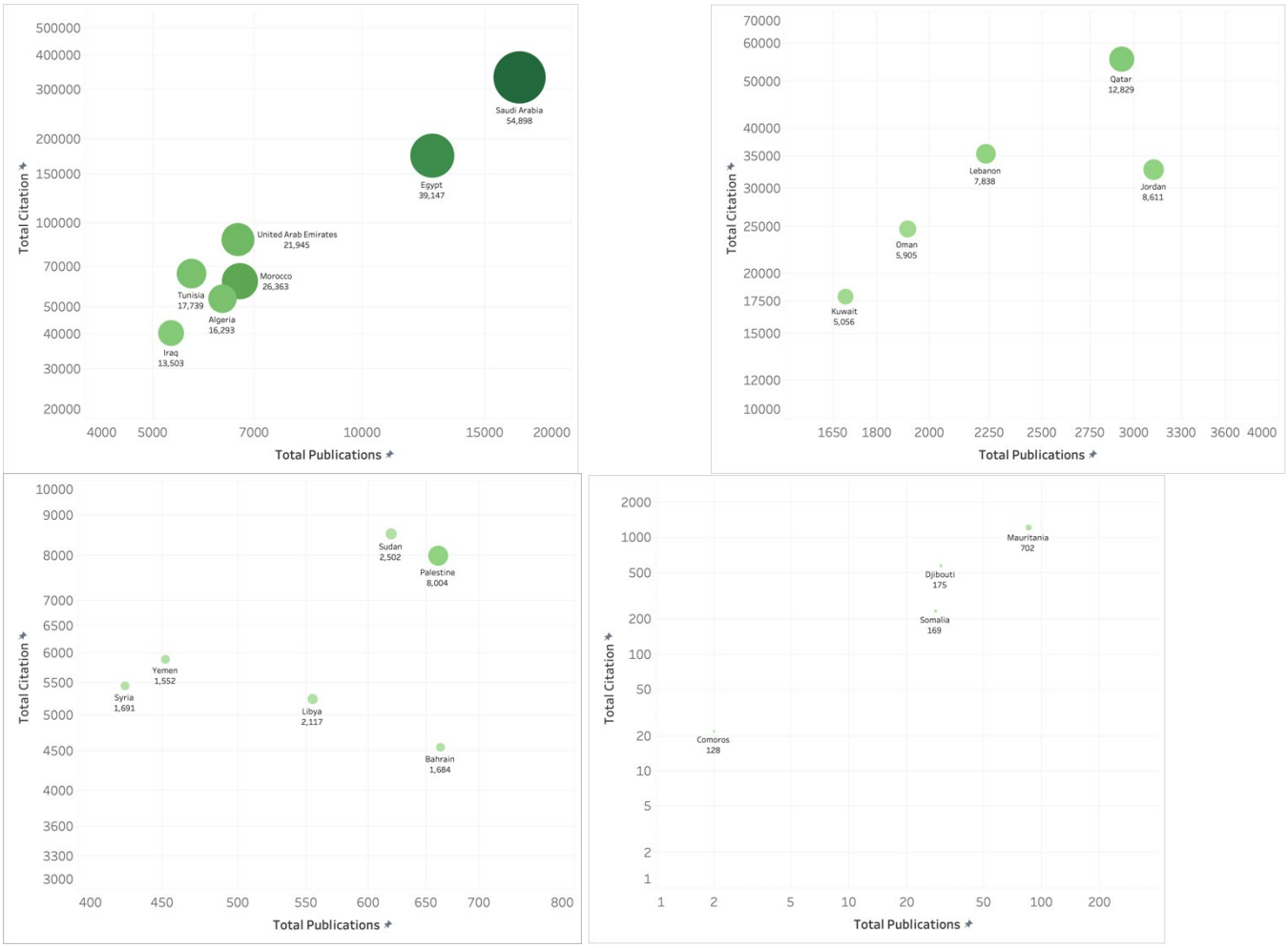


Figure 4. Arab countries scholar outputs in Climate change research, 2012-2021 (log-log scale was used for illustration purposes. The graph is divided into four graphs of different log-log scales)

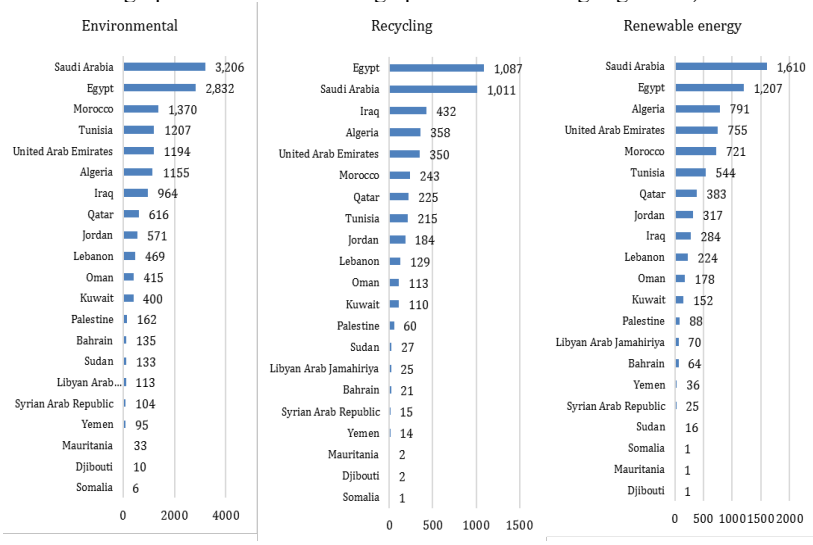


Figure 5. The publication of Arab countries in environmental, renewable energy and recycling research

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Top Arab Institutions in Climate change research

In an attempt to deepen the analysis of bibliometric data for the Arab countries, the data revealed that more than 50% of the scientific output is attributed to only 30 institutions (universities, research centres, etc.) in the Arab world (cf. Table 4). Those 30 institutions are in only ten countries of the Arab world. Table 5 shows a pivot table for the countries and their institutions in terms of the total number of publications. We may conclude here that with respect to the total number of institutions from which the 68,128 publications in the past ten years are attributed, those 30 top institutions are positive outliers; from the tables below, it is evident that the five most active institutions are: King Saud University (Saudi Arabia), King Abdulaziz University (Saudi Arabia), King Abdullah University of Science and Technology (Saudi Arabia), Qatar University (Qatar), and Mohammed V University (Morocco). Citations and the number of authors follow the same pattern, while the FWCI and the C/P follow a different pattern that needs more in-depth analysis to understand the underlying meaning better.

Table 4. Top 30 Arab Institutions in Climate change research, 2012-2021

Rank	Institution	Country	TP	TC	FWCI	C/P	AUS	% of total	Cumulative Percentage
1	King Saud University	Saudi Arabia	3398	72517	1.71	21.3	2593	3.96%	3.96%
2	King Abdulaziz University	Saudi Arabia	3029	95817	1.93	31.6	1951	3.68%	7.64%
3	King Abdullah University of Science and Technology	Saudi Arabia	1804	58640	2.29	32.5	1567	2.27%	9.92%
4	Qatar University	Qatar	1654	29998	1.74	18.1	1136	2.13%	12.05%
5	Mohammed V University in Rabat	Morocco	1637	13450	1.08	8.2	1723	2.16%	14.21%
6	Cairo University	Egypt	1611	19451	1.18	12.1	1680	2.17%	16.38%
7	King Fahd University of Petroleum and Minerals	Saudi Arabia	1597	36391	1.6	22.8	1181	2.20%	18.58%
8	University of Sfax	Tunisia	1455	15599	1.01	10.7	1624	2.05%	20.63%
9	Université de Tunis El Manar	Tunisia	1373	14478	0.9	10.5	1737	1.97%	22.60%
10	University of Carthage	Tunisia	1370	17453	1.12	12.7	1421	2.01%	24.61%
11	Khalifa University of Science and Technology	United Arab Emirates	1315	25778	1.5	19.6	1041	1.97%	26.58%
12	Ain Shams University	Egypt	1059	12114	1.11	11.4	1115	1.62%	28.20%
13	University of Hassan II Casablanca	Morocco	1003	6927	0.98	6.9	1250	1.56%	29.75%
14	Alexandria University	Egypt	977	14100	1.43	14.4	997	1.54%	31.29%
15	Sultan Qaboos University	Oman	954	14043	1.36	14.7	747	1.53%	32.82%
16	United Arab Emirates University	United Arab Emirates	939	10785	1.22	11.5	841	1.53%	34.35%

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Rank	Institution	Country	TP	TC	FWCI	C/P	AUS	% of total	Cumulative Percentage
17	National Research Center	Egypt	927	13732	1.06	14.8	1097	1.53%	35.88%
18	University of Baghdad	Iraq	807	4481	0.8	5.6	945	1.35%	37.23%
19	Cadi Ayyad University	Morocco	785	10749	1.42	13.7	914	1.33%	38.57%
20	American University of Beirut	Lebanon	779	16812	1.54	21.6	856	1.34%	39.91%
21	Mansoura University	Egypt	773	12833	1.85	16.6	607	1.35%	41.26%
22	University of Sharjah	United Arab Emirates	745	12135	2.44	16.3	526	1.32%	42.58%
23	Zagazig University	Egypt	725	11352	1.88	15.7	582	1.30%	43.88%
24	University of Jordan	Jordan	673	8235	1.21	12.2	685	1.22%	45.10%
25	University of Science and Technology Houari Boumediene	Algeria	640	4563	0.75	7.1	804	1.18%	46.28%
26	Sidi Mohamed Ben Abdellah University	Morocco	632	6722	1.24	10.6	820	1.18%	47.45%
27	King Khalid University	Saudi Arabia	624	5269	1.34	8.4	479	1.18%	48.63%
28	Taif University	Saudi Arabia	621	5030	1.44	8.1	413	1.18%	49.81%
29	Assiut University	Egypt	608	10183	1.41	16.7	483	1.17%	50.99%
30	Tanta University	Egypt	585	10207	1.65	17.4	423	1.14%	52.13%

Table 5. Total publications per country and institutions (only top 30 institutions)

Institutions	Algeria	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Qatar	Saudi Arabia	Tunisia	United Arab Emirates	Total
Ain Shams University		1059										1059
Alexandria University		977										977
American University of Beirut					779							779
Assiut University		608										608
Cadi Ayyad University						785						785
Cairo University		1611										1611
Khalifa University of Science and Technology											1315	1315
King Abdulaziz University									3029			3029

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Institutions	Algeria	Egypt	Iraq	Jordan	Lebanon	Morocco	Oman	Qatar	Saudi Arabia	Tunisia	United Arab Emirates	Total
King Abdullah University of Science and Technology									1804			1804
King Fahd University of Petroleum and Minerals									1597			1597
King Khalid University									624			624
King Saud University									3398			3398
Mansoura University		773										773
Mohammed V University in Rabat						1637						1637
National Research Center		927										927
Qatar University								1654				1654
Sidi Mohamed Ben Abdellah University						632						632
Sultan Qaboos University							954					954
Taif University									621			621
Tanta University		585										585
United Arab Emirates University											939	939
Université de Tunis El Manar										1373		1373
University of Baghdad			807									807
University of Carthage										1370		1370
University of Hassan II Casablanca						1003						1003
University of Jordan				673								673
University of Science and Technology Houari Boumediene	640											640
University of Sfax										1455		1455
University of Sharjah											745	745
Zagazig University		725										725
Total	**640**	**7265**	**807**	**673**	**779**	**4057**	**954**	**1654**	**11073**	**4198**	**2999**	**35099**

Keyword's Evolution

The keyword co-occurrence network analysis of the most used authors' keywords in climate change research by Arab researchers in the last five years (2017-2021) by using VOS viewer is shown in Figure 6. The keywords up to a minimum occurrence of keywords was 50 out of 156,633 keywords, 1,776 keywords meet the threshold, where the distance and size of the bubble indicate the occurrence of the keywords and links of co-occurrence

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keywords. The keyword "climate change" has the highest occurrence 2,245 followed by "renewable energy source", which appears 1,594 times, and "sustainable development", which appears 1,486 times.

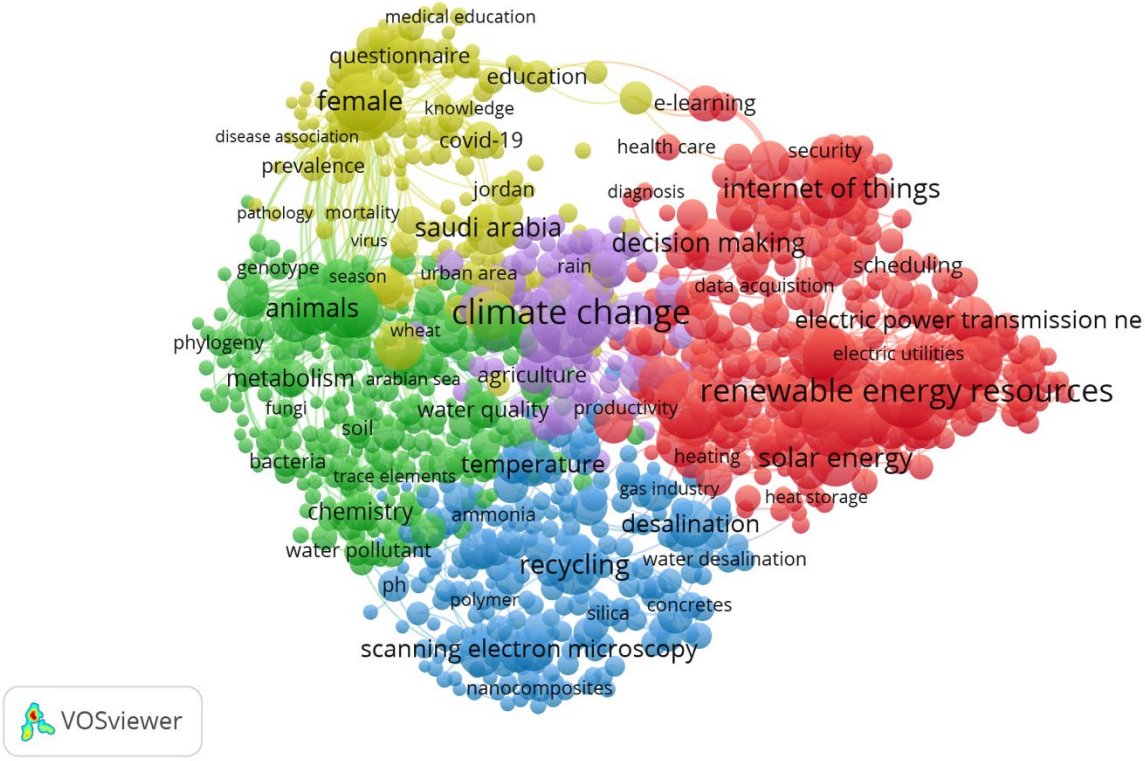


Figure 6. Keyword's co-occurrences of 5,540 with a threshold of 30 occurrence

Vos Viewer identifies five clusters of 1,776 keywords: blue, red, green, yellow and purple; the blue cluster has keywords such as temperature, biomass, recycling, pollutant removal, water filtration, etc., the green clusters have keywords as a controlled study, marine environment, water pollutant, salinity, etc., the red clusters has keyword as renewable energy, solar energy, energy utilization, decision making, etc., the yellow clusters have keywords as air quality, air pollution, carbon monoxide, education, etc., and the purple clusters have keywords as climate change, climate effect, climate modelling, land use, regional climate, etc.

Top leading Journals on Climate Change

The top 15 productive journals on climate change research by Arab researchers during 2012-2022 are shown in Table 6. The top 15 journals publish 9.2% of all papers on climate change in Arab countries. The top leading journals were IEEE Access (TP=684, TC=11,945) followed by sustainability (TP=598, TC=5,973), energy procedia (TP=569, TC=6,700) and Arabian journal of geosciences (TP=545, TC=3,787). In terms of citation count, the renewable and sustainable energy reviews are a highly cited source of publications that received citations (TC=28,991), followed by journals of cleaner production (TC=14,479) and desalination (TC=12,122).

The analysis of the most relevant journals by CiteScore 2021 metrics showed that the highest CiteScore Journal was the journal of renewable and sustainable energy reviews (28.5) followed by applied energy (20.4) and energy conversion and management journal (18), where CiteScore is an annual value that measures the citation impact of a title (i.e., journal, book series, conference proceeding or trade journal; includes special issues) (Elsevier, 2021).

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Table 6. The top 15 journals on climate change for Arab researchers

Rank	Journal name	TP	TC	FWCI	C/P	CiteScore 2021
1	IEEE Access	684	11,945	17.5	2483	6.7
2	Sustainability	598	5,973	10	2616	5
3	Energy Procedia	569	6,700	11.8	1459	-
4	Arabian Journal of Geosciences	545	3,787	6.9	1599	2.3
5	IOP Conference Series: Materials Science and Engineering	397	823	2.1	1041	1.1
6	Advances in Intelligent Systems and Computing	392	921	2.3	1107	-
7	ACM International Conference Proceeding Series	388	843	2.2	1063	1
8	Environmental Science and Pollution Research	377	7,702	20.4	1612	6.6
9	Energies	376	5,299	14.1	1526	5
10	Desalination and Water Treatment	375	2,594	6.9	1224	1.7
11	Journal of Cleaner Production	372	14,479	38.9	1421	15.8
12	Lecture Notes in Computer Science	354	1121	3.2	1058	2.1
13	Renewable and Sustainable Energy Reviews	343	28,991	84.5	1102	28.5
14	PLoS ONE	302	7046	23.3	2268	5.6
15	Scientific Reports	262	5635	21.5	1742	6.9

Bibliographic coupling is a similarity measure of scientific literature. It is primarily based on the idea that the two articles that cite similar references are expected to address the related or the same research issues (Almulhim, 2021). Bibliographic coupling links between publications indicate the number of cited references they have in common (van Eck and Waltman, 2020). The bibliographic coupling of journals during the last five years having at least ten publications and five citations are illustrated in Figure 7, where 662 of 8591 journals meet the criteria. IEEE access shows the highest occurrence of 538 documents, 8073 citations and a link strength of 27,703 followed by sustainability through the occurrence of 517 documents, 4650 citations and a link strength of 37,650 and energies with 304 documents, 3724 citations, and total link strength of 21,280.

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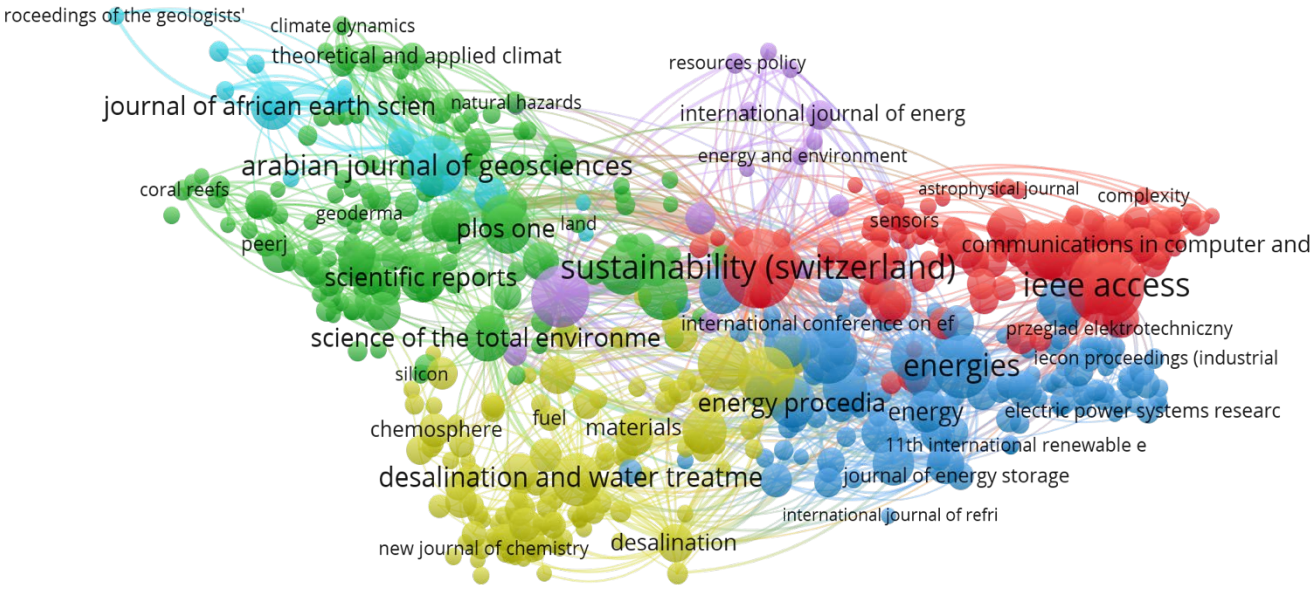


Figure 7. Bibliographic coupling network of climate change journals

Co-citation analysis involves tracking pairs of papers cited together in the source articles; a journal co-citation network provides an understanding of the collective intellectual base of a knowledge field (Liu et al., 2015). The Co-citation of journals during the last five years contains 3797 of 438060 journals with equal or more than 50 citations, as shown in Figure 8. Journal of desalination shows the highest citation TC=9034 and a link strength of 338,606 followed by energy (TC=9034) with a link strength of 297,109 and Science (TC= 6,634) with a link strength of 250,724.

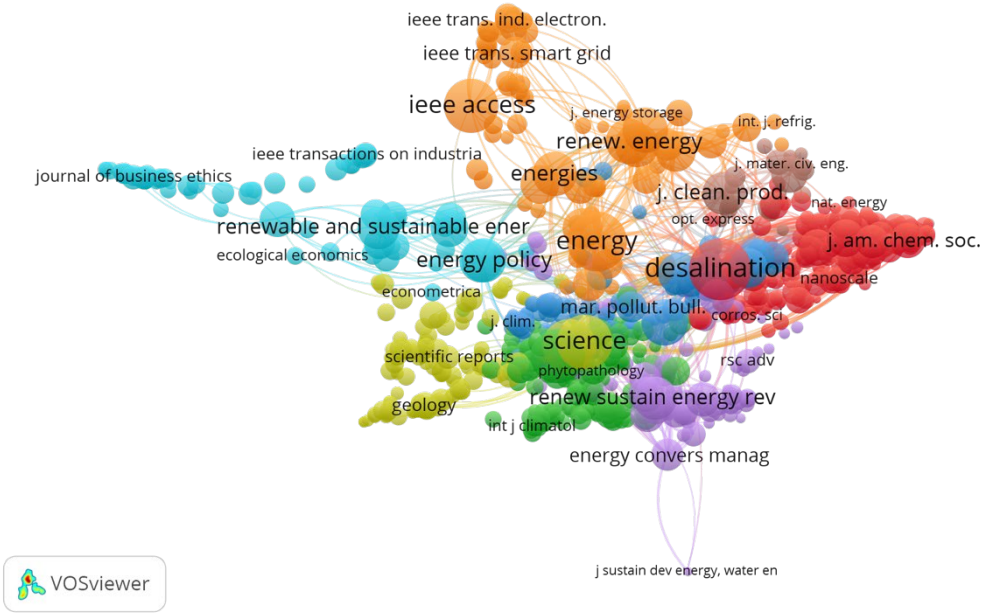


Figure 8. Co-citation network of climate change journals

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Arab countries Collaboration

The percentage of international collaboration in climate change research between Arab countries and other countries was 53.2% of the total research from 2012 to 2021, while the percentage of collaboration between researchers within the country (national collaboration) was 13.9%. The percentage of single authorship (no collaboration) publications represented 8.6%; the percentage of publications according to the type of collaboration for each Arab country is shown in Figure 9. The international publications of Arab countries were 36,234 documents that received 661,264 citations, and Arab authors were 140,127 from 2012 to 2021. The top leading countries with higher research collaboration with other countries in climate change research were Saudi Arabia (TP=12,011) followed by Egypt (TP=6,899), United Arab Emirates (TP=4,192) and Tunisia (TP=3,136), the most collaborated non-Arab countries as shown in Figure 9 were United States (TP= 6,260), followed by France (TP= 5,420), United Kingdom (TP=4,211) and China (TP=4,192).

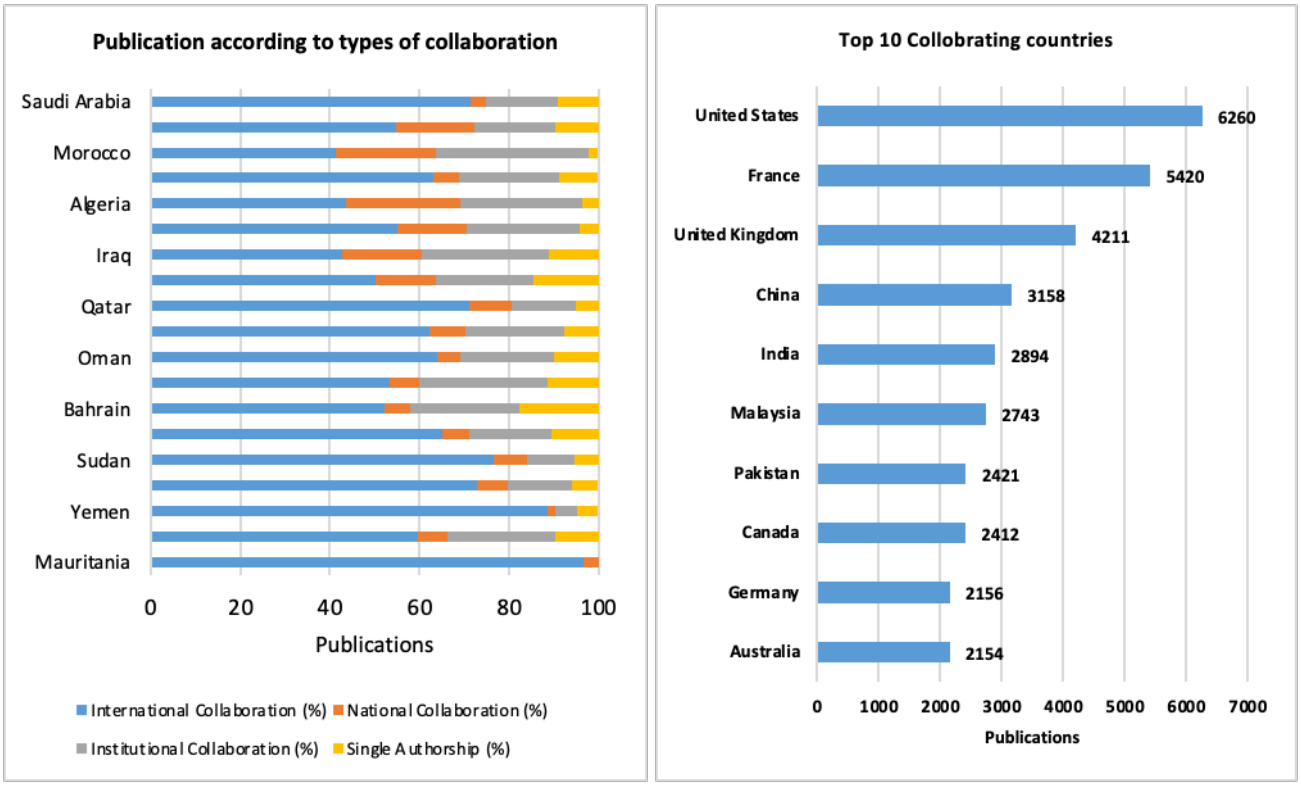


Figure 9. Publication according to types of collaboration in Arab countries and top 10 International collaboration Countries

Finally, Figure 10 illustrates the analysis of the collaborating countries with Arab countries through co-authored publications on climate change research with a minimum of 10 documents of a country during the last five years; 116 countries meet the threshold. The bubble size reflects the number of co-authored publications per collaborating country in climate change research with Arab countries. In contrast, the distance between the two bubbles reflects how frequently countries were mentioned in the same publications. There is noticeably strong cooperation between researchers in Egypt, Saudi Arabia, UAE, and Jordan. On the other hand, there is also strong cooperation between Northwest African countries, Morocco, Algeria, and Tunisia, whilst these countries showed similarities in science and research policies (Radwan, 2018).

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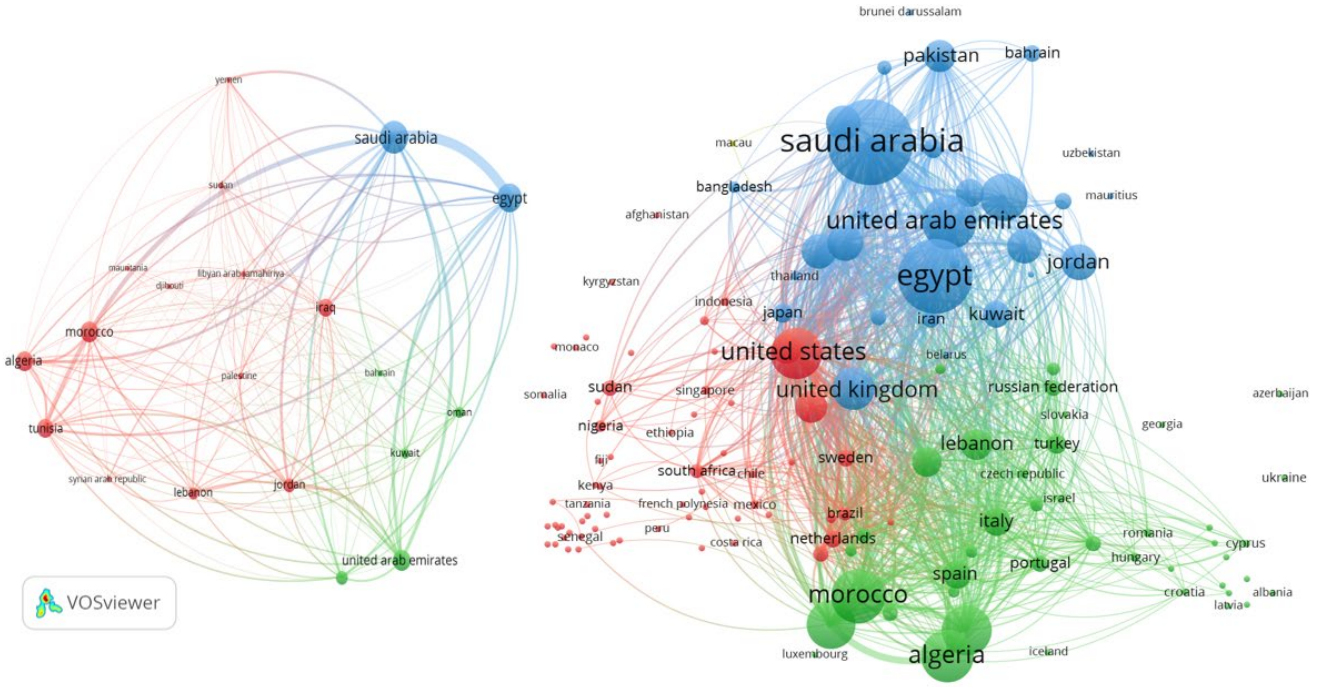


Figure 10. Co-authorship network between Arab countries and other countries on climate change research

Conclusions

The main objective of this paper is to review the publishing trends of climate change research by Arab researchers, including the most productive countries, institutions, journals, authorship, and international collaboration countries. A total of 68,128 documents were examined from the Scopus database. The bibliometric analysis covers the period from 2012 to 2021. Saudi Arabia institutions produced the highest number of documents and received the highest number of citations. The result of the analysis indicates that the performance of Saudi institutes is also superior in terms of the quality of research publications (FWCI) which is higher than the global average. Egypt's research performance is also considered very high compared to many other Arab countries. The percentage of international cooperation in climate change research between Arab countries and other countries reached 53.2% of the total research from 2012 to 2021, a relatively high percentage. The most collaborating countries were the United States, France, United Kingdom, and China; it is noticed that the rise in international cooperation research in Saudi Arabia is remarkable, as it represents about 71%. On a different front, the rate of increase and growth of the number of publications on Climate change within the Arab world is another excellent information, as the rate of growth is about two to three folds that of the rate of growth of the world's publication for the exact keywords and the same period (2012-2021).

The data of the climate change publications were extracted from the Scopus database using the search query involving 80 Keywords; the VOS viewer showed the keyword "climate change" has the highest occurrence 2,245 followed by "renewable energy source" which appears 1,594 times and "sustainable development" appears 1,486 times. The most productive journals in climate change research were IEEE Access, Sustainability, Energy Procedia and Arabian Journal of Geosciences.

At a country level, Saudi Arabia and Egypt alone were the most productive countries representing 43.2% of all research, which shows tremendous efforts exerted during the past 10 years by authorities in the two countries

towards financing climate research; for instance, several funding initiatives at the Egyptian Academy of Scientific Research and Technology are targeting research for confronting climate change.

Nevertheless, countries on the lower side in number of publications (Mauritania, Djibouti, Somalia, Comoros) should realize the challenges ahead in terms of research and research funding. They should adopt similar strategies as other countries in the Arab world to boost their research contribution.

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