

ISSN 2345-0282 ONLINE  
<http://doi.org/10.9770/jesi.2023.10.4>

# ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES

**10(4)**

**2023**



**Publisher**

<http://jssidoi.org/esc/home>

---

Volume 10

Number 4

June 2023

## ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES

2023  
10(4)



Listed in Journal Citation Reports (JCR) and is ranked in Q3 (170/295) of Category BUSINESS by Journal Citation Indicator (JCI) Source: Journal Citation Reports™ from Clarivate™ 2022

**The *Entrepreneurship and Sustainability Issues* ISSN 2345-0282 (online) is a peer-reviewed journal, which publishes original research papers and case studies. It is international journal published cooperating with universities, social companies, consultancies and associations indicated on the cover of the journal. It is published quarterly.**

**Areas of research include, but are not limited to, the following:**

- **Areas of research include, but are not limited to, the following:**
- **Conceptual/Practical Approaches and Methodologies towards Sustainable Entrepreneurship**
- **Globalization, Internationalization and Solutions for Low-Carbon Economies of Scope or Scale**
- **Innovations and Technology Transfer Pilot Results Advancing Entrepreneurship and Sustainability**
- **Information Technologies (IT) and Information Communication Technologies (ICT) for Entrepreneurship Sustainability, and Socio-Economic Innovations**
- **Environmental Engineering for Sustainability and Entrepreneurial Applications/Ventures**
- **Smart Electricity Grid Solutions for Sustainable Entrepreneurship**
- **Implementation of Renewable Energies (e.g. Harvesting, Storage, New Technologies Being Deployed/Developed, Innovative Market or Business Model Paradigms, etc.)**
- **Entrepreneurship, Security and Safety**
- **Sustainable Development, Entrepreneurship, Safety**
- **Threats to Society, Entrepreneurship and Regional Development**
- **Security and Safety of Countries, Regions and Society as Precondition of Sustainable Development and Sustainable Entrepreneurship**
- **Boarder Guard Issues. Regional Development and Entrepreneurship**
- **Migration and Sustainable Regional Development and Entrepreneurship**
- **Terrorism, International Crime, Regional Development and Sustainability**
- **Security and Safety Models for Sustainable Development of Societies and Businesses**
- **Emerging Business Drivers, Opportunities, or Constraints in Future Sectors of Current Markets**
- **Retrofitting Techniques and Technologies Near-Zero Energy Demand Buildings**
- **Urban Planning and Advanced Construction Materials for Energy-Efficiency or Smart Cities**
- **Modern Economics in the Context of Security, Comfort, or Legislation**
- **PPPs for Developments in Sustainable Entrepreneurship, Finance, and Investments**
- **Accounting and Entrepreneurship Issues**
- **Sustainable Entrepreneurship in the Context of Management or Life-Long Learning**
- **Strategic Management Practices and Creative Marketing Techniques for Sustainability**
- **Organizational Studies and Sustainable Entrepreneurship**
- **Entrepreneurship in the Context of Marketing, ICT, and Creative Industries**
- **Intercultural Communication for Sustainable Entrepreneurship**
- **Institutions and Entrepreneurship**
- **Case Studies on Entrepreneurship and Sustainable Development**
- **Social Cohesion and Social Innovation and Social Entrepreneurship**
- **Business Models and Strategic Management for Sustainable, Secure and Safe Futures**
- **Corporate Social Responsibility and Sustainable Development**
- **Entrepreneurship in the Context of Psychology, Education, or Women**
- **Intuitions about Emerging Phenomena in Business and Society**
- **Start-Ups, Spin-Offs, SMEs in the Context of Market Growth And Exit**
- **Global Value Chain Management for Sustainable Entrepreneurship**
- **Knowledge Management for Sustainable Entrepreneurship, Safety and Security**

## Editor-in-Chief

- [Prof. Abel Femi Adekola](#), Wilkes University, USA

## Editors

- [Prof. Salvatore Monni](#), Rome Tre University, Italy
- [Prof. Manuela Tvaronavičienė](#), Vilnius Gediminas Technical University, Lithuania
- [Prof. Armenia Androniceanu](#), The Bucharest University of Economic Studies, Faculty of Administration and Public Management, Bucharest, Romania
- [Prof. Edmundas Kazimieras Zavadskas](#), Vilnius Gediminas Technical University, Lithuania
- [Prof. Fernando García](#), Department of Economics and Social Sciences, Faculty of Business Administration and Management, Universitat Politecnica de Valencia (Polytechnic university of Valencia), Spain
- [Prof. Małgorzata Porada Rochoń](#), Faculty of Management and Economics of Services, University of Szczecin, Poland
- [Prof. Francisco Guijarro](#), Universitat Politecnica de Valencia (Polytechnic university of Valencia), Spain
- [Dr. Nadia Simoes](#), Instituto Universitário de Lisboa (ISCTE-IUL), ISCTE Business School Economics Department, Portugal
- [Prof. Michal Fabuš](#), School of Economics and Management in Public Administration in Bratislava
- [Director, Mercy Maclean](#), Health Psychology Management Org. Services, United Kingdom
- [Prof. Sharda Nandram](#), HAN University of Applied Sciences and Nyenrode Business University, the Netherlands
- [Prof. Inga Žalėnienė](#), Mykolas Romeris University, Lithuania
- [Prof. Kristel Mari Skorge](#), Oslo and Akershus University College of Applied Sciences, Norway
- [Dr. Leonardo Piccinetti](#), Europe for Business, Brussels, Belgium
- [Prof. Gunnar Prause](#), Tallinn University of Technology, Estonia
- [Prof. Irina Sennikova](#), Riga International College of Economics and Business Administration, Latvia
- [Prof. Natalja Lace](#), Riga Technical University, Latvia
- [Prof. Ona Gražina Rakauskienė](#), Mykolas Romeris University, Lithuania
- [Prof. Danuta Diskienė](#), Vilnius University, Lithuania
- [Prof. Mirjana Radović Marković](#), Institute of Economic Sciences, Serbia
- [Prof. Ing. Zuzana Dvorakova](#), University of Economics, Czech Republic
- [Prof. Ani Matei](#), National School of Political Studies and Public Administration, Romania
- [Prof. Givi Bedianashvili](#), European University, Ivane Javakhishvili Tbilisi State University, Georgia
- [Dr. Kavita Singh](#), University of Delhi, India
- [Dr. Ulku Yuksel](#), The University of Sydney, Australia
- [Assist.Prof. Meltem Caber](#), Akdeniz University, Tourism Faculty, Turkey
- [Prof. Bora Aktan](#), University of Bahrain, the Kingdom of Bahrain
- [Prof. Svetlana Drobyazko](#), European academy of sciences, Coventry, UK
- [Prof. Aleksandra Gawel](#), Poznan University of Economics and Business, Poland

## Field editorial board members

- [MS. Ing. Sylvain Robert](#), Commissariat a L'Energie Atomique CEA, Gif-sur-Yvette, France
- [Prof. Wolfgang Birk](#), Computer Science, Lulea tekniska Universitet, Sweden
- [MSC. Johan Desmedt](#), Unit Energy Technology, Genk, Belgium
- [Dr. Edoardo Patti](#), Politecnico di Torino, Italy
- [Dr. Ilias Lamprinos](#), Intracom Holdings SA, Telco Software Department, Greece

CONTENTS

<b>Katarzyna Grondys, Michal Kot</b> <b>GLOBAL SUPPLY CHAINS MANAGEMENT AGAINST FUTURE RISKS –</b> <b>A POST-PANDEMIC VISION DURING THE ONGOING WAR</b>	<b>10</b>
<b>Radoslav Ivančík, Vladimír Andrassy</b> <b>INSIGHTS INTO THE DEVELOPMENT OF THE SECURITY CONCEPT</b>	<b>26</b>
<b>Janis Teivāns-Treinovskis, Nikolajs Jefimovs, Ruta Velika, Igors Trofimovs</b> <b>LEGAL CONDITIONS OF EU ENERGY SECURITY</b>	<b>39</b>
<b>Andrea Seňová, Katarína Čulková, Marcela Taušová, Katarína Teplická</b> <b>BUSINESS COMPANIES' FINANCING PECULIARITIES IN CONDITIONS</b> <b>OF SLOVAKIA</b>	<b>48</b>
<b>Simona Hašková, Marek Vochozka, Jiří Kučera</b> <b>A FUZZY EVALUATION MODEL OF MANUFACTURING MACHINERY</b> <b>IN TERMS OF SUSTAINABLE BUSINESS</b>	<b>71</b>
<b>Iva Klementová, Zdeněk Čaha, Tomáš Mrhálek</b> <b>CHANGES IN EMPLOYEE MOTIVATION FOR EDUCATION IN COMPANIES</b> <b>BEFORE AND DURING THE COVID-19 PANDEMIC</b>	<b>89</b>
<b>Alena Srbová, Nikola Sagapova</b> <b>FAIRTRADE PRODUCTS IN RETAIL CHAINS: CASE STUDY</b> <b>IN THE CZECH REPUBLIC</b>	<b>105</b>
<b>Milan Taliř, Jarmila Straková</b> <b>INNOVATION OF THE PRODUCTION PROCESS OF ENGINEERING</b> <b>COMPANIES IN RELATION TO BUSINESS PORTFOLIO</b>	<b>118</b>
<b>Michal Igielski</b> <b>PROJECT MANAGEMENT IN THE RENEWABLE ENERGY SOURCES</b> <b>INDUSTRY IN POLAND - IDENTIFICATION OF CONDITIONS AND BARRIERS</b>	<b>135</b>
<b>Jana Pechová, Hana Volfová, Aneřka Jírová</b> <b>IMPACT OF TASK ASSIGNMENT ON EFFECTIVENESS IN WORK TEAMS</b>	<b>152</b>
<b>Vikram Jeet</b> <b>ENTREPRENEURIAL INTENTION OF SAUDI STUDENTS: ROLE</b> <b>OF SAUDI ARABIAN UNIVERSITIES IN ACHIEVING THE GOAL OF VISION 2030</b>	<b>171</b>
<b>Kristina Samařonok, Eimantas Kamienas, Vilma Gegužienė,</b> <b>Rūta Valentukevičiūtė, Agnė Šimkienė</b> <b>CREATING AN INCLUSIVE AND DIVERSE WORKPLACE ENVIRONMENT:</b> <b>CURRENT REALITIES AND TRENDS FOR IMPROVEMENT</b>	<b>184</b>
<b>Sebastian Bunzendahl, Jan Papula</b> <b>SUSTAINABLE AND TRANSPARENT PURCHASING IN</b> <b>THE AUTOMOTIVE INDUSTRY</b>	<b>202</b>

<b>Michal Ruschak, Zdeněk Caha, Milan Talíř, Michal Konečný</b> <b>THE APPLICATION OF CSR IN MARKETING COMMUNICATION</b> <b>AND ITS POTENTIAL IMPACT ON CUSTOMER PERCEIVED VALUE</b>	<b>223</b>
<b>Agnieszka Majewska, Patrycja Beltowska</b> <b>SOCIALLY RESPONSIBLE INVESTING (SRI) AS A FACTOR OF</b> <b>COMPETITIVENESS AND SUSTAINABLE DEVELOPMENT OF ORGANIZATIONS</b> <b>IN YOUNG CONSUMERS' OPINION</b>	<b>245</b>
<b>Bogdan Fleacă, Elena Fleacă, Sanda Maiduc, Ionut Marius Croitoru</b> <b>RESEARCH AND INNOVATION FOR SUSTAINABILITY TRANSFORMATION</b> <b>– MODERN OUTLOOKS AND ACTUAL CHALLENGES</b>	<b>263</b>
<b>Oleg Rybalkin, Olga Lavrinenko, Alina Danileviča, Wiesława Lizińska</b> <b>SUSTAINABLE DEVELOPMENT GREEN INDEX: MEASURING PROGRESS</b> <b>TOWARDS SUSTAINABLE DEVELOPMENT GOALS IN THE EUROPEAN UNION</b>	<b>279</b>
<b>Martin Holubčík, Jakub Soviar, Viliam Lendel</b> <b>INVESTING IN THE SEVEN BASIC APPROACHES OF SYNERGY</b>	<b>293</b>
<b>JVeronika Čabinová, Peter Gallo, Ján Dobrovič, Beáta Balogová, Mykola Palinchak</b> <b>ANALYSIS OF THE IMPACT OF COVID-19 PANDEMIC ON CONSUMER BUYING</b> <b>BEHAVIOR IN FOOD CHAIN STORES</b>	<b>307</b>
<b>Alfonso Marino, Paolo Pariso</b> <b>A QUANTITATIVE COMPARISON OF SMART CITIES BETWEEN</b> <b>CHINA AND ITALY</b>	<b>320</b>
<b>Vera Komarova, Edmunds Čižo, Janis Balodis, Anita Kokarevica, Oksana Ruza,</b> <b>Janis Kudins</b> <b>DEVELOPMENT OF TRANSPORT INFRASTRUCTURE AND ITS IMPACT</b> <b>ON TERRITORIAL PRODUCTION</b>	<b>338</b>
<b>Bohuslava Mihalčová, Antonín Korauš, Stanislav Šišulák, Peter Gallo,</b> <b>Jozef Lukáč</b> <b>THE RISKS OF MISUSING SOCIAL NETWORKS IN THE CONTEXT</b> <b>OF HYBRID THREAT</b>	<b>357</b>
<b>Albertina Paula Monteiro, Francisco Barbosa, Amélia Silva, Catarina Cepêda</b> <b>INDUSTRY AND PERFORMANCE IN THE PORTUGUESE LISTED COMPANIES:</b> <b>THE MEDIATING ROLE OF THE ENVIRONMENTAL INFORMATION DISCLOSURE</b>	<b>372</b>
<b>Mercedes Rubio-Andrés, María del Mar Ramos-González, Manuel M. Molina-López,</b> <b>Miguel Ángel Sastre-Castillo</b> <b>TRAINING HIGHER EDUCATION STUDENTS FOR EMPLOYABILITY</b> <b>SKILLS: IS IT WORTH IT?</b>	<b>390</b>
<b>Michael Cant, Cornelius Bothma</b> <b>FASHION RETAIL STRATEGIES IN-STORE DESIGN AND PLANNING:</b> <b>THE CASE OF SOUTH AFRICA</b>	<b>408</b>



**Publisher**

<http://jssidoi.org/esc/home>



---

## GLOBAL SUPPLY CHAINS MANAGEMENT AGAINST FUTURE RISKS - A POST-PANDEMIC VISION DURING THE ONGOING WAR

**Katarzyna Grondys <sup>1</sup>, Michał Kot <sup>2</sup>**

<sup>1,2</sup> *Czestochowa University of Technology, The Faculty of Management; Armii Krajowej 19B, 42-201 Czestochowa, Poland*

*E-mails: <sup>1</sup>[katarzyna.grondys@pcz.pl](mailto:katarzyna.grondys@pcz.pl); <sup>2</sup>[kotmichal012@gmail.com](mailto:kotmichal012@gmail.com)*

*Received 11 February 2023; accepted 29 April 2023; published 30 June 2023*

**Abstract.** For several years, the global supply chain has been particularly exposed to various dangers in particular natural disasters, the COVID-19 pandemic or the armed conflict in Ukraine, which threaten its stability, continuity of efficiency. Each of the current events brings full economic environmental social risks that directly affect the supply chain. Companies wishing to adapt to current market situations, wishing to be competitive, must learn to properly manage the supply chain, monitor it and anticipate the possibility of specific risks. The main purpose of the article is to determine the impact of potential risk factors on the supply chain and its stability. In addition, the current capacity of companies to implement a number of supply chain activities such as management, monitoring through the lens of recent events, among others, was verified. A survey questionnaire was used to conduct the survey in the first quarter of 2023, which yielded 250 questionnaires, of which 212 properly completed copies were selected for the study, representing companies from countries such as Poland, Romania, the UK and Turkey. Subsequently, the data was subjected to in-depth analysis thanks to which it was possible to create a series of recommendations for companies that will minimize the possibility of risk, minimize the effects after the occurrence of such risks and help companies to operate on currently dynamic supply chains being competitive in global markets. It has been shown that in companies according to which the impact of economic and environmental factors does not have much influence on their company is observed significantly more often are more likely to have deteriorating efficiency results. It has been shown that in companies according to which the impact of economic and environmental factors is not high influence on their company is observed significantly more often are more likely to have deteriorating efficiency results.

**Keywords:** global; supply chain; management; risks

**Reference** to this paper should be made as follows: Grondys, K., Kot, M. 2023. The global supply chains management against future risks a post-pandemic vision during the ongoing war. *Entrepreneurship and Sustainability Issues*, 10(4), 10-25. [http://doi.org/10.9770/jesi.2023.10.4\(1\)](http://doi.org/10.9770/jesi.2023.10.4(1))

**JEL Classifications:** M11

## 1. Introduction

In the 21st century and more specifically in recent years, the supply chain is exposed to constant destabilization caused by various events having their impact on a global scale. An additional factor causing SC instability is increased globalization and changes in global markets (Gomez-Mejia et al., 2021). The very wide range of products we consume or use are sourced, manufactured, modified in various sometimes distant geographic locations. Adequate management of global supply chains is necessary to meet the newly emerging challenges. (Choi et al., 2022). However, it is important to keep in mind that every global event brings with it both new opportunities and threats that can potentially affect the management of global supply chains (Kot et al., 2020). For the most part, companies are well aware of the definitions of supply chain risk management (Muangmee et al., 2022), however, recent events have shown that this knowledge is purely theoretical and in many cases focused only on their company or the closest links in its supply chain.

The most recent event that reinforces this was the COVID-19 pandemic. Entrepreneurs, in making their risk assessments, focused only on their own suppliers without taking into account that they themselves may have difficulty obtaining goods from their sub-suppliers. The issue of several companies sourcing from a single supplier was also overlooked. The best example of this is China. The introduction of restrictions in China, which is one of the largest suppliers of all kinds of raw materials, products, intermediates, caused supply chains to break down early on a global scale. These events have had a negative impact on companies in a variety of industries from both Europe and the United States. Another element that contributed to the large shortages of what? Was it the widespread use of the "Just in time" strategy, which is designed, among other things, to reduce inventory as much as possible, assuming that suppliers will meet their obligation to deliver goods on time. Undoubtedly, the COVID-19 pandemic brought with it a global crisis (Ali et al., 2022; Ivanov & Dolgui, 2020; Yang et al., 2020; Kot, 2021). It taught companies to take a broader view of risk assessment and to kind of anticipate the occurrence of an economic or economic crisis.

Not long after the world dealt with the effects of Pandemic COVID-19, we are faced with war and, more specifically, with Russia's military actions in Ukraine. Probably no one foresaw the possibility of a military conflict in 2022. Undoubtedly, this event had a strong impact on logistics and supply chains. A large number of Ukrainian employees from logistics and transportation companies resigned in response to the call for military service. Staff shortages have caused significant delays in orders, shipments. Many supply chains between Russia and Europe passing through Ukraine have been broken or severely curtailed (Melnychenko et al., 2022). In addition, economic restrictions imposed on Russia have contributed to destabilizing supply chains by cutting off sources of raw materials and products. Broken and restricted supply chains have contributed to shortages of raw materials and products in the West resulting in increases in commodity prices. The conflict also resulted in restrictions on the transportation of fossil fuels such as coal, oil and gas. In many European countries they were essential fuels for energy or heat production. The war in Ukraine has also caused a large reduction in the transportation of food from Ukraine, and it should be noted that it is in the top of the world in terms of sales of sunflower oil corn wheat or barley.

Undoubtedly, global events regardless of the plane on which they arise - environmental, economic, political, etc. - are difficult to predict and carry a high probability of multiple threats to the supply chain. (Davis et al., 2021). The purpose of the article is to identify the impact of potential risk factors on the supply chain and its stability based on recent events, i.e. the COVID-19 Pandemic and the armed conflict in Ukraine. The article also aims to verify the current ability of companies to carry out a number of supply chain activities such as supply chain management, monitoring and anticipating risks, adaptability in case of supply chain constraints. The results also aim to indicate the relationship between the assessment of risk factors in the areas of pandemic, political instability, environmental and economic, and company performance. Based on the research, recommendations have been created, with entrepreneurs as the main audience. The recommendations are complete because they

apply to each type of enterprise by size as well as the area in which they conduct their supply chain operations. The companies studied are located in different regions of the world and are members of different organizations, which will allow the illustration of a broader spectrum of cases from a global aspect. Recommendations are primarily aimed at illustrating ways to mitigate the negative effects of a crisis situation, as well as highlighting the significant impact of an appropriate way of running a business oriented toward supply chain and risk management activities. The research also identifies areas that need to be given special attention due to their significant impact on supply chain performance results.

## **2. Theoretical background**

Recent global events, i.e., the Covid 19 pandemic and the war in Ukraine, have strongly changed the perception of supply chain vulnerabilities. On the one hand, it has been observed that supply chain disruptions can occur at any level due to factory closures, quarantine, accidents. On the other hand, producer disruptions have also occurred recently due to the conflict in Ukraine. (Passarelli et al., 2023). Supply chain disruptions (SCDs) are unexpected events that disrupt the flow of goods and products or create a discontinuity S.C. (Ali et al., 2021; Althaf and Babbitt, 2021). Supply chain disruption can also be defined as "the manifestation of a company's inability to match supply and demand." company's inability to match demand and supply" (Hendricks et al., 2005). Disruptions in supply chains can result from a variety of causes: climate change or natural disasters (e.g., floods, earthquakes, hurricanes, epidemics) (Ghosh & Sanyal, 2021; Moosavi et al., 2022) or human factors (e.g., wars, tariffs on specific products, economic crises, on specific products, economic crises) (Villalón-Huerta et al., 2022; Sarkar & Shankar, 2021), the inevitable consequence of which is the disruption of the normal flow of materials and information within supply chains (Cardoso et al., 2022). Events such as a pandemic or war bring unexpected challenges such as demand and supply shocks resulting in stockpiling, labor shortages, restriction of transportation primarily across borders (Nikolopoulos et al., 2021).

Usually companies have a strategy within the framework of an emergency, few have dealt with the situation caused by the Covid-19 pandemic and related restrictions. The same situation occurred with regard to the ongoing war in Ukraine and the sanctions imposed on Russia. Some companies were forced to act unsystematically which was further hampered by little information, poor situational forecasts and led to increasing uncertainty. The war in Ukraine and the COVID-19 pandemic caused major disruptions and even interruptions in supply chains (Golan et al., 2020; Ivanov and Dolgui, 2020; Mehrotra et al., 2020), which revealed their vulnerability to potential risks (Ivanov, 2020; Sodhi & Tang, 2021).

### **The Long-Term Impact of Pandemic COVID-19 on the Supply Chain**

Covid-19 was hailed as the most serious disruption that caused many disruptions and broken supply chains (Araz, 2020). The impact of the Covid-19 pandemic was felt even in the years following its occurrence in aspects such as politics education and social relations (Chandasiri, 2020; Lipsy, 2020; Cooper, 2021). Its impact can also be seen in the economy especially in aspects such as production, consumption, flow of goods and services, and foreign trade (del Rio-Chanona et al., 2020; Fleming, 2021). The COVID-19 pandemic disrupted the availability of many global supply chains thereby paralyzing many industries (Araz et al., 2020) a phenomenon previously unheard of and undescribed in the literature (Butt, 2021a). A pandemic differs from traditional disruptions due to its long-term effects, unpredictable spread and wide-ranging impact on multiple levels of the supply chain and multiple regions around the world (Ivanov, 2020a). The flagship impacts of Pandemic COVID-19 cited in the literature in the context of transportation and the supply chain include the following issues.

Changing consumption patterns: Pandemic COVID-19 caused a change in consumption patterns, increasing demand for certain products such as foodstuffs, personal protective equipment and medical products. Companies

that manufacture and distribute these products have had to quickly change their supply chains to meet increased production and demand (Kráľ et al., 2022).

**Restrictions on movement of goods and people:** the COVID-19 pandemic has caused border closures, restricting the movement of goods and people, making logistics processes difficult (Gomes & Lopes, 2022). Transportation by road, sea and air is now hampered, meaning that moving goods from one country to another is becoming increasingly difficult.

**Supply problems and delays:** As a result of restrictions on the movement of goods and people, many companies have experienced supply shortages and delivery delays. Companies that rely on importing or exporting goods face high transportation costs and difficulties in maintaining regular deliveries.

**Rising transportation and warehousing costs:** Rising transportation and warehousing costs are another effect of the COVID-19 pandemic on supply chains. Companies that rely on international supply chains have to deal with high transportation and warehousing costs, affecting their profit margins.

**Need to adjust supply chains:** The COVID-19 pandemic has forced companies to adapt their supply chains to new conditions and requirements. Companies must react quickly to changing situations and adapt their supply chains to meet new challenges.

### **The Impact of the Ongoing Armed Conflict in Ukraine on the Supply Chain**

Factors destabilizing the supply chain, qualified in the market analysis as unlikely events but likely to cause business collapse, are, in addition to natural disasters, political tensions, armed conflict. The armed conflict in Ukraine is increasingly hitting the transportation industry and the logistics and manufacturing sector, which was just beginning to recover from the problems caused by the pandemic. The ongoing war and the economic sanctions being implemented are causing problems in the supply of raw materials. The flow of goods is declining, the supply chain is encountering more and more problems and is broken in many places. Instability is growing. In many ports, cargoes destined for Russia and Ukraine are backlogged blocking surface availability. This is causing many delays and stoppages at the ports. Warehousing capacity is limited and this is putting negative pressure on the supply chain in the form of rising costs, rising prices and rising inflation around the world. Sources report that the situation is increasing global demand for ship purchases and shipping costs around the world. Many companies are forced to relocate their supply chains due to reduced flow or disrupted supply chains due to the inability to obtain goods required from either Ukraine or Russia. The war in Ukraine is causing a huge impact on the supply chains of fossil fuels such as oil gas, but also on the supply chains of food and agricultural products such as grains and corn. In addition, the negative impact of the war has been noted in terms of higher energy prices. An important effect of the ongoing war is also increased political and economic tension. This affects both business decisions and company strategies. These companies must take into account the risks associated with investing in Ukraine and possible changes in government policies and regulations.

### **Compilation of Covid-19 and the Conflict in Ukraine Based on the Impact on the Supply Chain**

The disrupted supply chains due to the COVID-19 pandemic and the war in Ukraine share many common features, but also have differences in some aspects. In both cases, border closures and restrictions on the movement of people and goods have caused major disruptions in supply chains. Companies are having to deal with delays, supply shortages and increased transportation costs. As a result of these disruptions, many companies are facing problems in maintaining their operations and sourcing necessary raw materials and supplies. However, in the case of the COVID-19 pandemic, supply chain disruptions are associated with restrictions on the movement of people and goods to prevent the spread of the virus. In the case of the war in Ukraine, disruptions to supply chains are caused by armed conflict and transportation restrictions due to security and political stability.

Additionally, the COVID-19 pandemic had a global impact on supply chains, while the war in Ukraine mainly affects countries neighboring Ukraine and countries that rely on importing or exporting goods to Ukraine. Despite the differences in aspects of the two situations, both the COVID-19 pandemic and the war in Ukraine have demonstrated the importance of having flexible and diverse supply chains that can respond quickly to changing conditions. Companies that are able to adapt to these challenging conditions are more resilient to future supply chain disruptions.

### **The Impact of the COVID-19 Pandemic and the Conflict in Ukraine on the Scientific Community and the View of SCRM**

The reaction to these developments reflects the interest of many organizations in the topic of supply chain risk management (SCRM) which will help ensure continued supply to meet demand. Supply chain risk management (SCRM) is critical to the competitive growth of companies by successfully connecting them with manufacturers, retailers and customers, among others (Li & Chen, 2019). As organizations today increasingly prefer to rely on incorporated supply chain networks, they are becoming more vulnerable to supply chain disruption risk (SCDR) (Novoszel & Wakolbinger, 2022).

In order to correctly identify issues related to the occurrence of supply chain disruptions, one must categorize the risks that cause them into appropriate divisions.

Disasters-are caused by natural disasters or human behavior. We are primarily talking about earthquakes, floods, fires and hurricanes. Current literature points to the need to take natural risks into account in managing the global supply chain and countering the impact of risks (Gunessee et al., 2018). Natural or man-made (geopolitical) disruptions are low probability and high impact events with devastating consequences. High probability and medium impact disruptions include sudden changes in demand, supply shortages, congestion in supply or distribution networks, and supply constraints (Katsaliaki et la., 2021)

Systems-e.g., information disruption-occurred when the internet and new technologies were implemented less in supply chain management (Reshmi, 2021). We are referring to the use of various technologies in the implementation of Industry 4.0. The increasing deployment of new technologies has reduced information transaction times and inaccuracies (Ali et al., 2022). However, alongside the benefits of widespread Internetization and the introduction of new technologies, a new threat has emerged in the form of data security and information flow. We are speaking here primarily of cyber attacks (Durowoju et al., 2020; Reshmi, 2021). Current studies also show the doubtfulness of the information system and its security thus increasing the possibility of the risk of information disruption and disruption of the supply chain.

Delays-e.g., transportation disruption-is a risk that rapidly paralyzes the entire supply chain (Paul et al., 2020) Transportation disruption causes the interruption or stoppage of the temporary or total flow of goods (Lam & Yin 2022). Supply chain disruption can be caused by, among other things, incorrect human decisions by, for example, selecting inappropriate sub-suppliers.

The likelihood of supply chain disruption or interruption can be minimized or prevented altogether through continuous monitoring of the entire supply chain and factors potentially affecting supply chain performance (Scheibe & Blackhurst, 2018). To help companies become better prepared to deal with uncertainty, and thus become more resilient, the academic literature has contributed theoretical models for supply chain risk management.

### 3. Research Methodology

The research was aimed at investigating the difference between the performances of different areas of company efficiency due to macroeconomic factors affecting the supply chain. For this purpose, in the first quarter of 2023, a survey was carried out initially among 250 companies, and finally 212 entities were left in the collection after the data was dumbed down. The survey was conducted in four selected European countries viz: Poland, Romania, the United Kingdom and Turkey. These countries are at a similar level of economic development, with similar annual GDP levels (4.9%; 4.8%; 4.1% and 5.6%, respectively). At the same time, two of these countries are members of the European Union. The collected data were subjected to statistical analysis according to the assumptions of selected statistical methods. It was assumed that:

H1: The level of assessment of the impact of environmental, economic, organizational and resource factors on the supply chain causes a change in the efficiency of enterprises operating in the chain.

Table 1 presents key information on the companies in the survey sample.

**Table 1.** Characteristics of the study sample by country covered [%]

Features of the research sample - independent variables	Share of surveyed companies in total	Country			
		UK	Poland	Romania	Turkey
		21,7	19,3	32,5	26,4
Employment volume					
10 to 49 people	40,1	16,5	23,5	37,6	22,4
50 to 249 people	25,5	46,3	13,0	9,3	31,5
250 >	34,3	9,6	19,2	43,8	27,4
Length of operation in the market					
Less than 3 years	18,9	25,0	5,0	40,0	30,0
From 3 to 7 years	16,0	23,5	5,9	35,6	35,0
From 8 to 15 years	20,8	22,7	11,4	34,1	31,8
More than 15 years	44,3	19,1	34,0	27,7	19,1
Number of global partners					
No	4,7	20,0	40,0	0,0	40,0
From one to three	36,8	12,8	20,5	35,9	30,8
Four to nine	29,2	29,0	14,5	33,9	22,6
Ten and over	29,2	25,8	19,4	32,3	22,6
The company's place in the supply chain					
Raw material	9,4	30,0	0,0	30,0	40,0
Semi product	10,4	27,3	0,0	45,5	27,3
Manufacturer	33,0	17,1	28,6	28,6	25,7
Distributor	18,9	20,0	35,0	35,0	10,0
Logistics Provider	28,3	23,3	11,7	31,7	33,3

Source: Authors' elaboration

Analyzing the overall structure of the survey sample, it is observed that the most frequent participants in the survey are small enterprises (40.1%); which have been operating in the market for more than 15 years (44.3%), have one to three global partners (36.8%) and are manufacturers (33%). No more than 5% are occupied in the

sample by entities that do not have any global partner. This means that the conclusions drawn from the survey can be generalized to global supply chain risks. The largest number of companies were surveyed in Romania, which has the largest number of small and large entities, which have been in business for less than 15 years, have a large number of global partners and most often act as suppliers of intermediate products, are manufacturers or distributors. In contrast, companies from Turkey most often act as suppliers of raw materials and logistics services. Enterprises from Poland dominate in the case of seniority in the market and most often among the other countries surveyed do not have a global partner in doing business.

In addition to the independent variables that characterize the research sample, the study identified dependent variables that relate to potential risks that threaten the sustainability of the global supply chain. The identification of risks was based on five major macro-economic challenges that companies have been facing in global supply chain management over the past few years:

Pandemics (Covid-19, H1N1, Ebola);

Political instability (wars, economic sanctions, bad governance);

Environmental aspects (sustainability, green logistics);

Economic aspects (sanctions, trade disputes, financial crisis, market crash).

These challenges were detailed and given a five-point assessment (Table 2).

**Table 2.** Description of selected dependent variables

<b>Covid - 19 the pandemic</b> (where 1 = very negative and 5 = very positive) <b>(Challenge C1)</b>	<b>Political instability</b> (where 1 = doesn't matter and 5 = very influential) <b>(Challenge C2)</b>	<b>Environmental aspects</b> (where 1=doesn't matter and 5 = very important) <b>(Challenge C3)</b>	<b>Economic and financial aspects</b> (where 1 = doesn't matter and 5 = very influential) <b>(Challenge C4)</b>
Labor shortage caused by pandemic <b>(C1a)</b>	War between nations <b>(C2a)</b>	Procurement strategy beneficial to the environment <b>(C3a)</b>	Inflation <b>(C4a)</b>
Transition to (work from home)/ remotely <b>(C1b)</b>	Change in the energy sources on the market <b>(C2b)</b>	reducing waste generation from company related activities <b>(C3b)</b>	Implementation of new economic and trade policies by countries <b>(C4b)</b>
The reduced amount of cash inflow <b>(C1c)</b>	Shift in the economic power (western countries to Asia) <b>(C2c)</b>	Employee participation in environmental conservation initiatives <b>(C3c)</b>	Economic sanctions on some countries <b>(C4c)</b>
Shortages at the supplier level <b>(C1d)</b>	Electronic equipment supply shortage (microprocessors, transistors, capacitors) <b>(C2d)</b>	The move toward greener and more environmentally energy sources <b>(C3d)</b>	Purchasing power (amount of money with customers and businesses available to spend) <b>(C4d)</b>
Weakness of just-in-time strategy <b>(C1e)</b>	Increase in fuel price due to OPEC plus nations producing less oil <b>(C2e)</b>	Choosing supply chain partners based on environmental regulations <b>(C3e)</b>	Economic growth of a country <b>(C4e)</b>
		Recycling of damaged and useless goods <b>(C3f)</b>	

Source: Authors' elaboration

The potential effects (P) that occurred as a result of the identified crises were assessed on a five-point scale (1=definitely worse than previous years , 2=worse than previous year , 3=comparable to previous years, 4=better than previous years, 5=definitely better than previous years) for the following indicators of company effectivity: lead time (P1); efficiency of the entire supply chain (P2); logistics costs (P3); efficiency in inventory and warehouse management (P4); human resource management (P5); fulfillment of customer requests (P6); mitigation of risk in the supply chain (P7); revenue of the company and market share: the share of the company in the whole market on which it operates (P8). The surveyed companies made an overall assessment of the level of efficiency of their operations, a summary of which is presented in Figure 1.

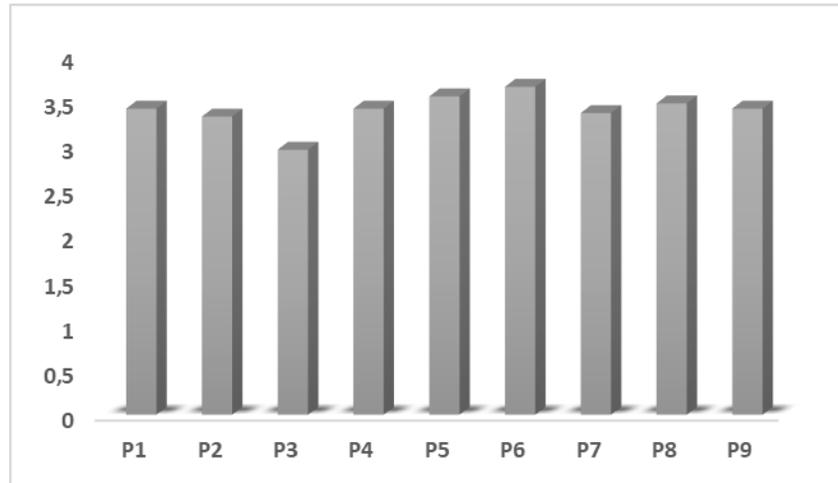


Fig.1. Mean of performing of the company in the present year 2022 compared to previous years  
 Source: Authors' elaboration

Of the several evaluated potential changes in the performance results of the surveyed enterprises, the highest scores were P6, or Fulfillment of customer requests, where the average score was 3.64, and P5, or Human resource management, where the average score was 3.54, which marked the achievement in 2022 of comparable results to previous years. Overall, the data obtained indicate the preservation of comparable results to the previous period in most of the surveyed companies. Half of the enterprises declared no impact for the variable P1, P2, P3, P4, P7 and P9 (Me =3.00). Half of the enterprises declared improved performance to the previous period for the variable P5, P6 and P8 (Me=4.00).

To compare the distributions of unidimensional statistical characteristics of the study populations, where data were expressed on an ordinal scale, the non-parametric Kolmogorov-Smirnov test was used. Due to the numerous dependent variables, factor analysis was used to reduce their set. It allowed to divide all variables into subsets according to the correlation index. Highly correlated variables were placed in one set. In the end, four sets were identified, defined as the main factors, which took into account the cumulative impact of each variable. In order to compare the four factors in terms of the independent variable, the non-parametric Kruskal-Wallis test was applied.

#### 4. Study Results

##### Characteristics of dependent variables and testing normality of distribution

The next stage of the study was to identify the effect of the individual dependent variables (C1, C2, C3 and C4) on the independent variable P. In order to select a statistical test, the normality distribution was first tested for all the variables studied. The test of normality distribution in each group was carried out according to the assumptions of the Kolmogorov-Smirnov test. The resulting calculations for each variable viz: C1, C2, C3 and C4 and P, where  $Z(202)$  and  $p < 0.001$  mean that the null hypothesis, which states that the distribution of the variable does not deviate from the normal distribution, should be rejected. The absence of a normal distribution and the ordinal nature of the variables under study, determined the choice of comparing the groups under study using a non-parametric Kruskal-Wallis test. At the same time, due to the large number of potential dependent variables that can affect the performance results of the company, the study of the impact of risk on performance results was preceded by factor analysis to reduce the number of factors. In order to check whether the variables have adequate statistical properties appropriate for factor analysis, the basic descriptive statistics of these variables were examined (Table 3).

**Table 3.** Basic statistics for dependent variables

C1	Mean	Median	Std. dev.	C2	Mean	Median	Std. dev.
C1a	3,0667	3,000	1,0739	C2a	3,3429	4,000	1,3257
C1b	3,0952	3,000	1,2101	C2b	3,4381	4,000	1,1813
C1c	3,0190	3,000	1,1065	C2c	2,6381	3,000	1,0904
C1d	3,1143	3,000	1,2005	C2d	2,9333	3,000	1,3783
C1e	3,1333	3,000	1,0810	C2e	3,3396	4,000	1,2837
C3	Mean	Median	Std. dev.	C4	Mean	Median	Std. dev.
C3a	3,1810	3,000	1,1473	C4a	3,7714	4,000	1,1921
C3b	3,1048	3,000	1,2054	C4b	3,5810	4,000	1,0873
C3c	3,2286	3,000	1,2316	C4c	3,6190	4,000	1,2011
C3d	3,6190	4,000	1,3152	C4d	3,7524	4,000	1,2434
C3e	3,3619	4,000	1,2383	C4e	3,8286	4,000	1,1106
C3f	3,6667	4,000	1,2578				

Source: Authors' elaboration

The average level of impact for Challenge 1 is similar, with a rating of 3. According to the median value, at least half of the number of respondents rated the impact of the pandemic on supply chain management as neutral, with a standard deviation of 1, which is significant for such a scale. The values of the statistics are more varied for Challenge 2, where the average rating ranges from 2.6 to 3.4, and the median value for the variable C2a, C2b and C2e indicates a dominant rating of 4, or influential. The value of the standard deviation indicates a slightly greater dispersion of ratings in this area. The average rating values for Challenge 3 are above 3, and the results are the most dispersed. The highest average ratings are for Challenge 4, where half of the respondents declared a minimum rating of 4.

According to the assumption of factor analysis, the variances of the results within each variable were close to each other. Looking at the standard deviations for this purpose, it is observed that their values are close to each other, so a factor analysis can be carried out for the dependent variables. The second condition for conducting factor analysis is that the dependent variables are mutually correlated, which was checked using the basic K-M-O statistic. and Bartlett's The results obtained are presented in Table 4.

**Table 4.** Kaiser-Mayer-Olkin and Bartlett tests

KMO measure of sampling adequacy.	0,852	
Bartlett's sphericity test	Approximate chi-square	2404,203
	df	210
	Relevance	0,000

Source: Authors' elaboration

The K-M-O measure is more than 0.5, which means that factor analysis will give a satisfactory reduction of variables. Bartlett's test of sphericity for  $p < 0.001$ , in turn, allows us to assume that there are correlations between variables, that is, latent factors.

### Factor analysis

One of the tasks of the analysis is dimension reduction, which allows to assess the optimal number of principal components. For this purpose, one of the most common methods of identifying the number of factors which is the Kaiser criterion was chosen. This criterion considers factors for which the eigenvalue is greater than the average of the eigenvalues to be significant. Table 5 indicates only those components that meet the eigenvalue criterion  $>1$ .

**Table 5.** Total explained variance

Component	Initial eigenvalues			Sums of squares of charges after separation		
	Total	% of variance	% cumulative	Total	% of variance	% cumulative
1	7,765	36,976	36,976	7,765	36,976	36,976
2	2,587	12,318	49,294	2,587	12,318	49,294
3	1,545	7,358	56,652	1,545	7,358	56,652
4	1,199	5,710	62,362	1,199	5,710	62,362

The method of extracting factors - the main components.

Source: Authors' elaboration

The results showed that exactly four components meet the criterion for which the eigenvalue is greater than 1. The first two components are the strongest, explaining respectively 37% and 12% of the variability of all questions. In total, all components explain 62% of the variability of all questions. This means that four factors should be extracted in further analysis. Values less than 0.3 have been removed from Table 6.

**Table 6** Matrix of rotated components

Symbol	Risk area	Component			
		1	2	3	4
C3e	Choosing supply chain partners based on environmental regulations	,866			
C3f	Recycling of damaged and useless goods	,787			
C3d	The move toward greener and more environmentally energy sources	0,765	0,390		
C3c	Employee participation in environmental conservation initiatives	0,754			
C3b	Reducing waste generation from company related activities	0,660		-0,361	
C3a	Procurement strategy beneficial to the environment	0,622		-0,423	
C2a	War between nations	0,459	0,404	-0,355	
C4d	Purchasing power (amount of money with customers and businesses available to spend)		0,793		
C4c	Economic sanctions on some countries		0,770		
C4b	Implementation of new economic and trade policies by countries		0,749		
C4e	Economic growth of a country		0,698		
C4a	Inflation		0,663	0-,327	
C1d	Shortages at the supplier level			0,861	
C1e	Weakness of just-in-time strategy			0,734	
C1c	The reduced amount of cash inflow			0,710	
C2e	Increase in fuel price due to opec plus nations producing less oil(opec = organizations of the petroleum exporting countries)	0,351	0,334	-0,552	
C1b	Transition to (work from home ) / remotely			0,510	
C2d	Electronic equipment supply shortage (microprocessors, transistors, capacitors)	0,307			0,710

C1a	Labor shortage caused by pandemic			0,396	-0,653
C2c	Shift in the economic power (western countries to Asia)				0,642
C2b	Change in the energy sources on the market		0,364		0,383

Source: Authors' elaboration

After performing an orthogonal rotation analysis of the factors using the Varimax method, it was found that the first factor strongly loads questions from the Environmental area and about the war in Ukraine. The second covers the entire economic area. The third factor partially covers aspects related to the pandemic and rising fuel prices. The fourth factor focused mainly on political factors and changes in the workforce as a result of the pandemic. The first factor (F1) can be called an environmental factor, the second an economic factor (F2), the third an organizational factor (F3) and the fourth a resource factor (F4). Each factor was checked for scale reliability, resulting in both question C2e and C1a requiring scale inversion. Ultimately, for each indicator  $\alpha > 0.07$ , the scale should therefore be considered reliable. The indices of the four variables were then estimated using a regression method that took into account the factor loadings of each question in each factor. The factors finally took on a binomial value, where 1 meant a value below the mean, while 2 meant a value above the mean (in terms of the variable in question).

### Testing the significance of differences

Then, in order to test the significance of differences between the factor group and the efficiency results group, a K-W test was applied, the results of which are presented in Table 7.

Table 7. Results of the Kolmogorov-Smirnov test

	P1	P2	P3	P4	P5	P6	P7	P8	P9
F1									
H Kruskal-Wallis	20,421	14,544	2,659	27,743	12,798	10,510	16,952	31,803	16,184
Asymptotic significance	<0,001	<0,001	0,265	<0,001	0,002	0,005	<0,001	<0,001	<0,001
F2									
H Kruskal-Wallis	13,132	9,290	1,341	5,129	12,989	24,235	0,002	14,731	7,957
Asymptotic significance	0,001	0,010	0,512	0,002	0,002	<0,001	0,999	<0,001	0,019
F3									
H Kruskal-Wallis	0,118	2,359	14,291	0,176	2,499	0,122	0,718	0,317	0,802
Asymptotic significance	0,943	0,307	<,001	0,916	0,287	0,941	0,698	0,854	0,670
F4									
H Kruskal-Wallis	0,545	4,254	3,655	0,136	0,781	1,430	0,426	0,174	4,416
Asymptotic significance	0,761	0,119	0,161	0,934	0,677	0,489	0,808	0,917	0,110

Source: Authors' elaboration

The assumption of the K- W test is that if  $p < 0.05$  then the null hypothesis of no difference between groups should be rejected. Thus, for most of the variables studied, there are significant differences between their groups.

The most common differences are between the change in efficiency and the F1 factor for the environmental area and the F2 factor for economic aspects. Significant differences between the groups for the organizational area factor F3 occur only in the case of the change in performance from the Logistics cost area (P3). In contrast, for the resource factor F4, no significant differences were identified between groups for any of the performance indicators. Both the F3 and F4 factors similarly affect the level of change in performance indicators. The obtained results allow to partially confirm the main hypothesis. It is shown that the level of assessment of the impact of environmental and economic factors on the supply chain causes a change in the efficiency of companies operating in the chain. The further part of the study focuses exclusively on the analysis of significant differences between the group of factors and changes in efficiency scores.

**Table 8.** Shaping of the efficiency results of enterprises due to the evaluation of the influence of macro-transformation factors due to the relevance of links

	F1		F2		F3	
	Low	High	Low	High	Low	High
P1	3,18	3,53	3,05	3,75		
P2	3,06	3,53	3,07	3,63		
P3	-	-	-	-	3,14	2,72
P4	2,95	3,70	3,16	3,63		
P5	3,28	3,75	3,29	3,87		
P6	3,38	3,81	3,25	4,06		
P7	3,12	3,51	-	-		
P8	3,06	3,73	3,16	3,77		
P9	3,13	3,40	3,18	3,65		

\*Where a score of 1.0- 2.9 indicates a deterioration in performance relative to the previous period, an average of 3.0 - 3.5 indicates no effect of the factor on changes in the performance index, an average of 3.6 - 5.0 indicates an improvement in performance relative to the previous year.

Source: Authors' elaboration

In the case of statistically significant differences between the studied groups (Table 8), it can be observed that companies that rate the impact of the studied factors on supply chain operations at a below-average level have a higher risk of worsening efficiency results. This risk is greatest in the case of warehouse inventory performance management (P4) in the area of the environmental factor. In contrast, companies that rate the impact of the factors studied at above average levels are more likely to observe a lower risk of deterioration of these results. The lowest risk of unfavorable changes is observed in the fulfillment of customer requests (P6) in the area of the economic factor. At the same time, the greater the influence of the organizational factor (F3) on the functioning of the supply chain, the greater the risk of deterioration in the results regarding logistics costs (P3). What companies should be most concerned about are the environmental factor and the economic factor, which affect the largest number of performance indicators. This may mean that companies that rate the occurrence of macroeconomic factor risks higher have a greater awareness of the need to adapt to the surrounding environment. At the same time, it should be remembered that both the results of the impact of individual factors and performance indicators were most often at the average level, which somewhat narrows the judgment due to the high frequency of assessments with values close to the average.

## 5. Conclusion

Companies that rate the impact of economic and environmental factors below average are more likely to have deteriorating efficiency results. On the other hand, companies that rate the impact of each factor at above average have a greater chance of improving their efficiency performance compared to the previous period. At the same time, in the case of the entity management factor (F3), companies that rated the impact of this factor on the company's operations above average tended to observe a deterioration in efficiency in the area of logistics costs incurred. According to the McKinsey Global Institute report, the source of vulnerability and resilience building is supply chain operations. Depending on the effectiveness of risk monitoring, implementation of risk management strategies and proper planning of future operations, the impact of emergencies on efficiency results can be significantly reduced (Lund et al., 2020).

Emerging changes and crisis situations in the market, contrary to appearances, did not significantly worsen the performance results of the surveyed companies. This may be due to the increased activity of companies as a result of the changes taking place, in order to catch up with the competition and survive in a dynamic market. Awareness and the ability to anticipate risks and adaptability can significantly minimize the risk of reducing the efficiency of global supply chains. This is supported by the results of many studies. Henrich et al. (2022) highlight in their article the agility and flexibility of the supply chain, which is becoming one of the key prerequisites for companies to survive against rapidly changing and increasingly volatile customer needs. "Future supply chains will need to be much more dynamic-and be able to predict, prepare, and respond to rapidly evolving demand and a continually changing product and channel mix. In short, supply chains will need to become agile" (Henrich et al., 2022) In order to mitigate the negative effects of crisis situations, Raj et al. (2022) recommend choosing suppliers located closer to the company, redefining security levels or reaching for artificial intelligence tools. At the same time, it is almost impossible to exclude economically destructive events, so it is important in this aspect to mitigate their negative effects with appropriate risk management plans. Smirnov and Suresh (2020) proved in their research that risk management strategies benefit and help reduce the impact on supply chains. Accordingly, improving the flexibility and resilience of supply chains determines its well-being even during disruptions.

At the same time, our research has shown that an area that requires special observation concerns environmental and economic factors that significantly affect changes in supply chain efficiency scores, which include the companies studied. The demonstrated differences in changes in the level of efficiency differ significantly at the average level, where the evaluation of these indicators in relation to the previous year was above average, while the evaluation of the impact of individual factors on changes in the supply chain at the average level.

## References

- Ali, S. M., Bari, A. M., Rifat, A. A. M., Alharbi, M., Choudhary, S., & Luthra, S. 2022. Modelling supply chain disruption analytics under insufficient data: A decision support system based on Bayesian hierarchical approach. *International Journal of Information Management Data Insights*, 2(2), 100121. <https://doi.org/10.1016/j.ijime.2022.100121>
- Ali, S. M., Paul, S. K., Chowdhury, P., Agarwal, R., Fathollahi-Fard, A. M., Jabbour, C. J. C., & Luthra, S. 2021. Modelling of supply chain disruption analytics using an integrated approach: an emerging economy example. *Expert Systems with Applications*, 173, Article 114690. <https://doi.org/10.1016/j.eswa.2021.114690>
- Althaf, S., & Babbitt, C. W. 2021. Disruption risks to material supply chains in the electronics sector. *Resources, Conservation and Recycling*, 167, Article 105248. <https://doi.org/10.1016/j.resconrec.2020.105248>
- Araz, O. M., Choi, T., Olson, D. L., & Salman, F. S. 2020. Data Analytics for Operational Risk Management. *Decision Sciences*, 51(6), 1316-1319. <https://doi.org/10.1111/deci.12443>

- Butt, A. S. 2021a. Understanding the implications of pandemic outbreaks on supply chains: An exploratory study of the effects caused by the COVID-19 across four South Asian countries and steps taken by firms to address the disruptions. *International Journal of Physical Distribution & Logistics Management*, 52(4), 370-392. <https://doi.org/10.1108/IJPDLM-08-2020-0281>
- Butt, A. S. 2021b. Strategies to mitigate the impact of COVID-19 on supply chain disruptions: a multiple case analysis of buyers and distributors. *The International Journal of Logistics Management*, Vol. ahead-of-print. <https://doi.org/10.1108/IJLM-11-2020-0455>
- Cardoso, B.F.O., Fontainha, T.C. And Leiras, A. 2022. Disasters' impact on supply chains and countermeasure strategies: an overview of the academic literature' nature. *Brazilian Journal of Operations & Production Management*, 19(2), e20221429. <https://doi.org/10.14488/BJOPM.2021.05>
- Chandasiri, O. 2020. The COVID-19: impact on education. *Journal of Asian and African Social Science and Humanities*, 6(2), 37-42.
- Choi, T.M., Kumar, S., Yue, X., Chan, H.L. 2022. Disruptive technologies and operations management in the Industry 4.0 era and beyond. *Production and Operations Management*, 31(1), 9-31. <https://doi.org/10.1111/poms.13622>
- Cooper, K., Hards, E., Moltrecht, B., Reynolds, S., Shum, A., Mcelroy, E., & Loades, M. 2021. Loneliness, social relationships, and mental health in adolescents during the COVID-19 pandemic. *Journal of Affective Disorders*, 289, 98-104. <https://doi.org/10.1016/j.jad.2021.04.016>
- Davis, K. F., Downs, S., & Gephart, J. A. 2021. Towards food supply chain resilience to environmental shocks. *Nature Food*, 2(1), 54-65. <https://doi.org/10.1038/s43016-020-00196-3>
- Del Rio-Chanona, R. M., Mealy, P., Pichler, A., Lafond, F., & Farmer, J. D. 2020. Supply and demand shocks in the COVID-19 pandemic: An industry and occupation perspective. *Oxford Review of Economic Policy*, 36(Supplement\_1), S94-S137. <https://doi.org/10.1093/oxrep/graa033>
- Durowoju, O. A., Chan, H. K., Wang, X., & Akenroye, T. 2021. Supply chain redesign implications to information disruption impact. *International Journal of Production Economics*, 232, Article 107939. <https://doi.org/10.1016/j.ijpe.2020.107939>
- Fleming, O. M. 2021. Modeling the US Beef Industry's Response to COVID-19. *Undergraduate Economic Review*, 17(1), 14.
- Ghosh, I., & Sanyal, M. K., 2021. Introspecting predictability of market fear in Indian context during COVID-19 pandemic: An integrated approach of applied predictive modelling and explainable AI. *International Journal of Information Management Data Insights*, 1(2), Article 100039. <https://doi.org/10.1016/j.ijime.2021.100039>
- Golan, M. S., Jernegan, L. H., & Linkov, I. 2020. Trends and applications of resilience analytics in supply chain modeling: systematic literature review in the context of the COVID-19 pandemic. *Environment Systems and Decisions*, 40(2), 222-243. <https://doi.org/10.1007/s10669-020-09777-w>
- Gomes, S., & Lopes, J. M. 2022. Consequences of the pandemic constraints on the supply chain of companies: an exploratory approach. *Polish Journal of Management Studies*, 26(2), 162-171. <https://doi.org/10.17512/pjms.2022.26.2.10>
- Gomez-Mejia, L. R., Martin, G., Villena, V. H., & Wiseman, R. M. 2021. The behavioral agency model: Revised concepts and implications for operations and supply chain research. *Decision Sciences*, 52(5), 1026-1038. <https://doi.org/10.1111/dec.12547>
- Gunessee, S., Subramanian, N., & Ning, K. 2018. Natural disasters, PC supply chain and corporate performance. *International Journal of Operations & Production Management*, 38(9), 1796-1814. <https://doi.org/10.1108/IJOPM-12-2016-0705>
- Hendricks, K. B., & Singhal, V. R. 2005. An empirical analysis of the effect of supply chain disruptions on long-run stock price performance and equity risk of the firm. *Production and Operations Management*, 14(1), 35-52. <https://doi.org/10.1111/j.1937-5956.2005.tb00008.x>
- Henrich, J., Li, J., Mazuera, C., & Perez, F. (2022). With supply chains in the spotlight, three new long-term transformation priorities form a fresh focus for competitive advantage. <https://www.mckinsey.com/capabilities/operations/our-insights/future-proofing-the-supply-chain>

- Ivanov, D., & Dolgui, A. 2020. Viability of intertwined supply networks: extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. *International Journal of Production Research*, 58(10), 2904-2915. <https://doi.org/10.1080/00207543.2020.1750727>
- Ivanov, D., 2020. Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. *Transportation Research Part E: Logistics and Transportation Review*, 136, 101922. <https://doi.org/10.1016/j.tre.2020.101922>
- Katsaliaki, K., Galetsi, P., & Kumar, S. 2021. Supply chain disruptions and resilience: A major review and future research agenda. *Annals of Operations Research*, 1-38. <https://doi.org/10.1007/s10479-020-03912-1>
- Kot, M. 2021. Threats In International Logistics -Study During Covid-19 Pandemic Time. Proceedings of the 37th International Business Information Management Association Conference (IBIMA) 30-31 May 2021, Cordoba, Spain, 2002-2013.
- Kot, S., Ul Haque, A., & Baloch, A. 2020. Supply chain management in smes: Global perspective. *Montenegrin Journal of Economics*, 16(1), 87-104. <https://doi.org/10.14254/1800-5845/2020.16-1.6>
- Kráľ, Š., Fedorko, R., Štofejová, L., & Kizák, M. 2022. An analytical view of consumers' purchasing behavior in terms of e-commerce during covid-19. *Polish Journal of Management Studies*, 26(1), 140-156. <https://doi.org/10.17512/pjms.2022.26.1.09>
- Lam, J. S. L., & Yin, Y. 2022. Integrated Cost and Risk Management Enhancing Supply Chain Resilience. In *Civil Engineering for Disaster Risk Reduction* (pp. 385-399). Singapore: Springer. [https://doi.org/10.1007/978-981-16-5312-4\\_26](https://doi.org/10.1007/978-981-16-5312-4_26)
- Lipsy, P. Y. 2020. COVID-19 and the Politics of Crisis. *International Organization*, 74(S1), E98-E127. <https://doi.org/10.1017/S0020818320000375>
- Lund, S., Manyika, J., Woetzel, J., Barriball, E., Krishnan, M., Alicke, K., Birshan, M., George, K., Smit, S., Swan, D., Hutzler, K. 2020. Risk, resilience, and rebalancing in global value chains, McKinsey Global Institute, Report 2020, <https://www.mckinsey.com/capabilities/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains/>
- Mehrotra, S., Rahimian, H., Barah, M., Luo, F., & Schantz, K. 2020. A model of supply-chain decisions for resource sharing with an application to ventilator allocation to combat COVID-19. *Naval Research Logistics (NRL)*, 67(5), 303-320. <https://doi.org/10.1002/nav.21905>
- Melnychenko, O., Osadcha, T., Kovalyov, A., & Matskul, V. 2022. Consequences of russia's military invasion of Ukraine for Polish-Ukrainian trade relations. *Journal of International Studies*, 15, 131-149.
- Moosavi, J., Fathollahi-Fard, A. M., & Dulebenets, M. A. 2022. Supply chain disruption during the COVID-19 pandemic: Recognizing potential disruption management strategies. *International Journal of Disaster Risk Reduction*, 102983. <https://doi.org/10.1016/j.ijdr.2022.102983>
- Muangmee, C., Kassakorn, N., Khalid, B., Bacik, R., & Kot, S. 2022. Evaluating competitiveness in the supply chain management of small and medium scale enterprises. *Journal of Competitiveness*, 14(2), 93-112. <https://doi.org/10.7441/joc.2022.03.06>
- Nikolopoulos, K., Punia, S., Schäfers, A., Tsinopoulos, C., & Vasilakis, C. 2021. Forecasting and planning during a pandemic: COVID-19 growth rates, supply chain disruptions, and governmental decisions. *European Journal of Operational Research*, 290(1), 99-115. <https://doi.org/10.1016/j.ejor.2020.08.001>
- Novoszel, L., & Wakolbinger, T. 2022. Meta-analysis of supply chain disruption research. In *Operations research forum*: 3 (pp. 1-25). Springer International Publishing. <https://doi.org/10.1007/s43069-021-00118-4>
- Passarelli, M., Bongiorno, G., Beraldi, P., Musmanno, R., & Filice, L. 2023. Supply chain management in case of producer disruption between external (instable) forces and effective models. *Procedia Computer Science*, 217, 1305-1315. <https://doi.org/10.1016/j.procs.2022.12.328>
- Paul, S., Kabir, G., Ali, S. M., & Zhang, G. 2020. Examining transportation disruption risk in supply chains: A case study from Bangladeshi pharmaceutical industry. *Research in Transportation Business & Management*, 37, 100485. <https://doi.org/10.1016/j.rtbm.2020.100485>

Raj, A., Mukherjee, A. A., De Sousa Jabbour, A. B. L., & Srivastava, S. K. 2022. Supply chain management during and post-COVID-19 pandemic: Mitigation strategies and practical lessons learned. *Journal of Business Research*, 142, 1125-1139. <https://doi.org/10.1016/j.jbusres.2022.01.037>

Reshmi, T. R. 2021. Information security breaches due to ransomware attacks-a systematic literature review. *International Journal of Information Management Data Insights*, 1(2), Article 100013. <https://doi.org/10.1016/j.jjime.2021.100013>

Sarkar, B. D., & Shankar, R. 2021. Understanding the barriers of port logistics for effective operation in the Industry 4.0 era: Data-driven decision making. *International Journal of Information Management Data Insights*, 1(2), Article 100031. <https://doi.org/10.1016/j.jjime.2021.100031>

Scheibe, K. P., & Blackhurst, J. 2018. Supply chain disruption propagation: a systemic risk and normal accident theory perspective. *International Journal of Production Research*, 56(1-2), 43-59. <https://doi.org/10.1080/00207543.2017.1355123>

Smirnov, I., & Suresh, P. 2020. Risk management in global supply chains – A review based on the impact of COVID-19. Linköping University. Department of Management and Engineering, Linköping.

Sodhi, M. S., & Tang, C. S. 2021. Supply chain management for extreme conditions: Research opportunities. *Journal of Supply Chain Management*, 57(1), 7-16.

Villalón-Huerta, A., Ripoll-Ripoll, I., & Marco-Gisbert, H. 2022. A Taxonomy for Threat Actors' Delivery Techniques. *Applied Sciences*, 12(8), 3929. <https://doi.org/10.3390/app12083929>

Yang, Y., Yang, S.L., Lv, X., & Ge, T.S. 2020. China's Manufacturing Strategy from the Perspective of Characteristics Comparison of Global Value Chains. *Transformations in Business & Economics*, Vol. 19, No 3C (51C), pp.396-417.

**Data Availability Statement:** More data may be obtained from the authors on a reasonable request.

**Author Contributions:** Conceptualization: *Grondys*; methodology: *Grondys, Kot*; data analysis: *Grondys*; writing—original draft preparation: *Grondys*; writing; review and editing: *Kot*; visualization: *Kot*. All authors have read and agreed to the published version of the manuscript.

**Katarzyna GRONDYS**, PhD, Czestochowa University of Technology, The Faculty of Management; Armii Krajowej 19B, 42-201 Czestochowa, Poland

**ORCID ID:** <https://orcid.org/0000-0001-6461-5475>

**Michał KOT**, Czestochowa University of Technology, The Faculty of Management; Armii Krajowej 19B, 42-201 Czestochowa, Poland

**ORCID ID:** <https://orcid.org/0000-0002-5449-593X>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center  
This work is licensed under the Creative Commons Attribution International License (CC BY).  
<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

INSIGHTS INTO THE DEVELOPMENT OF THE SECURITY CONCEPT\*

Radoslav Ivančík<sup>1</sup>, Vladimír Andrassy<sup>2</sup>

<sup>1</sup>Academy of the Police Force in Bratislava, Sklabinská 1, Bratislava, Slovakia

<sup>2</sup>Armed Forces Academy of General Milan Rastislav Štefánik, Demänová 393, Liptovský Mikuláš, Slovakia

E-mails:<sup>1</sup> [radoslav.ivancik@akademiapz.sk](mailto:radoslav.ivancik@akademiapz.sk); <sup>2</sup> [vladimir.andrassy@aos.sk](mailto:vladimir.andrassy@aos.sk)

Received 1 February 2023; accepted 5 May 2023; published 30 June 2023

**Abstract.** The prosperity and development of human civilization and the sustainable growth of individuals, social groups and states have never been more strongly dependent on national and international security than in today's dynamically changing and globally interconnected world. For this reason, security research plays a significant role in the development of human society as a whole, especially in these turbulent and changing times, characterized by the global and regional security environment crisis and by increasing tensions in international relations. What does this development and its perception mean for one of the primary functions of the modern state, which is to ensure its security and the safety of its citizens, and what is the impact on research in this area? Following this, the development of the methodology of political science in the context of the development of the very concept of security is the subject of the presented discussion, a study in which, using appropriate methods of applied scientific research, we rely primarily on security science theory and theory of international relations. The methodology presented by us is based on a heuristic approach in research in political science (international relations). At the same time, it represents an analysis, synthesis and comparison of possible starting points processed in theoretical studies and practical constructs of authors who reflect the concept of security from the system theories' point of view. At the same time, the study's authors aim to open a discussion on new hypotheses and possible scenarios for the future development of political and security science.

**Keywords:** security theory; science; concept; human society; state; international relations

**Reference** to this paper should be made as follows: Ivančík, R., Andrassy, V. 2023. Insights into the development of the security concept. *Entrepreneurship and Sustainability Issues*, 10(4), 26-39. [http://doi.org/10.9770/jesi.2023.10.4\(2\)](http://doi.org/10.9770/jesi.2023.10.4(2))

**JEL Classifications:** F52, F59, H56, H59, K22

**Additional disciplines:** Security

---

\* *This scientific paper was prepared within the framework of APVV project ID APVV-20-0334 "This is not true, but it could be: Conspiracy theories and hoaxes in the modern development of Slovakia in the European context".*

## 1. Introduction

The prosperity and development of human civilization, as well as the sustainable growth of living and quality of life of the inhabitants of our planet, have probably never been more strongly dependent on the level of security of states and their citizens than in today's dynamic, changing and interconnected world. For this reason, research on safety and its dimensions play a critical role in the development of human society, especially in these turbulent and changing times, characterized by deteriorating global and regional security environments and increasing tensions in international relations.

On the one hand, the possibility of a global missile-nuclear apocalypse has been substantially reduced in previous years, as well as the risk of a classic, symmetrical war between two or more states. Still, on the other hand, there has been a significant increase in asymmetric security threats in the form of international terrorism, illegal mass migration, cross-border organized crime, cyberattacks on private and public computer networks and systems, activities of foreign intelligence services, etc. These threats, which have come to the fore, especially in the new millennium, are much more diversified, structurally more complex, and difficult to predict. Their growing scope and nature only confirm the need for more profound security research in search of solutions to eliminate them.

The current security threats are very different from those we have become accustomed to and according to which states have shaped their security strategies, policies, and doctrines. This is at least confirmed by a significant stream of authors writing about security and international relations (Baldwin, 1995; Buzan, Waeber, Wilde, 1998; Ayoob, 2005; Bailliet, 2009; Purpura, 2011; Jurčák et al., 2020; Trifunovic et al., 2021; Barabash, Beinoravičius, Valčiukas, 2022; Szabó, 2023; Tvaronavičienė, 2023; Waszkiewicz, Taksás, 2023).

While in the past, states were the only relevant players; today, they must share their influence with many other non-state actors at higher and lower levels. The activities of organized non-state actors and, in some cases, small groups or even individuals can cause damage of the same significance and scope as the armies of other countries.

Moreover, globalization has significantly complicated the situation in recent years, which is a highly dynamic multidimensional process in which political, economic, social, technological, security, military-strategic, environmental, cultural, religious, and other factors intersect and interact. The development of globalization so far shows that economic factors have a decisive influence on its course, which significantly influences others. On their basis, a new system of international economic, political, security, and social relations is emerging (Ivančík, 2011). As a result of globalization, there are not only changes that affect stability and security, but at the same time, they bring new risks and problems and make society more vulnerable (Kurilovská, Müllerová, 2021; Dušek, Kavan, 2022; Hajdúková, Marr, 2022).

The newly formed security environment, influenced by deepening globalization, is a direct consequence of the declining importance of territoriality in the international system. At the same time, states were clearly defined by their territory in the past and had direct control over who and what crosses their borders; today, they no longer have such opportunities. This is especially true in Europe, where European integration has eroded the privileged position of the modern state even more than in other regions, as it has moved many of its functions to a supranational level. It is no longer possible to separate the internal space of the state from the area outside it. Both dimensions intersect.

Similarly, the boundaries between internal and external security are blurred. Internal threats, such as organized crime or terrorism, are taking on an international dimension (e.g. Agbaje, 2022).

Today acts that can directly threaten and disrupt the stability of the state's security system can be committed from the other side of the globe. External threats thus come less and less from the armies of other states but

increasingly from the interests of non-state actors or migratory flows caused by civil wars or the failure of the essential functions of states in neighbouring and more distant regions. These threats thus bring a new perception of the security threat to states, which they must reflect on and create tools against these threats.

What do these changes and their perceptions mean for one of the primary functions of the modern state, which is to ensure its security and the safety of its people? What is the impact on research in this area, both in the development of the methodology of political science and in the context of the development of the very concept of security? This is the subject of the presented article, in the elaboration of which, using suitable methods of applied scientific research, we rely primarily on the theory of security science and international relations. The methodology presented by us is based on a heuristic approach in research in political sciences (international relations), synthesis and comparison of possible starting points processed in theoretical analyses and practical constructs of authors who reflect the concept of security from the point of view of system theories.

## **2. Background of security concept development**

In the interest of a comprehensive view of the development of the concept of security, it is necessary to go back several decades and mention that the thought began to change from the first half of the eighties. The academic debate on the concept of security, started by Ullman (1983), gained momentum after the end of the Cold War and became one of the main topics in international relations research. It was conducted at two partially different levels, focusing on the very concept of security and its transformation on the one hand and the content of the security review on the other.

In the debate on the concept of security, many scientists (e.g. Buzan, 2016) and politicians (e.g. Butrus-Ghálí, 1995) believed that the concept of security needed to be reconsidered. Some even considered security a controversial concept arising from the substance of the case (Smith, Archarya, 2002). It was then tough to agree on the definition of such a concept; according to Buzan, it was utterly impossible in principle because there was (and still does not exist) any neutral, unified, and generally accepted definition of security (Smith, Archarya, 2002, p. 1). Other scientists preferred maintaining the status quo, as there was no reason to change the security concept. For example, Baldwin (1997, p. 6) argues that four basic questions: "Security of what? Security of what values? Security against what threats? Security by what means?" were formulated at the beginning of the second half of the last century, sufficiently define the concept of security, and in any way, according to him, they have not lost their significance.

Baldwin raises a few other closely related basic questions: How much security? For what price? In what time horizon? Although these issues are essential in formulating a specific security strategy and security policy of a given state, they are optional for basic research into the content of the concept of security. In this context, Baldwin himself acknowledges that, although the questions remained the same, the answers to them, and thus to the content of security, changed after the end of the Cold War (Baldwin, 1997, p. 23). According to some authors (e.g. Lutterbeck, 2005, p. 235), this "new security agenda" is significantly broader than the previous one from the time of the bipolar division of the world. Attention is no longer focused only on the state but also other levels, and the concept of security is gradually deepening. Of course, in this context, the nature of the security threats faced by the various reference objects is also changing while the concept of security is being broadened and deepened.

## **3. Deepening the security concept**

As the concept of security deepens, the answer to Baldwin's first question: "Security of what?" changes. In addition to the state, entities above and below the state level also become reference objects. One of the first swallows in this direction was the so-called Palme Report (ICDSI, 1982), led by former Swedish Prime Minister

Olof Palme at the United Nations in the early 1980s. According to this report, the only way to deal with the security dilemma is to take joint action by the participating states. This "common security" is qualitatively different from individual states' security. Similarly, Shaw (2000, p. 14) speaks of the "reconstruction" of national security into international security - the security of the system of states.

The reference object, in this case, can also be a particular selected group of states, not the whole system, including all states. For example, rising ocean levels due to climate change pose an existential threat to several countries low above the world's seas. A group of these states can be considered as one reference object because they face the same danger<sup>†</sup>

However, international organizations can also be a reference object. A typical example is the North Atlantic Alliance, which, under Article 5 of the Washington Treaty, considers an attack on one of its member states to be an attack on the Alliance as a whole (NATO, 2019).<sup>‡</sup> Similarly, the European Union considers terrorism an act committed to seriously destabilize or destroy the fundamental political, constitutional, economic or social structures of its Member State and the Union as a whole (EU, 2008).<sup>§</sup>

Groupings of states or international organizations, which are overwhelmingly made up of states, are not too much of a challenge to the state's dominant position as a reference object of security. However, it can also become "institutions", such as religion. The most famous terrorist group today, al-Qaeda, is defending its activities by supporting the belief - in Islam and its values. Objects that do not relate to states at all and include everything essentially and everyone can also be considered endangered - this is the case of reference objects such as "humanity" or "environment" (Belan, 2016; Majchút, 2018; Jurčák, 2020).

Deepening the security concept within the security research framework will most likely meet with new reference objects below the state level. This is mainly due to empirical findings based on the fact that there are significantly more national than interstate armed conflicts worldwide. Some authors even argue that virtually all armed conflicts are internal, and federal, ethnic, religious, and communal tensions are significant factors in their emergence (Murphy, Weiss, 1999, p. 116). This, of course, is a fundamental problem for any state-centred approach, which is based on the fact that the state is a basic level, a cornerstone for its citizens' security, and the state's protection automatically means the safety of its citizens.

Kaldor (2012), on the margin of this approach, states that at the end of the twentieth century, a new type of organized violence developed, manifesting itself in a higher proportion of national conflicts. This type, which she calls "new wars", consists in blurring the distinction between classical war (violence between states or politically organized groups for political reasons), organized crime (violence between private individuals for personal reasons) and human rights violations on a large scale (violence of states or politically organized groups against individuals). These conflicts are referred to as internal or civil wars. Still, the fact is that they involve a large number of cross-border connections, so it is difficult to distinguish what is internal and what is external, what is aggression and what is repression, and what is local and what is global.

The key is the erosion of the state monopoly on violence from two sides. On the one hand, the state is weakened by forming military forces into pacts and alliances. At the same time, its ability to use power unilaterally is reduced by various international standards. On the other hand, the state is threatened by the privatization of

---

<sup>†</sup> For more details, see: The Alliance of Small Island States is an intergovernmental organization of low-lying coastal and small island countries. AOSIS was founded in 1990 before the Second World Climate Conference. The main purpose of the Alliance is to strengthen the voices of small island developing states in tackling global warming. (<https://www.aosis.org>)

<sup>‡</sup> For more details, see NATO. 2019. Washington Treaty from 4 April 1949.

<sup>§</sup> For more details, see EU. 2008. Council Framework Decision 2008/919/JHA of 28 November 2008 amending Framework Decision 2002/475/JHA on combating terrorism.

violence. These "new wars", as Kaldor (2012, p. 2) called them, reduce state revenues, whether as a result of crisis or crime, privatize violence between various organized crime groups or paramilitary groups, or private military and security companies as a result of which political legitimacy disappears (Herbert, 2006, p. 28).

Just as academic and political voices have emerged calling for a reassessment of national security for common or international security above the level of the nation-state, there is an alternative concept for security threats below the status of the state. The so-called "human security" leaves any group reference object and focuses on a possible minor factor - the individual.

However, human security is a vague concept that means something different to everyone. It is possible to find not only a range of different definitions but, in particular, a range of different contents and definitions, from relatively narrow to broad, covering many aspects of human life. However, all approaches include several common elements: they shift attention to the individual as a reference object, define the threat as a threat to the individual's quality of life, and at the same time, involve non-state actors and turn away from traditional and exclusive interest in military conflict (McDonald, 2002, p. 279).

There are currently two significant schools of human security based on the following stakeholder programs: the approach of the Government of Canada and the approach of the United Nations Development Program. Canada's approach to human security, considered "narrow," is defined negatively as the absence of a physical threat to an individual. According to Shani, such a definition conforms to the Western liberal tradition of equality before the law and is also a right enshrined in the UN Charter (Shani, 2009, p. 4). In this context, Bailliet (2009, p. 182) adds that it is a definition based on the importance of the state and the promotion of good governance.

The broad definition of human security in the United Nations Development Program, also promoted by Japan, seeks to "protect the core of all human lives in ways that enhance human freedoms and fulfilment of human life". It is a positive definition, a set of living needs of all people, their fundamental rights and freedoms (Shani, 2009, p. 5). At the same time, it is a definition that goes far beyond the Canadian approach. As Biscop (2005, pp. 11-12) points out, the physical dimension (freedom from fear) is accompanied in this broad sense by other dimensions: economic (freedom from scarcity), political (participation in government, rule of law, respect for human rights, etc.) and social (access to education, health care, clean environment). According to this concept, a safe environment can only be said to be met if the needs of individuals in all four areas are met.

#### **4. Extension of the security concept**

Classical state-centrist theories, especially realism and neorealism, are narrowly defined at the state level and in the question of the nature of threats. For the realists, the state's primary interest is to preserve its existence; for the neorealists as well, but in addition, they add to it the preservation of the power position vis-à-vis other states. The factor primarily influencing the position of power is the same for both approaches - it is the state's military power. However, realism is also interested in the economic and demographic base.

The extended concept of security recognizes far more sources of threat, whether for states or other reference objects (Buzan, 2000). In this sense, the economy or economic prosperity becomes an independent value that can be endangered and defended. The economy is the basis of the state's defence, providing the resources needed to build the armed forces, their quality, quantity, armaments, equipment, training, and the state's defence infrastructure and defence system, etc.\*\* As threats against which it is necessary to intervene actively, it is

---

\*\* For more details see: Ivančík, R. 2012. *Alokačná a technická efektívnosť financovania obrany v Slovenskej republike*. Liptovský Mikuláš: Akadémia ozbrojených síl gen. M. R. Štefánika, 2012. ISBN 978-80-8040-444-4.

possible to present, for example, a disruption of the stability and functionality of the financial system.<sup>††</sup> Or an interruption of the supply of critical raw materials.

Other existential threats then appear at higher than state levels. For example, realists say the Alliance of island states may feel safe because any other form does not threaten it. Still, if their territory disappears below rising sea levels, it will only help them a little. Environmental threats usually extend beyond the borders of one state and, in some cases, can even be understood as threats to the whole of human civilization and to man as a species (Podesta, Ogden, 2007). The specificity of these threats is that, with a few exceptions, they are not caused by states but by non-state actors, groups, individuals, or the way of life of most of the human population.

Many new types of threats concern the sub-national level. It can threaten individuals' health (McLean, 2008) or their way of life, which changes as a result of migration (Collyer, 2006). Through their activities, terrorist groups endanger the lives of individuals, as does organized crime. In addition, its growth in the state administration may threaten the political establishment and democratic participation of individuals in the management of society. A specific risk can also be the state itself, which can be a source of oppression - not only physically but also economically and, in the case of minorities, also culturally. Efforts to extend the security concept are not primarily directed against the state. It also recognizes the relevance of traditional military threats, not only as exhaustive but as a subset of societal threats (Brimmer, 2006).

All these threats are invisible from a state-centrist, realistic point of view. Nevertheless, the media is full of daily news and information about economic crises, environmental or energy security, or the threat of terrorism. This creates a gap that needs to be filled. One of the possibilities is constructivist approaches, which are not limited to the predetermined nature of threats, but on the contrary, they always try to construct them again. One of the most influential attempts at systematically interpreting the extended security concept is the securitization theory developed by the so-called Copenhagen School (Weaver, 2000).

Securitization is identifying a problem as an existential threat, allowing the use of extraordinary means. It is a more robust version of politicization, where the issue becomes the subject of political debate and is also identified as a security threat. Successful securitization means that the population accepts the safe interpretation of the phenomenon and agrees to the use of extraordinary means, such as violence, restriction of rights, stricter regulations, etc. Unlike the realism theory, the idea of securitization is not limited to the context of security. It is constructed by public debate, and what is considered a security issue today may not be among tomorrow's threats, meaning that the issue is desecuritized (Buzan, 2000).

This approach makes it possible to include almost any topic under the term security if it is successfully securitized in public discourse. Buzan, Wæver and de Wilde (1998) identify five different security sectors in their work. In addition to the military industry, which includes the classic security of the realistic direction, there is also political, economic, social, and environmental security. Securitization theory has found its place in the analysis of the concept of security precisely because it allows for a flexible response to ongoing changes and includes topics that classical theories cannot cope with (Higgott, 2004).

After the end of the Cold War and the bipolar division of the world, the content of the security concept expanded in two directions: a) in-depth by including a range of non-state actors and b) in scope by including a range of topics other than threats of force. In this context, however, it should be noted that such an extension of the security concept is not accepted without reservations, and several objections are raised against it.

---

<sup>††</sup> For more details see: Mikušová Meričková, B., Nemeč, J., Murray Svidroňová, M., Pischko, V. 2017. Analysis of the Relationship between the Size and Structure of Public Expenditure and Socio-economic Development. *Journal of Economics*, 65(4)

## 5. Criticism of new approaches to security

Efforts to expand the content of the security concept have, of course, met with reservations. The criticisms raised can be divided into two primary groups. To those who question the precondition for expanding the concept of security, i.e., that reality has changed, and it is necessary to respond to it. And to those who criticize how the new directions approach the issue. Some authors fall into both groups.

Ripsman and Paul (2005, p. 201), based on research into defence spending, the use of human resources, and national security doctrines, believe that globalization does not affect states' security policies as much as many authors claim, and states still focus on traditional notions of security. Walt (1991, p. 213) says that the existence of other threats to national security does not mean that the danger of war has disappeared. Similarly, several other researchers disagree with moving the state to the edge. He believes that his role in.

For example, Shaw (2000, p. 20) operates in the sense that power must still be understood concerning the state, even in the world of global institutions, because states create these. Likewise, non-governmental organizations, as well as sub-state actors, enforce their influence primarily through state institutions. Miller (2001, p. 25) points out that the new perspectives are based on inaccurate considerations, as inter-state conflicts still exist and arise. States are still the most potent military actors with no justice or hegemon. Like Shaw, he points out that although some international institutions, such as the justice and the hegemon, seek to behave, such as the UN Security Council, the fact is that it is made up of states that exercise a veto if necessary and thus block the adoption and implementation of decisions that are not in line with their interests.

Ayoob (2005, p. 9) presents the view that the academic discourse overestimates the nature of economic, technological, and normative changes that affect security while underestimating the strength and resilience of the state and its role as the primary provider of security. According to him, the state's role is critical in decision-making. Ayoob (2005, p. 21) seeks a compromise between the theory of securitization and the state's prominent position, arguing that the securitization will not succeed unless it threatens state institutions or state borders/or to a regime acting on behalf of the state. In other words, for any phenomenon to be securitized, it must first be politicized.

In their works, some authors argue that the state, defined territorially, is in decline. For example, Thompson (2006, p. 255) challenges the conclusion that the state is in fall due to the expansion of various humanitarian interventions and post-Cold War missions. She believes that external sovereignty has little to do with the Westphalian system of territorially defined states because the original treaties did not contain anything like that, and the later treaties nevertheless allowed states to intervene in the affairs of other states. She cites as an example Roosevelt's amendment to the Monroe Doctrine, which allowed the United States to intervene in the internal affairs of the countries of the Western Hemisphere or on the European continent.

According to some authors, the territorial delimitation of the state may even be desirable. Kofman (2007) points out that public goods (collective goods.\*\*) are indivisible and territorial, as public goods, such as clean air or security, are not tied to citizenship or loyalty but to a given territory. Their funding must then be centralized from public resources so that, if necessary, resources can be transferred from one budget chapter to another. Finally, public goods are financed from the expected general budget. A transparent system is then needed to decide on the use of public resources. Thus, a territorially sovereign state can be a normatively optimal way of organizing political life, which enables democratic control on the one hand and ensures the efficiency of public

---

\*\* For more details see: Mikušová Meričková, B., Stejskal, J. 2014. Value of Collective Consumption Goods. *Politická ekonomie*, 62(2), ISSN 0032-3233.

administration on the other. At the same time prevents duplication by merging into a common territorial framework.

The second line of criticism of the new approaches concerning the content of the concept of security does not call into question their initial assumptions but asks whether their idea is correct. Bailliet (2009, p. 212), for example, believes that while the Copenhagen school broadened the notion of security from a global perspective, the main reference object of Buzan's security analysis remains the nation-state. The question, therefore, arises as to whether new approaches are helpful when examining a unique situation from an old perspective. In addition, several critics question their scientific significance. For example, Kolodziej (1999, p. 24) considers rejecting the rational actor model as an effective analysis tool meaningless. However, he acknowledges the need to reflect on the socio-economic, domestic, and normative context.

However, many authors believe that the endless expansion and deepening of the security concept undermines the intellectual cohesion of the entire research sector. It also makes it much more difficult to design any solution (Walt, 1991, p. 213). Freedman (1998, p. 53) agrees with this, warning that all problems should be labelled as something other than security, as this would lose the focus of the entire science department. According to critics, this has already happened with the concept of human security, which is so vague, incoherent, and challenging to function that it could be more helpful in formulating political or research goals (Tarry, 1999).

For the same reason, Baldwin (1997, p. 21) criticizes securitization, claiming that the security concept loses its applicability. It is also questionable to what extent new approaches can be applied universally. In this context, Thompson (2006, p. 252) believes that the universality of values is doubtful and will remain so. Ayoob (2005, p. 20) points out that new approaches are challenging to use in exploring third-world countries, where the state may sometimes threaten its people. However, its weakening or failure poses an even greater danger to the population because the state remains a key security provider. Therefore, he fears that new research findings may be detrimental to practical policy. Some other authors also point out this, especially in connection with the so-called paradox of human and national security. At the same time, states that strengthen their national security are reducing the human security of their people by investing in armaments or paying less attention to human rights instead of developing them. Otherwise, a state investing in the prosperity and well-being of its population cannot ensure its physical security, which may be threatened by other states or even non-state actors (McDonald, 2002, p. 289). This process can also work at the international level. Liotta (2002, p. 479) describes the "boomerang effect", where strengthening the national security of developed countries reduces human security in the developing world, which in turn threatens the national security of developed countries.

## **6. Discussion on the position of the state and the concept of security**

As indicated in previous chapters, there is an intense discussion on security and its review. It manifests itself in extending security content to "new" security threats, such as cyber or environmental, critical infrastructure threats, threats posed by organized crime, migration or terrorism. However, these topics, apart from cyber threats, are familiar. All of them have been among the problems that states have had to deal with in the past. Therefore, although attempts are being made to restore them, it is more of a new perception (Dalgaard-Nielsen, 2005, p. 60). However, this does not change the fact that this new perception of some security threats affects the reactions of politicians and academics.

Despite the opposition of some staunch realists, it is more than evident that the situation has changed compared to the Cold War and needs to be addressed in some way. At the same time, however, rejecting all existing knowledge and approaches is impossible because they still play an essential role in describing reality. Some resign straight to the search for a theory. Terriff (1999, p. 243), for example, argues that theories are always a step behind real politics and are, therefore, not valuable for predicting change and direction. The end of the Cold War

clearly showed this in realism, but even the new theories look less promising. However, it makes sense to explore theory and concepts because they are one of the sources of practical policy. It was demonstrated and confirmed in practice by mutually guaranteed destruction during the Cold War. So, what should the theory look like? Many academics are inclined to the so-called "golden mean", which recognizes that while states remain key, they are forced to coexist with other actors and adapt to a new environment where national borders play less role (Miller, 2001).

However, this middle way does not have a profiled approach or school where academia can discuss the details against shared assumptions, as with the debate on neorealism and neoliberalism in the 1980s and 1990s. The discussion is still quite broad, and unification on basic postulates is still very far away. This is also evidenced by the fact that academics have yet to agree on whether the current situation is historically unique or whether looking for connections with the past is possible. Some argue that human society is at the beginning of the first truly global age (Booth, 2005, p. 28). Others find surprising parallels with the present in the past, for example, between Carr's concept of security (Carr, E. H. 2016) just after World War II and the current widespread concept of security (Rotschild, 1995, p. 57). This is also confirmed by Brodie (Baldwin, 1995, p. 122) when he shows that for the first researchers in the field of security studies, security was a derived value that only makes sense in combination with other worthy discussions of defence and protection. This is still a very current topic of including domestic policy in security studies, a matter of course at the department's beginning.

The sharp division between national and international affairs was long ago considered a "serious obstacle to clear thinking." It is a question of whether the Cold War was not just a deviation from the emerging trend we are currently returning to. This would be evidenced by the work of Bigo, which shows how the border function was destabilized before World War II with the emergence of ultra-specialized agencies operating across countries (such as Interpol) and how the Cold War reversed this trend (Bigo, 2006, p. 393). Therefore, the question arises as to whether a comprehensive safety theory is possible.

Sørensen (2005, p. 87) considers that no. According to him, the world consists of three types of states at different stages of development, which he describes as post-colonial, modern and post-modern. Each class has a slightly different way of working; other dangers endanger it, and it has other options to respond to them. According to him, the post-colonial state has problems controlling its territory due to the instability of the internal organization and the weakness of state institutions. The post-modern state is subject to multilevel governance in the context of transnational and international relations. It is no longer a national community but a community of citizens and opinions, where collective loyalty is increasingly projected outside the state.

Most economic activities are set in cross-border networks, and the national economy is far less self-sufficient than before. Topics such as recognizing the universality of human rights, restrictions by international institutions or the opening of globalization by pressure primarily affect post-modern states (Ripsman, Paul, 2005). In this case, the resignation to a unified approach makes it possible to circumvent the objections of many representatives of realism, who pointed out the relevance of traditional instruments and policies in many parts of the world, such as the Middle East or the Taiwan Strait.

## **Conclusions**

The current stage of development of human civilization is influenced by several tendencies, challenges and threats prevailing in all spheres of society, which force individual actors to reconsider their attitude to security, mainly to ensure favourable conditions for their further development. However, many current manifestations of human behaviour and action threaten the conservation of humans as a biological species. For this reason, the requirement to ensure security is becoming a priority. Man, as an individual and humanity as a whole, must seriously consider the consequences of his activities, not only in the military and security field but also in the

political, economic, social, environmental, energy, technical/technological or cultural spheres. This requires understanding security as a multidimensional phenomenon logically and causally linked to all areas and spheres of human existence.

Our research to date and the analysis and synthesis of the above considerations and opinions show that safety is a complex theoretical and praxeological problem that can be viewed from multiple perspectives. Therefore, defining the security concept is complex and unambiguous. The academic community perceives security differently and differently as an expert from practice. The economist's view of security is different, the politician's view is different, and the soldier, security or IT expert, or ecologist has a different idea. One understands it as a state, the other as a manifestation, the third; as a result, the fourth as a category and the fifth entirely differently. As indicated, more significant or minor differences exist between the particular theoretical directions.

That is why there is currently - and cannot be - no unified and generally accepted uniform definition of security when defining security. This is also why there has yet to be a universal consensus on the content of the security concept. And this is also the reason why it is necessary to distinguish and consider the existence of several dimensions of security (military, political, economic, social, environmental, information, energy, etc.), respectively, the presence of several levels of security (individual, group, state, Alliance, international, etc.).

The consensus is that security can never be absolute; it is always relative and directly proportional to external threats or risks. It cannot be viewed from an extreme position because no entity can guarantee security. What may be safe at one point may no longer be safe after conditions or circumstances change or become a high risk or even dangerous. If a phenomenon or process is safe for one subject, it can be hazardous for another issue. It follows that security is always associated with specificity, that is, with a particular person, group, or thing, with a particular phenomenon or process, with specific conditions, circumstances, relationships, with a clear space and time, and with a particular form and quality.

Whether we examine security from any point of view, whether economic, political, social, military, environmental, information, energy, or even existential, whether we are trying to solve theoretical or practical problems, or whether we are trying to solve them on an individual or collective level, or local, state, regional, global or Alliance level, one thing is sure, in the historical context, the issue of security has been, is and - taking into consideration the dynamics, unevenness, instability, uncertainty and difficult predictability of the further development of human society - will always be highly topical.

## References

- Agbaje, F. I. 2022. Toward querying the national peril of kidnapping in Nigeria. *Insights into Regional Development*, 4(4), 155-165. [https://doi.org/10.9770/IRD.2022.4.4\(9\)](https://doi.org/10.9770/IRD.2022.4.4(9))
- Ayoob, M. 2005. Security in the Age of Globalization: Separating Appearance from Reality. In Aydinli, E., Rosenau, J. N. (eds.): *Globalization, Security, and the Nation State*. Albany, NY: State University of New York Press, ISBN 978-0-79146-401-4, pp. 9-26.
- Bailliet, C. M. 2009. *Security: A Multidisciplinary Normative Approach*. Leiden: Martinus Nijhoff Publishers, 383 p. ISBN 978-90-04-17296-8.
- Baldwin, D. A. 1995. Security Studies and the End of the Cold War. *World Politics*, 48(1), 117-141. <https://doi.org/10.1353/wp.1995.0001>
- Baldwin, D. A. 1997. The Concept of Security. *Review of International Studies*, 23(1), 5-26. <https://doi.org/10.1017/S0260210597000053>

- Barabash, Y., Beinoravičius, D., Valčiukas, J. 2022. Invisible Constitution as an instrument of consolidation of nation and defence of democracy. *Insights into Regional Development*, 4(3), 110-126. [https://doi.org/10.9770/IRD.2022.4.3\(7\)](https://doi.org/10.9770/IRD.2022.4.3(7))
- Belan, L. 2016. Vlastnosti bezpečnosti. In Národná a medzinárodná bezpečnosť 2016 – zborník vedeckých a odborných prác zo 7. medzinárodnej vedeckej konferencie. Liptovský Mikuláš: Akadémia ozbrojených síl generála M. R. Štefánika, ISBN 978-80-8040-568-7, 31-37.
- Bigo, D. 2006. Internal and External Aspects of Security. *European Security*, 15(4), 385-404. <https://doi.org/10.1080/09662830701305831>
- Biscop, S. 2005. The European Security Strategy and the Neighbourhood Policy. Brussels: Royal Institute for International Relations.
- Booth, K. 2005. Two Terrors, One Problem. In: Aydinli, Ersel – Rosenau, James. N. (eds.): Globalization, Security, and the Nation State. Albany, NY: State University of New York Press, 2005, ISBN 978-0-79146-401-4, pp. 27-48.
- Brimmer, E. 2006. From Territorial Security to Societal Security: Implications for the Transatlantic Strategic Outlook. In: Brimmer, E. (ed.): Transforming Homeland Security: U.S. and European Approaches. Washington: Center for Transatlantic Relations, ISBN 978-0-97664-344-9, pp. 23-42.
- ButrUs-GhÁli, B. 1995. Let's Get Together to Halt the Unraveling of Society. In The New York Times, 1995. [online]. [cit. 25.8.2021]. Available on the Internet: <https://www.nytimes.com/1995/02/10/opinion/IHT-lets-get-together-to-halt-the-unraveling-of-society.html>
- Buzan, B., Waever, O., Wilde, J. 1998. Security: A New Framework for Analysis. Boulder: Lynne Rienner Publishers, 239 p. ISBN 978-155587-784-2.
- Buzan, B. 2000. The Logic of Regional Security in the Post-Cold War World. In: Hettne, B. et al. (eds.): The New Regionalism and the Future of Security and Development. London: Palgrave Macmillan, ISBN 978-0-3336-8713-0, pp. 1-25. [https://doi.org/10.1007/978-1-137-11498-3\\_1](https://doi.org/10.1007/978-1-137-11498-3_1)
- Buzan, B. 2016. People, States and Fear: An Agenda for International Security Studies in the Post-Cold War Era. Boulder: Rienner, 2016. 318 s. ISBN 978-1-78552-244-4.
- Carr, E. H. 2016. The Twenty Years' Crisis, 1919-1939. London: Palgrave Macmillan, 233 p. <https://doi.org/10.1057/978-1-349-95076-8>
- Collyer, M. 2006. Migrants, Migration and the Security Paradigm: Constraints and Opportunities. *Mediterranean Politics*, 11(2), 255-270. <https://doi.org/10.1080/13629390600682974>
- Dalgaard-Nielsen, A. 2005. Homeland Security and the Role of the Armed Forces: A Scandinavian Perspective. In: Borchert, Heiko (ed.): Weniger Souveränität – Mehr Sicherheit. Schutz der Heimat im Informationszeitalter und die Rolle der Streitkräfte. Hamburg: Verlag E.S. Mittler & Sohn, 2005, ISBN 978-3-8132-0844-3, pp. 59-75.
- Dušek, J., Kavan, Š. 2022. Management and implementation of territorial cooperation programs on the example of ESUS. In 25th International Colloquium on Regional Sciences – Conference Proceedings. Brno: Masaryk University, ISBN 978-80-280-0068-4, pp. 2012-2021.
- EU. 2008. Council Framework Decision 2008/919/JHA of 28 November 2008 amending Framework Decision 2002/475/JHA on combating terrorism. Brussels, 28.11.2008 [online]. [cit. 22.8.2021]. Available on the Internet: <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32008F0919>
- Freedman, L. 1998. International security: Changing targets. *Foreign Policy*, 110, 48-63. <https://doi.org/10.2307/1149276>
- Hajdúková, T., Marr, S. 2022. Vývoj kriminality v Českej republike a Slovenskej republike počas rokov 2010 až 2020 vo vzájomnom porovnaní. *Police Theory and Practice*, 30(3), 3-21.
- Herbert, W. 2006. The challenges to re-establishing a public monopoly of violence. In: Glasius, Marlies – Kaldor, Mary (eds.): A Human Security Doctrine for Europe: Project, Principles, Practicalities. London: Routledge, 2006, ISBN 978-0-415-36745-X, pp. 20-39.
- Higgott, R. 2004. US Foreign Policy and the 'Securitization' of Economic Globalization. *International Politics*, 41(2), 147-175. <https://doi.org/10.1057/palgrave.ip.8800073>
- ICDSI. 1982. Common security: a blueprint for survival. New York: Simon and Schuster, 1982. 202 p. ISBN 978-0-67145-879-9.

- Ivančík, R. 2011. Fenomén zvaný globalizácia. *Vojenské reflexie*, 6(1), 32-49.
- Jurčák, V. et al. 2020. Teoretické prístupy k skúmaniu bezpečnosti. Ostrava: Key Publishing, 134 p. ISBN 978-80-7418-358-4.
- Kaldor, M. 2012. New and Old Wars: Organized Violence in a Global Era. Malden: Polity Press, 224 p. ISBN 978-0-7456-5562-8
- Kofman, D. 2007. The Normative Limits to the Dispersal of Territorial Sovereignty. *The Monist*, 90(1), 65-85. ISSN 0026-9662.
- Kolodziej, E. A. 1999. Security studies for the next millennium: Quo vadis? *Contemporary Security Policy*, 20(3), 18-38.
- Kurilovská, L., Müllerová, J. 2021. Environmental Risks in Crisis Management by Nuclear Accidents. In 21st International Multidisciplinary Scientific GeoConference SGEM 2021 – Conference Proceedings. SGEM International Multidisciplinary Scientific GeoConference, 2021, ISBN 978-619-7603-34-7, pp. 191-196.
- Liotta, P. H. 2002. Boomerang Effect: The Convergence of National and Human Security. *Security Dialogue*, 33(4), 473-488. <https://doi.org/10.1177/0967010602033004007>
- Lutterbeck, D. 2005. Blurring the Dividing Line: The Convergence of Internal and External Security in Western Europe. *European Security*, 14(2), 231-253. <https://doi.org/10.1080/09662830500336193>
- Majchút, I. 2018. Súčasný bezpečnostný aspekt. In Národná a medzinárodná bezpečnosť 2018, zborník vedeckých a odborných prác z 9. medzinárodnej vedeckej konferencie. Liptovský Mikuláš: Akadémia ozbrojených síl gen. M. R. Štefánika, s. 233-241. ISBN 978-80-8040-568-7.
- McDonald, M. 2002. Human Security and the Construction of Security. *Global Society*, 16(3), 277-295. <https://doi.org/10.1080/09537320220148076>
- McLean, S. J. 2008. Microbes, Mad Cows and Militaries: Exploring the Links between Health and Security. *Security Dialogue*, 39(5), 475-494. <https://doi.org/10.1177/0967010608096149>
- Mikušová Meričková, B., Nemeč, J., Murray Svidroňová, M., Pischko, V. 2017. Analysis of the Relationship between the Size and Structure of Public Expenditure and Socio-economic Development. *Journal of Economics*, 65(4), 320-333. <https://doi.org/10.18267/j.polek.947>
- Mikušová Meričková, B., Stejskal, J. 2014. Value of Collective Consumption Goods. *Politická Ekonomie*, 62(2), 216-231.
- Miller, B. 2001. The Concept of Security: Should It Be Redefined? *Journal of Strategic Studies*, 24(2), 13-42. <https://doi.org/10.1080/01402390108565553>
- Murphy, C. N., Weiss, T. G. 1999. International peace and security at a multilateral moment: What we seem to know, what we don't, and why. *Contemporary Security Policy*, 20(3), 116-141. <https://doi.org/10.1080/13523269908404233>
- NATO. 2019. Washington Treaty from 4 April 1949. [online]. [cit. 22.8.2021]. Available on the Internet: [https://www.nato.int/cps/en/natolive/official\\_texts\\_17120.htm](https://www.nato.int/cps/en/natolive/official_texts_17120.htm)
- Podesta, J., Ogden, P. 2007. The security implications of climate change. *The Washington Quarterly*, 31(1), 115-138. <https://doi.org/10.1162/wash.2007.31.1.115>
- Purpura, P. P. 2011. Security: An Introduction. Boca Raton: CRC Press, 637 p. ISBN 978-1-4200-9284-4.
- Ripsman, N. M., Paul, T. V. 2005. Globalization and the National Security State: A Framework for Analysis. *International Studies Review*, 7(2), 199-227. <https://doi.org/10.1111/j.1468-2486.2005.00481.x>
- Shani, G. 2009. Introduction: Protecting Human Security in a Post 9/11 World. In: Shani, G. et al. (eds.): Protecting Human Security in a Post 9/11 World. Critical and Global Insights. New York: Palgrave Macmillan, ISBN 978-1-349-28228-9, pp. 1-14. [https://doi.org/10.1057/9780230592520\\_1](https://doi.org/10.1057/9780230592520_1)
- Shaw, M. 2000. The Development of "Common-Risk" Society: A Theoretical Overview. In: Kuhlmann, J. – Callaghan, J. (eds.): Military and Society in 21st Century Europe: A Comparative Analysis. Picataway: Transaction Publishers, 350 p. ISBN 978-0-8258-4449-8.

Smith, S., Archarya, A. 2002. The Contested Concept of Security. In *The Concept of Security before and After September 11*. In Institute of Defence and Strategic Studies, 32 p. No. WP023.

Szabó, Z. 2023. African peacekeeping operations in recent years. *Insights into Regional Development*, 5(1), 72-85. [https://doi.org/10.9770/IRD.2023.5.1\(5\)](https://doi.org/10.9770/IRD.2023.5.1(5))

Tarry, S. 1999. Deepening' and 'Widening: An Analysis of Security Definitions in the 1990s. *Journal of Military and Strategic Studies*, 2(1) ISSN 1488-559X. [online]. [cit. 28.8.2021]. Available on the Internet: <https://jmss.org/article/view/57850/43523>

Terriff, T. 1999. Change, security and surprise. *Contemporary Security Policy*, 20(3), 231-246. <https://doi.org/10.1080/13523269908404237>

Thompson, H. 2006. The Case for External Sovereignty. *European Journal of International Relations*, 2006, Vol. 12, No. 2, ISSN 1354-0661, pp. 251-274. <https://doi.org/10.1177/1354066106064509>

Trifunovic, D., Kazanský, R., Nečas, P. 2021. T Conceptualization of Terrorism as a Modern Form of Political Violence. *Politické Vedy*. 24(2), pp. 108-124. <https://doi.org/10.24040/politickevedy.2021.24.2.108-124>

Tvaronavičienė, M. 2023. A Review of the Book "Conflict and Peace in Western Sahara: The Role of the UN's Peacekeeping Mission (MINURSO) Edited by János Besenyő, R. Joseph Huddleston, and Yahia H. Zoubir. *Journal of Security and Sustainability Issues*, 13, <https://doi.org/10.47459/jssi.2023.13.9>

Ullman, R. H. 1983. Redefining Security. *International Security*, 8(1), 129-153. <https://doi.org/10.2307/2538489>

Walt, S. M. 1991. The Renaissance of Security Studies. *International Studies Quarterly*, 35(2), 211-239. <https://doi.org/10.2307/2600471>

Weaver, O. 2000. What is security? – The securityness of security. In: Hansen, B. (eds.): *European Security 2000*. Copenhagen: Political Studies Press, ISBN 978-1-4039-0527-7, pp. 222-254.

Waszkiewicz, G., Taksás, B. 2023. Military Spending Among European NATO Members. The Importance of Strategic Factors after 2014. *Journal of Security and Sustainability Issues*, 13, 53-63. <https://doi.org/10.47459/jssi.2023.13.5>

**Funding:** This work was supported by the Agency for the Support of Research and Development on the basis of Contract no. APVV-20-0334.

**Data Availability Statement:** More information and data can be obtained from the authors on a reasonable request.

**Author Contributions:** The authors contributed equally, they have read and agreed to the published version of the manuscript.

**Radoslav IVANČÍK**, COL GS (ret.), Assoc. Prof. Dipl. Eng., PhD. et PhD., MBA, MSc. is an associate professor at the Department of Informatics and Management, Academy of the Police Force in Bratislava, Slovakia.

ORCID ID: <https://orcid.org/0000-0003-2233-1014>

**Vladimír ANDRASSY**, LTC (ret.), Assoc. Prof. Dipl. Eng., PhD. is an associate professor at the Department of Security and Defence, Armed Forces Academy of General Milan Rastislav Štefánik, Liptovský Mikuláš, Slovakia.

ORCID ID: <https://orcid.org/0000-0002-1207-300X>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access



Publisher

<http://jssidoi.org/esc/home>



---

## LEGAL CONDITIONS OF EU ENERGY SECURITY

Janis Teivāns-Treinovskis <sup>1</sup>, Nikolajs Jefimovs <sup>2</sup>, Ruta Velika <sup>3</sup>, Igors Trofimovs <sup>4</sup>

<sup>1 2 3 4</sup> Department of Law, Faculty of Social Sciences, Daugavpils University,  
Daugavpils, Vienibas street 13, Republic of Latvia

E-mails: <sup>1</sup> [janis.teivans@du.lv](mailto:janis.teivans@du.lv); <sup>2</sup> [nikolajs.jefimovs@du.lv](mailto:nikolajs.jefimovs@du.lv); <sup>3</sup> [ruta.velika@daugavpils.lv](mailto:ruta.velika@daugavpils.lv); <sup>4</sup> [igors.trofimovs@du.lv](mailto:igors.trofimovs@du.lv)

Received 15 February 2023; accepted 6 May 2023; published 30 June 2023

**Abstract.** Despite the high level of technological and civilisational development of Western society, its prosperity and sustainability of development most directly depend on energy policy. Quite often, the field of energy security determines which countries are leading and decisive in the world economy and global competitiveness. The latest geopolitical events, namely the Russian military aggression on Ukraine's territory, showed that most European countries, including Russia itself, increasingly depend on individual energy resources. Such a situation creates serious challenges that must be promptly and effectively responded to. One of the most severe challenges is energy blackmail, which is purposefully implemented by the leadership of the Russian Federation to achieve its goals in Ukraine. The threat of destroying Ukraine's energy system is no less severe, and a humanitarian disaster may also follow in this European and Western-oriented country. Unable to defeat Ukraine on the battlefield, the Russian Federation is trying to force the Ukrainian leadership to agree to an actual capitulation by methodically destroying its energy sector. This shows that the European Union must be able to respond to the problems of its energy sector and provide support to its allies to guarantee energy security. In addition, this type of response must comply with international and national law.

**Keywords:** distribution of energy resources; energy security; legal mechanisms

**Reference** to this paper should be made as follows: Teivāns-Treinovskis, J., Jefimovs, N., Velika, R., Trofimovs, I. 2023. Legal conditions of EU energy security. *Entrepreneurship and Sustainability Issues*, 10(4), 39-47. [http://doi.org/10.9770/jesi.2023.10.4\(3\)](http://doi.org/10.9770/jesi.2023.10.4(3))

**JEL Classifications:** K14, K20, K22

### 1. Prerequisites for the establishment of the European united Energy Sector

The most dynamic phase of European energy development began after the Second World War when the economic and legal systems of all countries were practically destroyed and degraded, and thus there was a need for a new unique legal and political formation (association), which would allow achieving the maximum growth of economic efficiency in a short period of time.

Leaders, economists, lawyers, and scientists of leading European countries agreed to establish the European Coal and Steel Community in 1951. It is the European Coal and Steel Community that has had both fantastic economic

and political significance. Because of the cooperation of European countries, a powerful union was created, which established a fundamental basis for the successful development of the EU (Petzina, Dietmar et al., 1981).

Seeing how important the economic and energy cooperation of European countries is, in 1957 the Treaty of Rome established the European Economic Community (History of the European Union 1945-59), which was created to strengthen the economic phenomenon of European countries. At the same time, the Treaty establishing the European Atomic Energy Community (EAK or Euratom) (Euratom Treaty) was signed, which made it possible to avoid abusive and unjustified use of nuclear materials. It is also important to note that all three communities were included in the EU.

The European Union (EU) is a unique partnership in which member states have combined sovereignty in certain areas of policy and law and harmonised laws on a wide range of economic, social and political issues. The basic purpose of the EU was based on three postulates - peace, security and economic prosperity.

According to the authors, the EU has proven its geopolitical importance in a historical cross-section and has confirmed its place in the world economy. However, the EU is currently faced with a series of severe and global challenges in the fields of economy, security and energy, starting from the crisis of the worldwide pandemic of COVID 19 and its impact on economic growth to Russia's aggressive foreign policy and military action in Ukraine (Vilks, Kipane, 2022). Together it poses security and energy threats and undoubtedly affect the economic stability of the EU and the world. It is also important to remember essential areas such as terrorism, global warming, environmental problems and migration issues. These developments have a considerable impact on the stability and security of the EU.

Russia's hostilities in Ukraine have led to irreversible political events in the EU. EU member states, and the rest of the world showed unprecedented solidarity in expressing their opinion. On March 2, 2022, the UN General Assembly overwhelmingly adopted a resolution demanding that Russia immediately stop military operations in Ukraine (General Assembly resolution demands end to Russian offensive in Ukraine). Thus, the majority of the civilised world condemned Russia's hostilities in Ukraine.

Undoubtedly, the war at the EU's external border raises severe and justified concerns in the European security environment and raises the issue that the EU should start intensively building its security infrastructure to avoid global threats.

Energy security must be on the main list of current issues in the EU. The war in Ukraine has shown that many EU countries depend on a single supplier, including some entirely dependent on Russia. Under such circumstances, Russia has usurped the right to manipulate the EU's opinion, decisions and position. Such monopoly dependence makes EU member states vulnerable to supply disruptions. The first signs of such a threat were observed in 2009, when a dispute broke out between Russia and the transit country Ukraine, leading to a severe natural gas shortage for the EU member states (Gas crises between Russia and Ukraine).

Russia's aggression against Ukraine began in 2014 (Clinch, 2022), when clearly illegal actions were carried out in relation to Crimea, annexating this territory of Ukraine. The EU has since then started imposing sanctions against Russia. Due to Russia's aggressive war in Ukraine, the EU has already introduced the sixth package of sanctions against Russia. Considering Russia's influence in the export of gas, coal and fuel, EU member states initially avoided the introduction of sanctions in the field of energy.

This position was based on dependence on energy supplies. According to Eurostat, primary energy production in the EU was 17.7% lower in 2020, than a decade ago. Russia was the main supplier of natural gas, crude oil and coal to the EU in 2020. In 2020, primary energy production was 7.1% lower, than the previous year. Over half

(57.5%) of the EU's gross available energy in 2020 came from imported sources (Energy production and imports). However, with the approval of the fourth package of sanctions, a ban was imposed on new European investments in the entire Russian energy sector (Statement by President von der Leyen on the fourth package of restrictive measures against Russia), which indicated the EU's firm position to withdraw from the Russian energy market segment and to minimise the direct dependence of member states on Russian energy supplies. Such a step is clearly a challenge for the EU member states, and the EU must be more united than ever to create an independent and secure energy system (Tvaronavičienė, 2023). According to the authors, to successfully solve this task, the focus should be on solidarity, regional cooperation, and a unified position.

According to the authors, these three most critical energy security areas can be identified that require increased attention:

1. Security of gas supply;
2. Safety of electricity supply;
3. BRELL.

## **2. Security of gas supply**

The current destabilisation of the gas market gave the EU member states an impetus to think about the safety and stability of the gas market. If earlier it was possible to talk about cooperation with Russia in connection with gas supply, now such cooperation is neither supportable nor possible and excluded from the EU's agenda. The first confirmation that the EU will take such a step was Germany's decision to freeze the controversial (Batzella, 2022; Fetisov, Tsvetkov et al., 2021; Aune, Golombek, et al., 2017) Nord Stream 2 project (Germany halts Nord Stream 2: How big of a deal is it?), which would significantly increase gas supply capacity and increase Russia's influence in the EU gas market sector, while at the same time ensuring stable market functioning. On the other hand, in this step, Russia had a distinctly political goal - to exclude Ukraine from gas supply chains.

According to the authors, in order to ensure the stability and security of gas supply, it is necessary to create a large-scale internal gas market and its system so that gas supplies do not depend on any country's political will to cooperate, nor are they hampered from a legal and technical point of view.

The aim of the legal protection of the EU gas market (*Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC; Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010*) is to ensure, that all Member States implement appropriate instruments to prepare for situations, where gas shortages arise, to improve regional cooperation and coordination in the gas field, and to implement the principle of neighbourly solidarity, which results in Member States committing to cooperate with neighbouring countries (Buzek, 2016).

To protect against major gas shortages, the EU needs to strengthen its gas security system. According to the authors, the EU must now evaluate all risks and create an action plan that would be activated in a crisis that could occur very soon. In the current case, when natural gas prices are disproportionately high on the market (Natural Gas Rate), such a crisis management mechanism would allow citizens and companies of EU member States to feel more stable and plan future investments.

### **3. Security of electricity supply**

The electricity market is experiencing countless global challenges, considering both socio-political and economic events. The mentioned fluctuations are reflected in electricity exchange prices, and it is clear that the security of the gas supply is no less important than the security and stability of the electricity supply (Day-ahead prices).

As a result of the rapid economic growth, electricity consumption is also undoubtedly increasing. In recent months, residents and businesses of all EU member states experienced a sudden rise in electricity costs, and as a result, prices increased not only for food, clothing, shoes but also for services, which made it necessary to immediately introduce support measures, so that such market fluctuations did not affect the solvency and well-being of the population. In addition to this, it is vital to decide on the issue of improving the electricity grid, that is, increasing the existing sources of electricity generators, such as nuclear power plants, thermal power plants, with renewable energy sources.

It is significant that on February 25, 2015, an essential strategy for the creation of a strong Energy Union with a far-sighted climate change policy was presented (COM/2015/080 final) that formulated the goal - to create a strong Energy Union, which would not only transform the EU's energy system but also include measures for the implementation of climate change policy (A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy). As well as, on November 30, 2016, the package (COM(2016) 860 final) "Clean energy for all Europeans" was presented (*Clean energy for all Europeans package (COM(2016) 860 final)*).

The mentioned documents are based on the common energy policy of the EU and its fundamental legal acts, which define common principles and define future directions of actions in the area of energy security and environmental protection (*Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018; Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018; Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019; Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019; Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019*). However, despite all the implemented measures and supply security guarantees, this year's electricity crisis has reached every resident of the EU member state. The overall goal, set by the legislation was not achieved and the electricity crisis has revealed the "weaknesses" of the system, which must be improved immediately.

### **4. The position of the Baltic States on the BRELL issue**

Considering that the Baltic States are a member of the EU, it is undoubtedly important to raise the issue of the separation of the energy market of the Baltic States from Russia and Belarus. In 2007, the leaders of the Baltic States conceptually agreed and expressed a firm position to create such an energy system that could successfully integrate into the energy system of continental Europe and break the historical energy supply ties with Russia and Belarus (Vempere, Jasevics et al., 2021).

It is anticipated that the electricity network of the Baltic countries will be synchronised with the network of continental Europe by 2025. It must be recognised that a number of measures still need to be implemented to achieve the ambitious goals, including reducing CO2 emissions, which are also linked to electricity production and environmental safety issues. It is recognised, that the current large-scale global economic crisis, both taking into account the long-term wave of the COVID 19 pandemic and Russia's war activities on the territory of Ukraine, may delay the withdrawal of the Baltic states from the BRELL network since the creation of new electrical networks can only be implemented with substantial financial investments.

The fact that insufficient funding has been allocated to the Baltic States for this purpose is also confirmed by the statement of Latvian Defense Minister A. Pabriks, announced that Latvia needs to build a nuclear power plant with Estonia (Pabriks: A nuclear power plant should be made together with Latvia or Estonia).

Estonia has previously stated that it plans to look for long-term solutions and that one of the possibilities is the development of nuclear energy (Karnau, 2022). According to the authors, such public statements indicate the stagnation of the idea of the independence of the Baltic States from the BRELL system.

## 5. Cyber security of supply of energy resources

In the era of technological development, when practically every house has smart devices, "smart home" control centres, the supply of energy resources is also closely related to the use of the latest technologies, which not only satisfy the needs of consumers and increase the level of comfort but also significantly facilitate performance results of suppliers. However, the digitisation of equipment and energy supply requires the careful creation of data security systems and the implementation of preventive measures against possible cybercrimes (*Cybersecurity Strategy of the European Union: An Open, Safe and Secure Cyberspace 2013/01 final; Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union; Resilience, Deterrence and Defence: Building strong cybersecurity for the EU /2017/0450 final; EU Security Union Strategy COM/2020/605 final*). The larger and more branched an energy network is, the more vulnerable it becomes to cybercrime.

As the energy segment transforms, that is, as the share of renewable energy resources increases - wind generators, solar batteries, terms such as "smart network" appear, which allows not only to control the indicators but also to adjust them to each individual case, so that the obtained natural resource is used in the most targeted and expedient way.

There is no doubt that as a result of the escalation of the conflict between Russia and Western countries, cyber threats are becoming increasingly important for the state and the private sector. The most significant attack on the energy sector is a cyber attack on the US oil pipeline system, which paralysed the fuel development and delivery system. Because there is an increase in cyber threats, there is a need to create legal mechanisms for data protection (*Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union*).

ENISA (the European Union Agency for Cybersecurity) plays a vital role in the prevention of cyber threats in the EU, which was founded in 2004 and whose main objective is to improve Union policy related to cyber security, including sectoral policy on issues, related to cyber security, to help develop and enhance cyber resilience and response capabilities, to promote Union - level cooperation and to promote a deep understanding of citizens, organisations and companies about cyber security, including cyber hygiene and cyber literacy (*Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013 (Cybersecurity Act)*).

Currently, the term "cybercrime" is considered from the broadest scope of the concept; that is, the term should be understood as everything that could "damage, disturb or negatively affect" natural and legal persons (Papakonstantinou, 2022).

Such a legal mechanism achieves a fair balance of rights, where legal grounds are sufficient to prosecute individuals who, for example, steal identities, engage in fraudulent activities with transactions, payments, advance payments, use computer viruses to access personal information, passwords, etc.

## 6. Military challenges of power system security in Ukraine

The Russian missile strikes on Ukraine's energy sector in recent months destabilised the operations of manufacturing companies in Ukraine. They put the Ukrainian people on the brink of a humanitarian disaster. Most of the inhabitants in the conditions of the approaching winter remained without light and heat because most of the heating networks are based on various types of electrical installations that ensure the supply of heat energy.

It is significant that if initially these strikes were directed against the power plants themselves, then recently they are mostly sent against the power distribution stations, which turned out to be much more "effective" from the aggressor's point of view. Such behaviour of the aggressor state poses a serious potential threat to the energy supply system.

The seriousness of the problem is also reinforced by the fact that, according to the data of the survey of the citizens of the Russian Federation, 93% of Russian citizens support such actions of their government in relation to the people of Ukraine. This action created specific legal consequences for the Russian Federation, as the European Parliament resolution of November 23, 2022 recognised the Russian Federation as a state sponsor of terrorism (2022/2896(RSP)) (*European Parliament resolution of 23 November 2022 on recognising the Russian Federation as a state sponsor of terrorism (2022/2896(RSP))*).

All this means that Ukraine, with the support of the EU, should in the near future create an energy supply system that would be sufficiently sustainable and able to neutralise the consequences of each such missile strike as quickly as possible.

## Conclusion

As a result of the analysis performed within the framework of the research, it can be concluded that the imposition of sanctions against various sectors of the economy of Russia is subject to rather complicated regulation and research. Most often, sanctions set restrictive conditions for such areas of the economy as the energy sector – limiting the import of electricity, gas and other hydrocarbons. Also, restrictions on exporting technologies that can be used for dual purposes are determined within the sanctions framework. Economic sanctions aim to change Russia's behaviour in the military conflict with Ukraine and ensure energy security throughout Europe. It is anticipated that the electricity network of the Baltic countries will be synchronised with the network of continental Europe by 2025. It is necessary to mention also that as a result of the escalation of the conflict between Russia and Western countries, cyber threats are becoming increasingly important. Because there is an increase in cyber threats, there is a need to create legal mechanisms for data protection and mitigate the negative results of possible attacks on the energy sector of Europe and Ukraine.

## References

*A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*. Retrieved March 6, 2023 from <https://eur-lex.europa.eu/legal-content/LV/TXT/HTML/?uri=CELEX:52015DC0080&from=EN>.

Aune, F. R., Golombek, R., Moe, A., Rosendahl, K. E., Le Tissier, H. H. (2017). The future of Russian gas exports. *Economics of Energy and Environmental Policy*, 6(2), 111-135. <https://doi.org/10.5547/2160-5890.6.2.fau>

Batzella, F. (2022). Engaged but constrained. Assessing EU actorness in the case of Nord Stream 2. *Journal of European Integration*, 44(6), 821-835. <https://doi.org/10.1080/07036337.2022.2043853>

Buzek, J. (2016). *Measures to safeguard the security of gas supply*. Retrieved March 6, 2023 from <https://www.europarl.europa.eu/committees/mt/measures-to-safeguard-the-security-of-ga/product-details/20160928CDT00901>

Clinch, M. (2022). *How Russia invaded Ukraine in 2014. And how the markets tanked*. Retrieved March 6, 2023 from <https://www.cnn.com/2022/01/27/how-russia-invaded-ukraine-in-2014-and-how-the-markets-tanked.html>

*Clean energy for all Europeans package (COM(2016) 860 final)*. Retrieved March 6, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52016DC0860&from=EN>

*Cybersecurity Strategy of the European Union: An Open, Safe and Secure Cyberspace 2013*. Retrieved March 6, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1553779410177&uri=CELEX:52013JC0001>.

*Day-ahead prices*. Retrieved March 6, 2023 from <https://www.nordpoolgroup.com/Market-data/Dayahead/Area-Prices/LV/Hourly/?view=table>

*Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC*. Retrieved March 6, 2023 from <https://eur-lex.europa.eu/eli/dir/2009/73/oj/?locale=LV>

*Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018*. Retrieved March 6, 2023 from [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2018.328.01.0210.01.ENG&toc=OJ:L:2018:328:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0210.01.ENG&toc=OJ:L:2018:328:TOC)

*Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019*. Retrieved March 6, 2023 from [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2019.158.01.0125.01.ENG&toc=OJ:L:2019:158:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.158.01.0125.01.ENG&toc=OJ:L:2019:158:TOC)

*Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union*. Retrieved March 6, 2023 from [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2016.194.01.0001.01.ENG&toc=OJ:L:2016:194:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2016.194.01.0001.01.ENG&toc=OJ:L:2016:194:TOC)

*Energy production and imports*. Retrieved March 6, 2023 from [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy\\_production\\_and\\_imports](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_production_and_imports)

*Euratom Treaty*. Retrieved March 6, 2023 from <https://www.europarl.europa.eu/about-parliament/en/in-the-past/the-parliament-and-the-treaties/euratom-treaty>

*EU Security Union Strategy COM/2020/605 final*. Retrieved March 6, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1596452256370&uri=CELEX:52020DC0605>.

*European Parliament resolution of 23 November 2022 on recognising the Russian Federation as a state sponsor of terrorism (2022/2896(RSP))*. Retrieved March 6, 2023 from [https://www.europarl.europa.eu/doceo/document/TA-9-2022-0405\\_LV.html](https://www.europarl.europa.eu/doceo/document/TA-9-2022-0405_LV.html)

Fetisov, V., Tsvetkov, P., Müller, J. (2021). Tariff approach to regulation of the European gas transportation system: Case of Nord Stream. *Energy Reports*, 7, 413-425. <https://doi.org/10.1016/j.egy.2021.08.023>

*Germany halts Nord Stream 2: How big of a deal is it?* Retrieved March 6, 2023 from <https://www.dw.com/en/germany-halts-nord-stream-2-how-big-of-a-deal-is-it/av-60889144>

*General Assembly resolution demands end to Russian offensive in Ukraine*. Retrieved March 6, 2023 from <https://news.un.org/en/story/2022/03/1113152>.

*Gas crises between Russia and Ukraine*. Retrieved March 6, 2023 from <https://www.reuters.com/article/us-russia-ukraine-gas-timeline-sb-idUSTRE50A1A720090111>

*History of the European Union 1945-59*. Retrieved March 6, 2023 from [https://european-union.europa.eu/principles-countries-history/history-eu/1945-59\\_en](https://european-union.europa.eu/principles-countries-history/history-eu/1945-59_en)

Karnau, A. (2022). *Estonia could get a nuclear power plant*. Retrieved March 6, 2023 from <https://news.postimees.ee/7433537/estonia-could-get-a-nuclear-power-plant>

*Natural Gas Rate*. Retrieved March 6, 2023 from <https://economictimes.indiatimes.com/commoditysummary/symbol-NATURALGAS.cms>

*Pabriks: Latvijai kopā ar Igauniju jābūvē atomelektrostacija*. Retrieved March 6, 2023 from <https://www.diena.lv/raksts/viedokli/latvija/pabriks-latvija-i-kopa-ar-igauniju-jabuve-atomelektrostacija-14276857>.

Papakonstantinou, V. (2022). Cybersecurity as praxis and as a state: The EU law path towards acknowledgement of a new right to cybersecurity? *Computer Law and Security Review*, 44. <https://doi.org/10.1016/j.clsr.2022.105653>

Petzina, D., Stolper, W. F., Hudson, M. (1981). The Origin of the European Coal and Steel Community: Economic Forces and Political Interests. *Journal of Institutional and Theoretical Economics*, 137(3), 450-68. <http://www.jstor.org/stable/40750370>.

*Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010*. Retrieved March 6, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32017R1938&from=lv>.

*Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018*. Retrieved March 6, 2023 from [https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ:L:2018:328:TOC&uri=uriserv:OJ.L\\_.2018.328.01.0001.01.ENG](https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ:L:2018:328:TOC&uri=uriserv:OJ.L_.2018.328.01.0001.01.ENG).

*Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019*. Retrieved March 6, 2023 from [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2019.158.01.0054.01.ENG&toc=OJ:L:2019:158:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.158.01.0054.01.ENG&toc=OJ:L:2019:158:TOC)

*Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019*. Retrieved March 6, 2023 from [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2019.158.01.0001.01.ENG&toc=OJ:L:2019:158:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.158.01.0001.01.ENG&toc=OJ:L:2019:158:TOC).

*Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013 (Cybersecurity Act)*. Retrieved March 6, 2023 from [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2019.151.01.0015.01.ENG&toc=OJ:L:2019:151:TOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.151.01.0015.01.ENG&toc=OJ:L:2019:151:TOC).

*Resilience, Deterrence and Defence: Building strong cybersecurity for the EU 2017/0450 final*. Retrieved March 6, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1505294563214&uri=JOIN:2017:450:FIN>.

Sauhats, A., Broka, Z., Baltputnis, K. (2021). Energy transition of the Baltic States: Problems and solutions. *Latvian Journal of Physics and Technical Sciences*, 58(3), 3-14. <https://doi.org/10.2478/lpts-2021-0013>

*Statement by President von der Leyen on the fourth package of restrictive measures against Russia*. Retrieved March 6, 2023 from [https://ec.europa.eu/commission/presscorner/detail/en/statement\\_22\\_1724](https://ec.europa.eu/commission/presscorner/detail/en/statement_22_1724)

Tvaronavičienė, M. (2023). Towards Renewable Energy: Opportunities and Challenges. *Energies*. 16(5), 2269. <https://doi.org/10.3390/en16052269>

Vempere, L., Jasevics, A., Zemite, L., Vempers, G. (2021). Methodology for Investment Evaluation in Electricity Generation Modules according to the Requirements of the European Union. *Latvian Journal of Physics and Technical Sciences* 58(3): 15-31. <https://doi.org/10.2478/lpts-2021-0014>

Vilks, A., Kipane, A. (2022). Legal Framework for Environmental Protection in the Context of Sustainable Development. *European Journal of Sustainable Development*, 11(4), 169-179. <https://doi.org/10.14207/ejsd.2022.v11n4p169>

Wallis, T., Paul, G., Irvine, J. (2022). Organisational Contexts of Energy Cybersecurity. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 13106, 384-402. [https://doi.org/10.1007/978-3-030-95484-0\\_22](https://doi.org/10.1007/978-3-030-95484-0_22)

**Funding:** This research was funded by Daugavpils University, Latvia

**Author Contributions:** The authors contribute equally.

**Jānis TEIVĀNS-TREINOVSKIS**

ORCID ID: <https://orcid.org/0000-0002-1440-2153>

**Nikolajs JEFIMOVS**

ORCID ID: <https://orcid.org/0000-0002-6291-6407>

**Ruta VELIKA**

ORCID ID: <https://orcid.org/0000-0000-0002-9661-9443>

**Igors TROFIMOVS**

ORCID ID: <https://orcid.org/0000-0001-7539-9499>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center  
This work is licensed under the Creative Commons Attribution International License (CC BY).  
<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

**BUSINESS COMPANIES' FINANCING PECULIARITIES IN CONDITIONS OF SLOVAKIA\***

**Andrea Seňová<sup>1</sup>, Katarína Čulková<sup>2\*</sup>, Marcela Taušová<sup>3</sup>, Katarína Teplická<sup>4</sup>**

<sup>1,2,3</sup> *Technical University of Košice, Letná 9, Košice, Slovakia*

E-mails:<sup>1</sup> [andrea.senova@tuke.sk](mailto:andrea.senova@tuke.sk); <sup>2\*</sup> [katarina.culkova@tuke.sk](mailto:katarina.culkova@tuke.sk) (Corresponding author); <sup>3</sup> [marcela.tausova@tuke.sk](mailto:marcela.tausova@tuke.sk); <sup>4</sup> [katarina.teplicka@tuke.sk](mailto:katarina.teplicka@tuke.sk)

*Received 23 February 2023; accepted 6 May 2023; published 30 June 2023*

**Abstract.** Growth becomes one of the factors influencing a business's ability to obtain financial sources. Anyway, many SMEs still need help finding out finances for their business. The contribution deals with business financing in Slovakia, intending to find out what financing possibilities are not used and to offer a solution for the problematic financing. The paper aims to answer three research questions in business financing from the view of classical and modern financing, from the perspective of territorial structure and from the standpoint of the business's legal form. To find out the actual situation in business financing in Slovakia (selected as a representative of one of V4 countries having similar development), we used questionnaire research from talking companies from different sectors and legal forms of business. Consequent data was obtained from the official database of financial reports in Slovakia. The questionnaire results are used for cluster analysis with the Ward method. The research, orientated to financial source use, proved that internal sources present the most significant rate of business activities financing. The results suggested how to increase the effectiveness of business financing by considering modern financing forms.

**Keywords:** business financing; credit; leasing; risk capital; Slovakia

**Reference** to this paper should be made as follows: Seňová, A., Čulková, K., Taušová, M. Teplická, K. 2023. Business companies' financing peculiarities in conditions of Slovakia. *Entrepreneurship and Sustainability Issues*, 10(4), 48-70. [http://doi.org/10.9770/jesi.2023.10.4\(4\)](http://doi.org/10.9770/jesi.2023.10.4(4))

**JEL Classifications:** D25, G32, L26

## 1. Introduction

Any company, either at the beginning of the business or during expansion, needs financial means for its activity. However, only some companies have sufficient finances to meet the needs of their activity; therefore, organisations seek funding sources. The prevailing part of the organisations is using a "traditional" external form

---

\*This research was supported by project 1/0430/22, financed by Scientific Grant Agency of the Ministry of Education of the Slovak Republic.

of financing without regarding other, more convenient sources (St-Pierrrer et al., 2018). The main reason is primarily the conservativeness of the business and the need for more information about available opportunities.

According to van der Schans (2015), businesses' access to external finance can affect economic growth by facilitating increased business investment and productivity. Nguyen (2022) examined the relationship between financing strategies and firm investments. He showed that there was a relationship between informal financing and investments. In business practice, financing is related to various risks (Li, 2017). It is also necessary to manage potential financial risks to avoid bankruptcy rather than improve business financing possibilities (Li et al., 2018). Nguyen B. and Nguyen C. (2021) proposed that entrepreneurs should consider individual, organisational and institutional factors when selecting financial sources. As for the institutional factors, Herianingrum et al. (2019) found a long-term relationship between bank and business financing, which means that economic and business indexes affect each other in the long term. This shows a company that runs well will also contribute to the development of banking performance.

Presently organisations play a crucial role in the market. SMEs are an essential economic factor contributing to the Slovakian economy's considerable growth. Establishing the company and its development demands vast capital and, therefore, finding finances for its activities from different sources. The organisations use external funding sources besides internal ones, which must be available. Organisations need help finding funding during their growth, despite commercial banks' growing offers. Many organisations prefer credit and leasing, while financial sources can be obtained through various "modern" forms of special financing, providing numerous advantages compared with conventional credit and leasing.

The literature analyses the financing of the business from different points of view. Wu et al. (2008) studied the funding of small to medium-sized enterprises developing their business. The scientists suggested possible strategies and policies support SME financing. Cowling et al. (2012) searched how difficult it is to obtain financial sources during the recession of the economy, finding larger firms in England are more easily getting financial sources. Abor and Biekpe (2006) found a similar situation in Ghanaian SMEs sector conditions. They believed that support policies and other financing initiatives would help SMEs. According to Morozko et al. (2018) and Ding et al. (2017), challenges were associated with a small number of own funds and the difficulty of raising borrowed funds. Wille et al. (2017) found the financial crisis brought a need to increase owner equity as a primary source of small-business financing.

Due to SMEs' lack of financial sources, Lambert et al. (2018) suggested using crowdfunding and crowd-investing to shape business success. St-Pierre et al. (2018) found that the domestic collaborations of small and medium-sized enterprises (SMEs) enhance these firms' access to external financing. Schwienbacher (2014) spoke about difficulties in obtaining financial sources as a factor affecting the period of the business life cycle since a business with innovative ideas and high growth potential needs a higher volume of financial resources. Hyz (2011) searched for reasons restricting access to bank services to find future opportunities and threats for SME financing, which would ultimately affect the development of the economy. Lindstrand and Lindstrand (2010) found banks are the least-used source for SME business, mainly at the international level. Local banks are partners for SMEs doing domestic business. The other factor studied in business financing is making business in the city by minority communities. Bates and Robb (2016) found minority business enterprises (MBE) encountered difficulties with accessing finances due to the firm location and minority ownership, considered as risk factors. This causes discrimination by banks, limiting credit to MBEs. A capital-constrained producer should have a proper financing strategy to achieve better performance and alleviate financial difficulties (Li, 2017; Gao and Fang, 2022).

Su and Yuan (2013) focused on finding a solution to small businesses' financing dilemma and providing recommendations to improve the e-finance market. Nguyen (2019) investigated the importance of external

financing to small firms' reinvestments and found micro-enterprises and small firms value local governance arrangements and funding. Nguyen et al. (2018) found that SMEs responded differently to the incentives provided by local governance, and only higher-quality local administration positively influenced SMEs' performance.

SMEs have a strong information asymmetry, which exposes them to the risk of rationing, and cause turning to internal financing (as in the Pecking Order Theory). The literature does not sufficiently cover the relationship between financing decisions and business performance as regards business financing (Klieštko et al., 2020; Zhao et al., 2020, Musa et al., 2021).

The available research studies focus more on investigating individual factors in individual categories than on investigating their mutual relationships and their effects on elementary decision-making processes. Published research studies focus primarily on the influence of various factors on the overall success of business financing and not on the decision-making process itself. In addition, there needs to be more examination of differences in factors in research studies, as well as an examination of their influence and dependence. The data/data database quality is also a significant problem in decision-making processes. Other experimental methods, including observation of decision-making processes in a monitored environment, in-depth interviews, and exploration of group goals, can effectively eliminate limitations related to the use of secondary data. We want to take further research into this issue in this direction. A correct understanding of the results of decision-making processes requires examining not only individual factors and the overall success of business financing but also the entire decision-making process in its phases and examination of the influence of individual stages and the factors included in them. These consistent facts represent a significant research gap in SMEs, which have the greatest problems financing their business activity and were, therefore, the motivation for our research.

Following mentioned, the study of the financing patterns of Slovakian companies still needs to be studied. Therefore, the study's goal is to examine the funding of the Slovakian business using cluster analysis, which would allow us to find out what financing possibilities are not used and the solution to the problematic financing.

The paper aims to answer the three research questions of how business organisations in Slovakia use financial sources. Primary data is obtained from respondents via questionnaire; the second part of the research presents the determination and verification of the hypotheses, with consequent cluster analysis a) from the view of the territorial structure, b) from the view of the classical and modern form of financing and c) legal form of the business and resulting recommendations for financing improvement in SMEs.

## **2. Materials and Methods**

The goal of the contribution is to classify sources of financing in Slovakia through cluster analysis, according to which we can find out why organisations are not using various financing possibilities. The necessary data are from official databases of financial reports in Slovakia. We used questionnaire research to find out the actual situation in business financing in Slovakia (Stankovičová and Vojtková, 2007).

The object of the search is SME organisations in all Slovakian regions. Slovakia was chosen to be one of the V4 regions, where we did a lot of research. We dealt only with SMEs since, in Slovakia, SMEs present 95% of the business. The long-term studies in this area are shown in previous publications (Gonos et al., 2018; Janošková et al., 2018).

The results are compared with those of other V4 countries – Czech Republic, Hungary and Poland. Such a comparison can contribute to the improvement of business development in V4.

According to the questionnaire, 89 organisations in the research realised their activity in Slovakia. The criterion for SME selection resulted from EU classification for SMEs, including all requirements, mainly the number of

employees and annual turnover. The survey period was October 2020-March 2021 when the respondents were requested personally and via Google Forms, according to the university's cooperation with companies from the business sphere. The Covid-19 situation worsened communication since many respondents worked via the home office.

The most prominent rate in the research belongs to SMEs. On the other hand, the study includes only a few big organisations and traders. From the view of legal form, the most significant rate belongs to limited organisations (78%) and traders (13%). Most organisations are from region Zilina 16.8% and Nitra 15.7%. The minority of the organisations participated in the research from region Trenčín 10.1% and Banská Bystrica 9%. The most considerable number of organisations according to the sector belongs to the industry area with 29.2%, and the rate of organisations orientated to construction presents 22.5%. On the other hand, organisations orientated to catering and accommodation or transport, information and communication delivered only 5%.

According to the research, we performed the determination of the hypothesis in the study:

- 1) More than 50% of small organisations did not use any modern form for their activity financing through external sources.
- 2) More than 60% of organisations use exclusively internal sources.
- 3) More than 10% of the organisations (orientated to the services) used one of the particular institutions through advisory or financial support.
- 4) More than 50% of SMEs consider corruption the biggest obstacle to their financial development.
- 5) More than 40% of Ltd. from the Bratislava region used credit as the external form of financing.
- 6) More than 15% of organisations doing business in construction used at least one source from a particular/modern form of financing as an external source.
- 7) More than 50% of micro and small businesses used leasing.
- 8) 10% of medium and big organisations used support from the EU through funds.
- 9) More than 50% of small organisations did not use support from the state through donations.
- 10) In the future, there will be interest in using external sources to finance the activity in less than 10% of organisations.
- 11) Organisations in various regions use different rates of their own and external source of financing.

The questionnaire was distributed online by placing it on the server [www.google.sk](http://www.google.sk), requesting respondents with 25 questions orientated to the characteristics of the business and its financing, as well as the plans for the future. Eighty-nine respondents participated in the research (from 860 respondents), representing a 10.34% return.

The respondents orientated to the business characteristics provided the following information. 63 % presented organisations doing business in the market for more than ten years, which means they have a stable market position; 25 organisations acted in the market yet 5-10 years – 28% and eight organisations realised their activity for five years – 9%. Due to the global economic crisis, legislation and other factors considerably influencing business activity, most organisations mentioned their situation is worsening – 52 organisations and 37 organisations said their condition was improving. Except for the local market, several organisations are also orientated to foreign trade – 47%, and only 53% act in Slovakia.

### **3. Results**

The research, orientated to the internal sources of financing, proved that internal sources present the most significant rate of business activities financing.

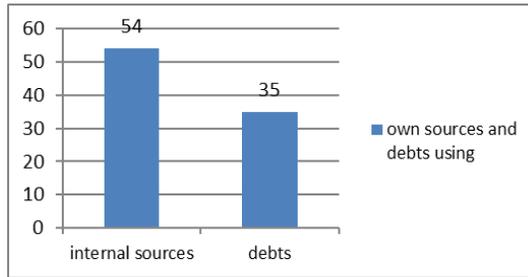


Fig. 1. Structure of the internal sources and debts in the company

According to Figure 1, 54% mentioned they realise their activity exclusively from internal sources and do not need to use debts; 39% use their internal activity resources and obligations. In the frame of internal sources, organisations use various possibilities. The highest rate belongs to self-financing from profit.

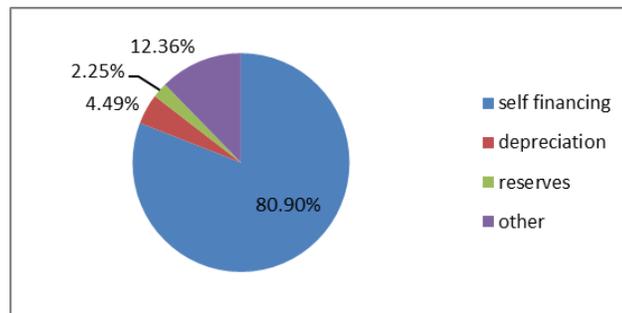


Fig. 2. Internal sources used in the company.

The responses show 81% use it as the most used form of internal financing self-financing, around 12% cover their needs from money release, around 5% of organisations covers their needs from depreciation and around 2% from reserves (see Figure 2).

Through the following questions, we determined if the organisations use bank credit as the primary external financing (Figure 3).

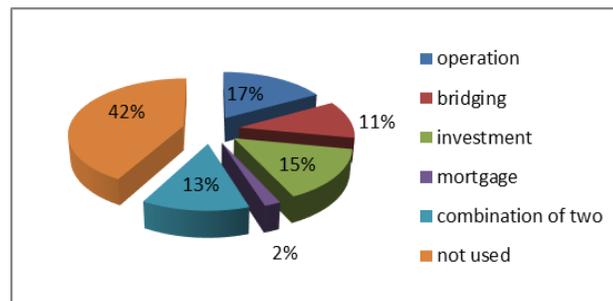
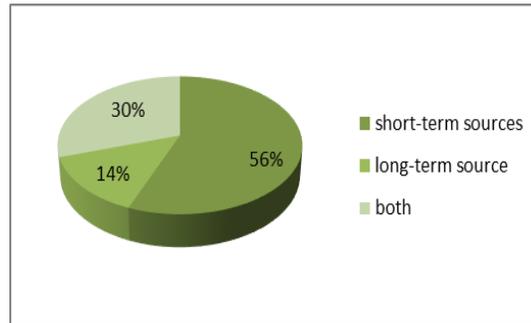


Fig. 3. Use of bank credit as an external form of business financing

Forty-two% responded to the question by the way they do not use bank credit, and 58% preferred this way of financing. This possibility uses 17% of respondents through operation credit, 15% use investment credit, 13% combination of two credits, 11% bridging credit and 2% through mortgage credit.

Figure 4 shows mostly – 56% of organisations use short-term sources, which means they do not need long-term liabilities. The following reason why organisations use short-term credits also presents a rapid lack of financial sources due to the unpredicted situation. They prefer short-term sources due to their higher availability compared to long-term sources. Fourteen % prefer long-term sources, and 30% use both forms.



**Fig. 4.** Type of debts the company uses from the time view

Besides familiar external sources that the organisations can use, financing through leasing, factoring, franchising, and forfeiting is also available. Credit presents one of the most used ways of funding business activity from external sources; however, mainly respondents used leasing in the high measure since this source of funding has several advantages. 63% of respondents responded to the question regarding leasing using, 8.9% use operative leasing and 54% use financial leasing. The remaining 37.1% mentioned they do not use leasing (see Table 1).

**Table 1.** Leasing use in the company

Type of leasing	Number of respondents	% rate
Financial leasing	48	54
Operative leasing	8	8,9
Not used	33	37.1

Due to the fact these forms of external financing presently do not expand, 74% mentioned any of these forms use, 11% have skills with business credit, and 9% with suppliers credit. 1% of organisations used franchising and forfeiting, and factoring in 4%.

As for the external sources, we found out if the organisations also use modern forms of financing, such as tolling, mezzanine capital, private equity, etc. (Wu et al., 2007). Not many organisations know such forms of funding; most organisations have yet to hear about them.

There are several forms of innovative financing of small and medium-sized enterprises (SMEs) through venture capital, where the business angels belong (Majtan and Sinsky, 2014), playing an important role, especially in financing startups (Harel et al., 2022) (Table 2).

**Table 2.** The modern form of financing in chosen organisations

Form of financing	Number of respondents	% rate
Tolling	0	0
Mezzanine capital	0	0
Private equity	3	3.4
Risk capital	7	7.7
Project financing	24	27
Business angels	2	2.25
No, not heard	53	59.5

Of the chosen organisations yet 59.5% still needed to hear about modern forms of financing, 27% heard about project financing, 7.7% registered information about risk capital, 3.4% about private equity, and 2.25% about business angels (Figure 5). Has any of the companies heard yet about tolling or mezzanine capital? Organisations that heard about the possibility of finding out finances through modern financing did not decide to use this way – yet 22.2%, 19.4% used project financing and 2.8% used business angels.

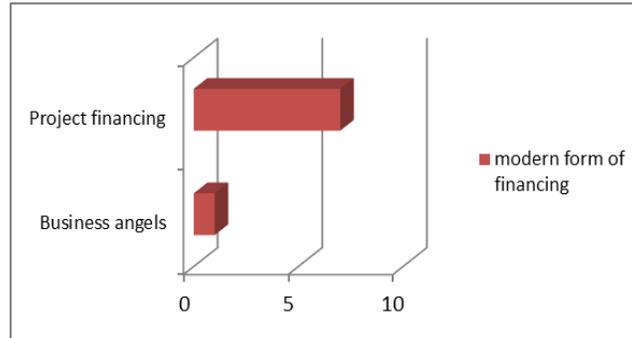


Fig. 5. Using modern forms of financing in the company

Any company needed to support its business by tolling, mezzanine financing, private equity, risk capital or another form of modern funding. The most common reason they had no interest in using current financing is not a necessity; 5.6% did not need this way due to good sources, and the other 5.6% required to learn this way of funding. The following reason why the organisations did not use this financing method is the owners' conservatism. On the other hand, the organisations that used this financing method decided to use this form due to the convenient conditions and the necessity to improve the business situation. A review of the reasons is included in Table 3.

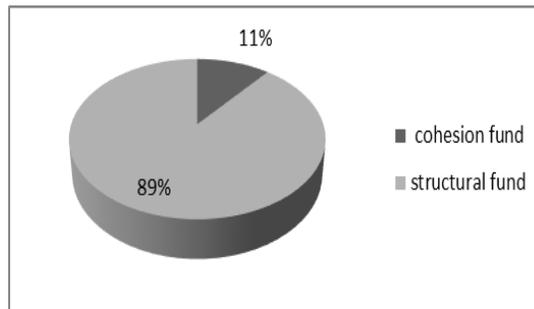
Table 3. Reasons for using / not using the modern form of business financing

Reasons for not using	Number of respondents	% rate
Not necessary	21	23.6
Internal decrees do not allow it	1	1.1
Great risk	1	1.1
Problems with financing through banks	2	2.25
Less information	4	4.5
Big investment in new projects	3	3.4
Modern forms present a burden	1	1.1
Do not know the methods	5	5.6
Credit burden	1	1.1
Sufficient own sources	5	5.6
We are part of the concern, providing the financing	1	1.1
Not interesting	4	4.5
The owners are conservative	2	2.25
The credit is sufficient	2	2.25
They are not a common form of financing	5	5.6
We invest only after profit earning	2	2.25
Not mentioned	25	28.1
Reasons for using	Number of respondents	% rate
Convenient conditions	3	3.4
To improve the business situation	1	1.1

Except for particular and modern financing methods, state support is also possible. Presently 83% did not need and had no interest in using state support. 15% had an interest in state support through a donation, 1% had an interest in using free economic advisory, and 1% used interest-free credit or credit with decreased interest rate.

Except for state support, specialised institutions provide financial support through advisory, information services or finances.

Eighty-eight % responded that they did not use cooperation with particular institutions, and 12% preferred this way of financing. Instead, a small number of organisations – 8% had an interest in using services from SZRB bank, 2% from Agency NARMSP and 2% from Exim bank. Despite European Union providing irreversible funds, which could cover yet 90% of the business project, 89% of the organisations did not use this way (Figure 6). The remaining 11% were interested in EU support, while all 11% had a claim of structural funds and any company using aid from the cohesive fund.



**Fig. 6.** Use of EU support

Statistical verification of the hypotheses helped to verify them through two chosen tests – a single selection test of the rate conformity and Fisher exact test. During the verification by single selection test, we came to the following conclusions: the level of importance is determined as:  $\alpha = 0.05$ , Zero hypothesis  $H_0: p=p_0$ , Alternative hypothesis  $H_A: H_{A1}: p \neq p_0; H_{A2}: p > p_0; H_{A3}: p < p_0$

**I. Hypothesis**

Statement: More than 50% of SMEs still need to start using the modern way of financing. Verification: SMEs rate that use the current form of funding. According to  $H_0: p=0.5$ , ( $H_{A1}: p > 0.5$ )  $H_0$  is rejected on behalf  $H_{A2}$ . After verification by a single selection test, more than 50% of SMEs were not interested in using any modern financing method.

<b>p0</b>	<b>TK</b>	<b>Kh</b>	<b>Conclusion</b>
0.5	5.6	1.96	$H_0$ rejected on behalf $H_{A2}$

The table concludes that  $TK > Kh; p > p_0$ , which means the statement about SMEs using modern financing is true. The research hypothesis is confirmed.

**II. Hypothesis**

Statement: More than 60% of organisations use internal sources to finance their activity. Verification: Rate of the organisations using internal sources. Due to the  $H_0: p=0.6$ , ( $H_{A1}: p \neq 0.6$ )  $H_0$  is not rejected. According to the verification, it is impossible to state solidly that most organisations use their internal sources of financing exclusively.

<b>p0</b>	<b>TK</b>	<b>Kh</b>	<b>Conclusion</b>
0.6	0.1	1.96	$H_0$ is not rejected

A statement that over 60% of organisations use their internal sources is untrue since  $TK < Kh$  and  $p_0 > p$ . The research hypothesis is not confirmed. The estimated rate of the organisations presenting the given statement is  $<47; 74>$  %.

**III. Hypothesis**

Statement: more than 10% of organisations use special institutions' support through advisory or financial aid. Verification: the rate of the organisations using services of the particular institutions. According to  $H_0: p=0.1$ , ( $H_{A1}: p > 0.1$ )  $H_0$  is not rejected. After verification, there is possible to state that more than 10% use support from particular institutions presently.

p0	TK	Kh	Conclusion
0.1	2.2	1.96	$H_0$ is rejected on behalf $H_{A2}$

The table concludes that  $TK > Kh$  and  $p > p_0$ , which means the confirmation that more than 10% use support from the particular institution is true. The research hypothesis is confirmed.

**IV. Hypothesis**

Statement: more than 50% of SMEs consider corruption the biggest obstacle to business development from the view of financial availability. Verification: SMEs rate considering corruption as the biggest obstacle to business development.  $H_0$  is not rejected according to  $H_0: p=0.5$ , ( $H_{A1}: p \neq 0.5$ ). After verification, there is not possible to state that more than 50% of SMEs consider corruption the biggest obstacle to business development.

p0	TK	Kh	Conclusion
0.5	-2.9	1.96	$H_0$ is not rejected

The results of the table illustrate that  $TK < 0$  and  $p_0 > p$ , which means the statement that more than 50% of SMEs consider corruption the obstacle cannot be regarded as accurate. The research hypothesis is not confirmed. The rate of the organisations that, according to the estimation, present this statement is  $<18; 44>$  %.

**V. hypothesis**

Statement: more than 40% ltd. in region Bratislava used in past time credit. Verification: the rate of ltd. in area Bratislava that used yet the credit. Due to the  $H_0: p=0.4$ , ( $H_{A1}: p \neq 0.4$ )  $H_0$  is not rejected. After verification, there is not possible to state that most Ltd. in the Bratislava region did use credit as the external source of financing.

p0	TK	Kh	Conclusion
0.4	0.6	1.96	$H_0$ is not rejected

According to the results of the table, it is evident that  $TK < Kh$  and  $p_0 > p$ , which means the statement that more than 40% ltd. In the region, Bratislava did use credit is not true. The research hypothesis is not confirmed. The estimated rate of the organisations that belong to the given statement is  $<30; 57>$  %.

**VI. Hypothesis**

Statement: more than 15% of organisations doing business in construction did use a special form of financing. Verification of the rate of construction organisations that used a particular financing form. According to  $H_0: p=0.15$ , ( $H_{A1}: p \neq 0.15$ )  $H_0$  is not rejected. After verification, there is not possible to state that more than 15% of construction organisations use a special form of financing. The hypothesis is not rejected.

p0	TK	Kh	Conclusion
0.2	1.9	1.96	H0 is not rejected

It is evident from the table that  $TK < Kh$  and  $p0 < p$ , which means the statement cannot be considered true. The research hypothesis is not confirmed. The estimation of the organisations' rate, belonging to the given statement, is  $<17; 43>$  %.

### VII. Hypothesis

Statement: more than 50% of SMEs did use leasing. Verification: the SMEs rate, which used leasing. Due to the  $H0: p=0.5$ , ( $H_{A1}: p \neq 0.5$ )  $H0$  is not rejected. According to the verification, there is not possible to confirm that more than 50% of SMEs use leasing as the external form of business financing.

p0	TK	Kh	Conclusion
0.5	1.9	1.96	H0 is not rejected

It is evident from the table that  $TK < Kh$  and  $p0 > p$ , which means the statement is not valid. The research hypothesis is not confirmed. The organisations' rate in this estimation is  $<48; 75>$  %.

### VIII. Hypothesis

Statement: more than 10% of SMEs did use support from the EU. Verification: the rate of organisations using EU support. According to  $H0: p=0.1$ , ( $H_{A1}: p \neq 0.1$ )  $H0$  is not rejected. After verification, there is not possible to state that more than 10% of SMEs used EU funds.

p0	TK	Kh	Conclusion
0.1	0.7	1.96	H0 is not rejected

The table results that  $TK < Kh$  and  $p0 > p$ , which means that the statement that most SMEs used EU support is invalid. The research hypothesis is not confirmed. According to the estimation, the organisations' rate of having the statement is  $<5; 25>$  %.

### IX. Hypothesis

Statement: More than 50% of small organisations did not use the donation as an irreversible form of state support. Verification: the rate of the organisations that used donation as irreversible state support. According to  $H0: p=0.5$ , ( $H_{A1}: p > 0.5$ )  $H0$  is rejected in favour  $H_{A2}$ . After hypothesis verification, it is possible to state that more than 50% of small organisations did use state support.

p0	TK	Kh	Conclusion
0,5	4,1	1,96	H0 rejected on behalf HA2

It is obvious  $TK > Kh$  and  $p0 < p$ , which means the statement 50% of small organisations did not use state donation is true. The research hypothesis is confirmed.

**X. Hypothesis**

Statement: less than 10% of organisations will have an interest in the future and claim to use some external sources for financing their activities. Verification: the rate of the organisations that plan to use some external forms of financing in the future. According to  $H_0: p=0.1$ , ( $H_{A1}: p>0.1$ )  $H_0$  is rejected in favour  $H_{A2}$ . After hypothesis verification, it is possible to state that less than 10% of the organisations plan for future external financing use.

p0	TK	Kh	Conclusion
0.1	2.2	1.96	$H_0$ rejected on behalf $H_{A2}$

It is obvious  $TK>Kh$  and  $p_0<p$ , which means the statement that less than 10% of the organisations will have an interest in the future in using any external form of financing is true. The research hypothesis is confirmed.

During the hypothesis verification by Fisher's exact test, we made the following conclusions:

The level of importance is  $\alpha = 0, 05$ . Zero hypothesis:  $H_0: p_1=p_2$  – both groups have the same opinions. Alternative hypothesis  $p_1 \neq p_2$ :  $H_1: p_1>p_2$ ;  $H_2: p_1<p_2$ . According to Fisher's exact test, the results of the two questions are answered from the view of two groups.

**XI. Hypothesis**

Statement: organisations use internal and external sources of financing in different measures.

*1st group* presents SMEs from the Zilina region

*2nd group* presents SMEs from the Trnava region

Table 4 illustrates the results of respondents' responses about internal financing.

**Table 4.** Groups of SMEs according to internal financing

Does the company use exclusively internal financing for its activity?	yes	others
1st Group	5	5
2nd Group	2	6

hypothesis	p-value
$H_1: p_1>p_2$	0.9434
$H_2: p_1<p_2$	0.2782
$H_3: p_1=p_2$	0.3665

According to the statistical verification of the hypothesis,  $H_0$  is rejected. The hypothesis holds that the first and second groups have the same answers against the alternative hypothesis ( $H_1: p_1 > p_2$ ). The first group, presented by SMEs in the Kosice region, has more respondents, answering the question positively compared with the second group, presented by SMEs in the Bratislava region.

*1st group* – SMEs in the Zilina region

*2nd group* – SMEs in the Trnava region

Table 5 illustrates the results of respondents' responses about credit use.

**Table 5.** Group of SMEs according to credit use

Did the company use the possibility to obtain credit in the past time?	yes	others
1st Group	7	3
2nd Group	4	4

hypothesis	p-value
H1: $p_1 > p_2$	0.9118
H2: $p_1 < p_2$	0.3522
H3: $p_1 = p_2$	0.6305

After hypothesis verification results  $H_0$  is rejected. The hypothesis holds the statement first, and a second group of organisations have the same answers against the alternative hypothesis ( $H_1: p_1 > p_2$ ). According to the mentioned, the first group, presented by service organisations, answered more organisations to the question positively than the second group, offered by production organisations. After previous calculation and analysis, we can state that in the frame of previous queries, the hypothesis had been confirmed – mainly  $H_1$  ( $H_1: p_1 > p_2$ ), which means that the statement that organisations in different regions use different financing for their activities can be considered as a true. The research hypothesis is confirmed.

Data analysis is applied to the hierarchic cluster analysis. The advantage of such research is that we can know ahead of the resulting number of clusters. According to the individual objects gradually clustering, the number of clusters will decrease after all groups are connected to the single unit.

**Table 6.** Review of hypothesis and their verification

No	Hypothesis	Verification
I.	More than 50% of SMEs used a different way of financing.	confirmed
II.	More than 60% of organisations use internal sources to finance their activity.	rejected
III.	More than 10% of organisations that use special institutions support by way of advisory or financial support providing	confirmed
IV.	More than 50% of SMEs consider corruption the biggest obstacle to business development from the view of financial availability.	rejected
V.	More than 40% ltd. in region Bratislava used in past time credit.	rejected
VI.	More than 150 organisations doing business in construction did use a special form of financing.	rejected
VII.	More than 50% of SMEs did use leasing.	rejected
VIII.	More than 10% of SMEs did use support from the EU.	rejected
IX.	More than 50% of small organisations should have used donation as an irreversible form of state support.	confirmed
X.	Less than 10% of organisations will be interested in using some external sources to finance their activities.	confirmed
XI.	Organisations use internal and external sources of financing in different measures.	rejected

The goal of the cluster analysis had been to find business financing in SMEs according to the respective financial sources, as well as according to the geographical point of view and from the legal form of business.

During the analysis of the results from the questionnaire research, the Ward method is used to measure the similarity of the responses of the selected file with 89 respondents by Euclidean distance. After the creation of cluster analysis according to the general characteristics results, all companies are divided into the nine clusters that are the most similar inside and the least alike. Dendogram illustrates 89 companies, from which it is evident that at any level of the distance, there is a significant decrease, which means the similarity of the companies is not increasing significantly. The numbers in the clusters present the number of respondents.

The first cluster (red colour) presents limited companies active in foreign trade, and their situation is improving. They exclusively use their internal finances for the activities. Such companies did not use any external sources of financing.

The second cluster (green colour) presents medium-limited companies active in foreign trade. Their situation is presently improving. Any of them use external financing by bank credit or another external source.

The third cluster (blue colour) is created from SMEs – limited companies acting in the market for over five years. Any of the companies use external financing.

The fourth cluster (orange colour) includes micro and small companies – limited companies from the area of services, acting in the market for over five years, preferring short-term external sources by leasing.

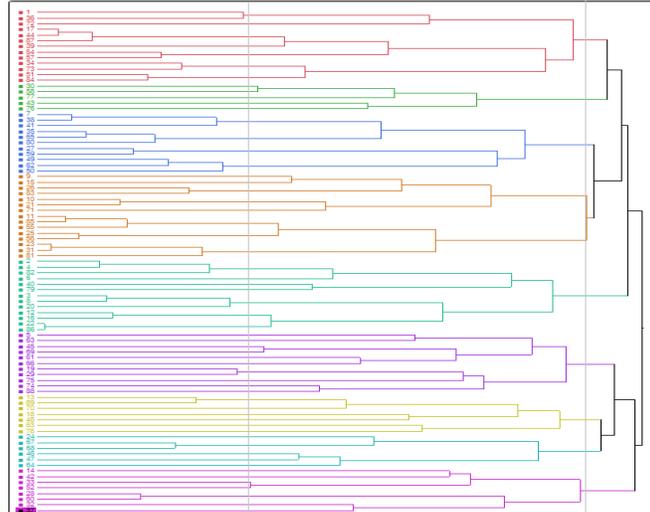
The fifth cluster (mint colour) - is small traders and micro companies from the area of services with over five years of activities. According to the activity results, their situation worsens; the companies need to be more active in foreign trade and use their internal sources exclusively.

The sixth cluster presents SMEs (purple colour), joint stock companies, primarily production companies, acting for over ten years in the market. Their situation is worsening, and they use external sources by way of credit and leasing.

The seventh cluster (yellow colour) is created by small limited companies from the area of services, doing business for over five years that already used external financing through credit and leasing. Still, they are interested in using something other than modern or unique ways of financing.

The eighth cluster SMEs (turquoise colour) - are limited companies orientated to the business services and construction that have been at in over five years at the market. They use external sources – credit and leasing, but also one of the modern forms of financing. Their common sign is interest in using particular institutions for support of their business by way of advisory or financing providing.

The ninth cluster (pink colour) presents small production companies in the agricultural sector, forestry and fishery, acting over ten years at the market when using credit and leasing as external financing. The following common sign of these companies is that in the past, they used financial support from the state by way of donations.



**Fig. 7.** Hierarchic cluster analysis of the companies in Slovakia after general characteristics

*Source: own processing in JMP*

Through the creation of cluster analysis according to the internal sources, using the study is in the following dendrogram. According to the results, there are 6 clusters. Every cluster includes companies, mutually similar and on the other hand, they are different from other clusters.

The first cluster (red) presents small companies whose situation is gradually improving. The companies are active in foreign trade.

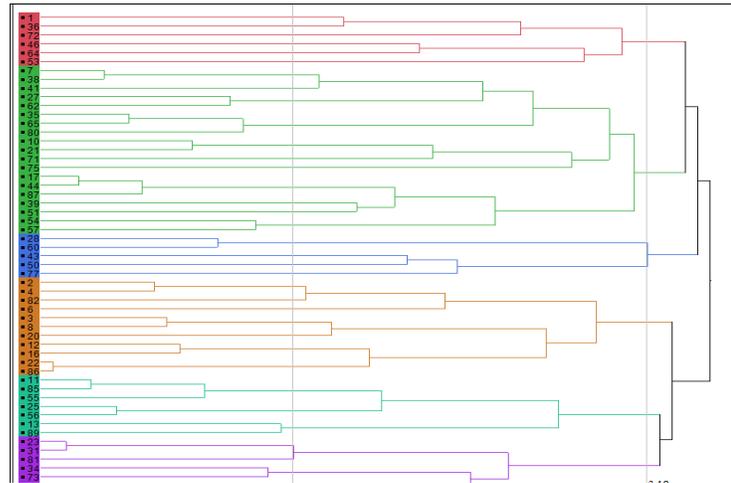
The second cluster (green colour) presents small, limited companies planning to extend their activity by other branches.

The third cluster (blue colour) is presented by production SMEs, using mostly internal forms of financing.

Micro companies acting in Košický create the fourth cluster (orange colour). They use internal sources and are not interested in any external forms of financing in the future.

The fifth cluster (mint colour) presents small limited companies acting in services.

Micro companies - limited companies acting in the market over ten years - comprise the sixth cluster (purple colour). They have good internal sources for their activities and are not interested in using any external financing method.



**Fig. 8.** Hierarchic cluster analysis of the companies, according to the internal sources using  
*Source:* own processing in JMP

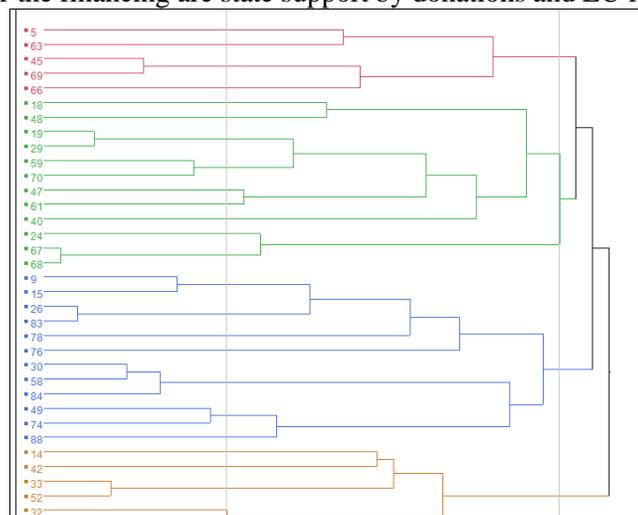
Four clusters are rising through clustering according to the criteria companies use for their activities and external ways of financing.

The first cluster (red colour) presents medium companies acting for over ten years in the market, using external financing sources by leasing. Still, they do not plan to use any other ways.

The second cluster (green colour) created by SMEs, acting over five years at the market, did use external financing through credit and leasing in the past, but any special form of external funding.

The third cluster (blue colour) presents SMEs - limited companies. The companies used external financial sources through credit and leasing but had no interest in other external sources.

The fourth cluster (orange colour) presents small production companies acting for over ten years in the market. The primary external sources for the financing are state support by donations and EU funds.



**Fig. 9.** Hierarchic cluster analysis of the companies, according to the external financing use  
*Source:* own processing in JMP

Nine clusters appear through cluster analysis in the companies from the view of a special form used to finance business activities.

The first cluster (red colour) presents micro and small limited companies that act in the area of business. The companies were only interested in using any special form of external financing.

The second cluster (green colour) presents micro and medium limited companies from the construction sector in the region Nitrianský and Prešovský. The companies were not interested in the particular form of external financing.

The third cluster (blue colour) presents medium limited and joint stock companies from the construction sector. All companies used at least one of the special forms of external financing in the past.

The fourth cluster (orange colour) consists of SMEs from the region Bratislavský and Trnavský, doing business in the industry where any company is interested in special external financing.

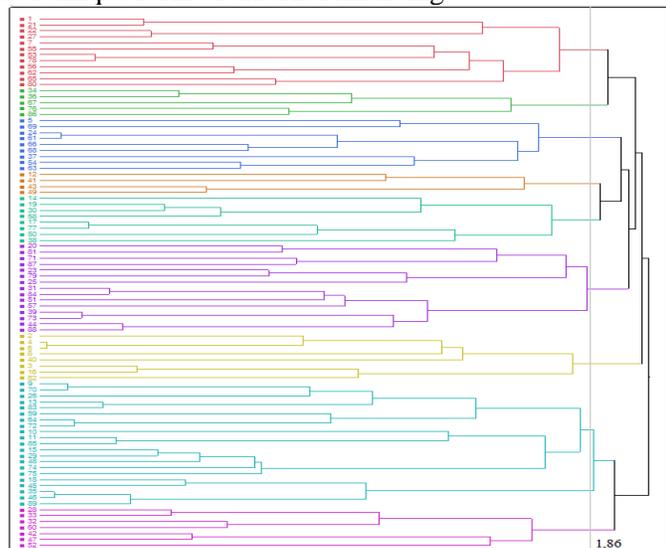
The fifth cluster (mint colour) consisted of medium limited and joint stock companies from the industrial sector, when the majority used external financing through special financial sources.

The sixth cluster (purple colour) presents micro and small limited companies; when that was all interested in using special external financing.

The seventh cluster (yellow colour) presents micro companies and small traders. The companies do business in the region Košický; in the past, they were not interested in particular external financial sources.

The eighth cluster (turquoise colour) presents SMEs' limited companies when using external sources of special financing of the business in the past.

The ninth cluster (pink colour) presents small businesses with influence in Nitrianský. They are from the industrial sector when a most used unique form of external financing.



**Fig. 10.** Hierarchic cluster analysis of the business according to the special form of the financing

*Source:* own processing in JMP



According to the previous analysis with the primary orientation to the financing of the Slovakian business, we can find answers to the questions regarding which financial sources are used or not, together with a determination of the reasons for not using some financial sources. The exciting finding is that despite the broad possibilities, companies vastly prefer in the present time mostly the same financial sources. Most companies use internal sources – 61%, which is positive. Companies with a shortage of internal sources are trying to find external sources. Through questionnaire research, we found out the companies prefer mostly bank credit. Yet 58% of the companies did use bank credit. The main reason is that bank credit is the most available external source. The main advantage of bank credit is that companies with negative economic results could also obtain the credit. Leasing seems to be also a significant external source of business financing. Still, more and more companies – 63% did use already leasing. The reason could be leasing supports cash flow, not demanding working capital. At the same time, leasing could save money for the owner. The other special sources and modern forms of external financing are preferred only by the low rate of the companies. The companies mentioned that the primary reason was the shortage of information.

#### **4. Discussion**

The key result of the paper is a comprehensive approach to the practical use of creating clusters and, based on them, deciding on the evaluation and selection of an effective form of financing. The other results show low use of a modern form of financing, such as factoring and forfeiting, which still need to be used in Slovakia; Organisations in Slovakia use minimally modern forms for funding, and despite their advantages, they are present only on a theoretical level. The reason is, the organisations mentioned have the conservative behaviour of the owners, as well as insufficient information on these forms of financing. Some organisations consider this a primary source for not using these forms in timely and administrative demand, as well as corruption. Yet also, successful organisations must face various appeals while entering the local and national capital market. The key is a balance between credit financing and other external sources used. The research showed that SMEs acting in the market over five years use mostly external sources, credit, and leasing. Medium-limited organisations working in the area of construction use mostly particular forms of financing. Modern forms are preferred only in micro and small limited organisations, which use one of the available instruments.

Many other authors are presently solving the task of business financing since the issue is topical due to the demand for financial resources. Organisations have to use external sources since internal ones are limited. According to Titman and Wessels (1988), Drobetz and Fix (2005), preference for external sources is related to the scale of the business. The bigger the company, the higher the rate of external sources is needed; while searching for external sources, the companies encounter information asymmetry.

Harris and Raviv (1988) claim that business volume and assets structure matter. The more tangible assets the company have, the higher indebtedness.

If organisations want to be competitive, they must permanently develop and innovate, increasing invested financial sources (Doroshenko et al., 2016).

According to Farinós et al. (2022), the position of the managers' tasks in the company and their opinions on business financing is also important to study. Moreover, cash management can help improve the business's financing (Latorre and Ángel, 2022).

During the pandemic, To et al. (2022) studied the influence of COVID-19 on the financial markets and found different impacts and possibilities to find finance in the financial markets (see Baker et al., 2020; Mura and Buleca, 2012).

Compared with the literature, the paper's novelty is that Slovakia, as part of V4, presenting post-communist countries, has slow onset on the modern form of financing compared with well-established EU countries, showing the necessity to speed up this transformation. Since the research is orientated toward SMEs, which typically lack financial management specialists, the results provide valuable information needed for the SMEs' management quality enhancement.

## **5. Conclusions**

Business financing will be a permanently up-to-date and essential theme since an effective economy with capital and obtaining financial sources are vital for the business. Organisations should decide which source is the proper, contributing to the expected goal and benefit. Organisations can be very successful if they manage rational treatment with financial resources. Presently, most startups and organisations that have been acting in the market for a long time need help to finance their future growth. Membership of Slovakia in the EU brought several advantages and higher measures of competitiveness.

In the frame of the contribution, we found out the organisations finance their activities primarily from internal sources, which can present a significant advantage on the one hand against the organisations that use mostly external sources. Small organisations generally have a lower rate of external sources. The bigger the company, the higher rate of external sources for financing used due to better debt diversification. The bank institutions consider such organisations less risky, and therefore, credit resources are more available. Despite the significant number of financing possibilities, most organisations prefer "old" known financing methods through banks. Presently bank financing is the most important source for obtaining financial means. Organisations, which also use external financing, vastly prefer credit. Due to the liability for a more extended period, they prefer mostly short-term sources, which are more available for the business. Presently, financing through leasing is increasingly attractive when the main advantage is cash-flow support. A majority of organisations prefer financial leasing. Due to the fact the analysed organisations produce a sufficient measure of profit, their creditability is higher, and they are less risky for the bank institutions. Even though many authors have an idea that organisations prefer external sources following their volume, it is necessary to mention that more than the company's size, it is a decisive factor in using external sources; hence, a proper financial strategy is crucial. Qualitative elaboration of the company's financial strategy presents a significant indicator influencing the company's financial result. Improper planning could lead the business to bankruptcy.

The results of the study will be a valuable platform not only for all interested actors of traditional approaches but also for creators of financial policies and business policies, as well as creators of national and regional development strategies to support the development of the business environment and thereby increase national and international competitiveness. The study's results will also support the building of a platform for the future implementation of other comparative analyses on this issue.

Since the present research is limited to any representative of the analysed companies, not orientated to the respondent position in the company, the task of the future possible analysis is to differentiate the results according to respondents' assignments. It means studying the different opinions of the shareholders, managers, employees, etc., as well as considering the gender of the respondents. Moreover, the presented research was during the pandemic; therefore, future research can be orientated to the business-financing situation after the pandemic with a consequent comparison of the results and the situation in other countries or regions.

## References

- Abor, J., & Biekpe N. 2006. Small Business Financing Initiatives in Ghana. *Difficulties and Perspectives in Management*, 4(3), 69-77. <http://doi.org/10.4236/jssm.2014.73016>
- Baker, H.K., Kumar, S. & Rao, P. 2020. Financing preferences and practices of Indian SMEs. *Global Finance Journal*, 43, 100388. <http://doi.org/10.1016/j.gfj.2017.10.003>
- Bates T., & Roob A. 2016. Impact of owner race and geographic context on access to small business financing. *Economic Development Quarterly*, 30(2), 159-170. <http://doi.org/10.1177/0891242415620484>
- Bo, L., Si-min, A., & Dong-ping, S. 2018. Selection of financing strategies with a risk-averse supplier in a capital-constrained supply chain. *Transportation Research Part E-logistics and Transportation Review*, 118, 163-183. <http://doi.org/10.1016/j.tre.2018.06.007>
- Cowling, M., Liu, W., & Ledger A. 2012. Small business financing in the UK before and during the current financial crisis. *International Small Business Journal: Researching Entrepreneurship*, 30(7), 778-800. <http://doi.org/10.1177/0266242611435516>
- Čulková K., Taušová M., Shejbalová Muchová M., Domaracká L., & Tauš P. 2018. Indebtedness in chosen industrial sectors with regard to the economic development in the world. *Ekonomický Časopis*, 66(1), 28-42.
- Ding, S., Jia, Ch. Wu, Z., & Yuan W. 2017. Limited attention by lenders and small business debt financing: Advertising as attention grabber. *International Review of Financial Analysis*, 49, 69-82. <http://doi.org/10.1016/j.irfa.2016.12.003>
- Doroshenko, Y., Sidorin, Y.M., & Somina I.V. 2016. Balanced investment financing into the innovative development of small business. *Journal of Fundamental and Applied Sciences*, 8, 1915-1925. <http://doi.org/10.4314/jfas.v8i3s.325>
- Drobetz, W., & Fix R. 2005. What are the determinants of the capital structure? Evidence from Switzerland. *Swiss Journal of Economics and Statistics*, 141(1), 71-113.
- Farinós, J.E., Herrero, B., & Latorre, M.Á. 2022. Gender diversity on the board of directors and the Friday takeover announcement: evidence from Spain. *Academia Revista Latinoamericana de Administración* (in print).
- Gao, Y., & Fang, L. 2022. Selection of financing strategies and business modes for a capital-costrained manufacturer. *RAIRO-Operations Research*, 56(4), 3219-3244. <http://doi.org/10.1051/ro/2022128>
- Gonos J., Mustafin, N. A., & Čulková K. 2018. Development of small and medium-sized enterprises on the example of the Russian Federation and the Slovak Republic. *The Journal of Social Sciences Research*, 5(S1), 85-89. <http://doi.org/10.32861/jssr.spi5.85.89>
- Harel Sh., Solodoha E., & Rosenzweig S. 2022. Can entrepreneurs who experiences business closure bring their new startup to a successful M&A? *Journal of Risk and Financial Management*, 15(9), Art No 386. <http://doi.org/10.3390/jrfm15090386>
- Harris M., & Raviv, A. 1988. Corporate control contests and capital structure. *Journal of Financial Economics*, 20, 55-68.
- Herianingrum, S., Ratnasari, R.T., Widiastuti, T., Mawardi I., Amalia R.C., & Fadhlilah H. 2019. The impact of Islamic bank financing on business. *Entrepreneurship and Sustainability Issues*, 7(1), 133-145. [http://doi.org/10.9770/jesi.2019.7.1\(11\)](http://doi.org/10.9770/jesi.2019.7.1(11))
- Hyz, A. 2011. SMEs in Greece - Barriers in Access to Banking Services. An Empirical Investigation. *International Journal of Business and Social Science*, 2(2), 161-165.
- Janošková, M., Čulková, K., & Csikósová, A. 2018. Position and development of small and medium enterprises in European countries. In *Proceedings of the 8<sup>th</sup> Business and Management Conference*, 2018, Venice, Italy, 04<sup>th</sup> September, 2018, 91-103. <http://doi.org/10.20472/BMC.2018.008.007>

- Klieštík, T., Valaskova, K., Lazaroiu, G., Kovacova, M. & Vrbka J. 2020. Remaining financially healthy and competitive: The role of financial predictors. *Journal of Competitiveness*, 12(1), 74-92. <http://doi.org/10.7441/joc.2020.01.05>
- Lambert, T., Ralcheva A., & Roosenboom, P. 2018. The Crowd– Entrepreneur Relationship in Startup Financing. *The Economics of Crowdfunding*, 1, 57-78. [http://doi.org/10.1007/978-3-319-66119-3\\_4](http://doi.org/10.1007/978-3-319-66119-3_4)
- Latorre, G., & Ángel, M. 2022. Behaviour of Insurance Brokers: the effect of policy collection on management decision. *Journal of Humanities: International Humanities Review*, 11, 1-10: <http://doi.org/10.37467/revhuman.v11.4035>
- Li, L. 2017. Analysis on the financing risk of international trade. In *Proceedings of the 3<sup>rd</sup> International conference on economics, social science, arts, education and management engineering*, 2017, Huhhot, China, 23-30 July, 2017, 1488-1491. <https://doi.org/10.2991/essaeme-17.2017.310>
- Lindstrand, A., & Lindstrand J. 2010. SMEs' dependency on banks during international expansion. *International Journal of Bank Marketing*, 29(1), 65-83. <http://doi.org/10.1108/802652321111101233>
- Majtan, M., & Sinsky P. 2014. Financing of small and medium-sized enterprises (SMEs) through business angels. In *Proceedings of 7<sup>th</sup> International Scientific Conference Managing and Modelling of Financial Risks*, Ostrava, Czech Republic, 2014, 08-09 September, 2014, PTS I-III: 462-469.
- Morozko, N., Morozko, N., & Didenko, V. 2018. Modeling the process of financing small organisations. *Journal of Reviews on Global Economics*, 7, 774-783. <http://doi.org/10.6000/1929-7092.2018.07.74>
- Mura, L., & Buleca, J. 2012. Evaluation of financing possibilities of small and medium industrial enterprises. *Procedia Economics and Finance*, 3, 217-222. [https://doi.org/10.1016/S2212-5671\(12\)00143-8](https://doi.org/10.1016/S2212-5671(12)00143-8)
- Musa, H., Musova, Z., Natorin, V., Lazaroiu, G. & Boďa, M. 2021. Comparison of factors influencing liquidity of European Islamic and conventional bank. *Oeconomia Copernicana*, 12(2), 217-236. <http://doi.org/10.24136/oc.2020.013>
- Nguyen, B. 2019. Entrepreneurial reinvestment: Local governance, ownership, and financing matter-evidence from Vietnam. *Journal of Small Business Management*, 57, 323-349. <http://doi.org/10.1111/jsbm.12475>
- Nguyen, B. 2022. Small business investment: The importance of financing strategies and social networks. *International Journal of Finance and Economics*, 27(3), 2849-2872. <http://doi.org/10.1002/ijfe.2302>
- Nguyen, B., & Nguyen, C.P. 2021. Formal and informal financing decisions of small businesses. *Small Business Economics*, 57(3), 1545-1567. <http://doi.org/10.1007/s11187-020-00361-9>
- Nguyen, B., Mickiewicz, T., & Du, J. 2018. Local governance and business performance in Vietnam: the transaction costs' perspective. *Regional Studies*, 52(4), 542-557. <http://doi.org/10.1080/00343404.2017.1341625>
- Schwienbachare, A. 2014. *Financing the business. The Routledge Companion to Entrepreneurship*. Routledge: Taylor & Francis eBooks, 524p.
- Stankovičová, I. & Vojtková M. 2007. *Multidimensional statistic methods with application* (in Slovak). Bratislava: Iura edition, 266p.
- St-Pierre, J., Sakka, O., & Bahri, M. 2018. External Financing, Export Intensity and Inter! Organisational Collaborations: Evidence from Canadian SMEs. *Small Business Economics*, 56(1), 68-87. <http://doi.org/10.1111/jsbm.12390>
- Su, Ch., & Yuan, H. 2013. New exploration – the role of e-finance in small business financing. In *IEEE Proceedings of 2016 6<sup>th</sup> International conference on information management, innovation management and industrial engineering*, 2013, Xian, China, 23-24 November, 2013, 1, 501+.

Titman, Sh., & Wessel, R. 1988. The determinants of capital structure choice. *The Journal of Finance*, 4(1), 1-19. <http://doi.org/10.1111/j.1540-6261.1988.tb02585.x>

To, B.C.N., Nguyen, T.V.T., Nguyen, N.T.H., & Ho, H.T. 2022. Responses of the international bond markets to COVID-19 containment measures. *Journal of Risk and Financial Management*, 15(3), Article No 127. <http://doi.org/10.3390/jrfm15030127>

van der Schans, Dan. 2015. The British business bank's role in facilitating economic growth by addressing imperfections in SME finance market. *Venture Capital*, 17(1-2), 7-25, SI. <http://doi.org/10.1080/13691066.2015.1021026>

Wille, D., Hoffer, A. & Miller, S.M. 2017. Small-business financing after the financial crisis – lessons from the literature. *Journal of Entrepreneurship and Public Policy*, 6(3), 315-339. <http://doi.org/10.1108/JEPP-D-17-00005>

Wu, J., Song, J. & Zeng, C. 2008. An empirical evidence of small business financing in China. *Management Research News*, 31(12), 959-975. <http://doi.org/10.1108/01409170810920666>

Wu, Z., Chua, J.H., & Chrisman, J.J. 2007. Effects of family ownership and management on small business equity financing. *Journal of Business Venturing*, 22(6), 875-895. <http://doi.org/10.1016/j.jbusvent.2006.07.002>

Zhao, Y.L., Liu, F.Y., Liu, C.Y., Usman, & M. Dutta, K.D. (2020). Readability of Annual Report and Inefficient Investment: Evidence from Debt Financing. *Transformations in Business & Economics*, Vol. 19, No 1(49), pp.166-190.

**Funding.** This research was supported by project 1/0430/22, financed by Scientific Grant Agency of the Ministry of Education of the Slovak Republic.

**Data Availability Statement:** More information and data can be obtained from the authors on a reasonable request.

**Author Contributions:** Conceptualisation: Seňová, A., Taušová, M.; methodology: Taušová, M., Čulková, K.; data analysis: Seňová, A., Čulková, K.; writing—original draft preparation: Seňová, A., Čulková, K.; writing; review and editing: Čulková, K., Taušová, M.; visualisation: Čulková, K., Taušová, M. All authors have read and agreed to the published version of the manuscript.

**Assoc. prof. Katarína ČULKOVÁ, PhD.** works at Institute of Earth Sources, Faculty BERG of Technical university of Košice, Slovakia. Her pedagogical and science activity is concentrated to financial analysis and financial management of industrial companies, as well as financial investment of organisations. In her scientific and research activity she deals with sustainable development from the view of financial management, resource policy of the state, and preparation of post-gradual students for the business in practice and at the job market. She published several scientific monographs, chapters of monographs, more than 50 articles in international journals, participated in several international scientific conferences.

**ORCID ID:** <https://orcid.org/0000-0002-5544-2872> **WoS ResearcherID:** E-7547-2012

**Assoc. prof. Andrea SEŇOVÁ, PhD., ING-PAED IGIP** - in her pedagogical and scientific research activities she focuses on the transfer of managerial and technological knowledge into the practice of companies, financing of innovative activities of companies of environmental character, economics of industries of national economy of Slovakia and application of risk management in theory and practice. She focuses its pedagogical activities on the preparation and implementation of teaching of selected subjects of economic management sciences, as well as on the support of further research with connection to the teaching of acquired knowledge in guaranteed study programs with business practice. In previous periods, she has participated in several VEGA and KEGA projects focusing on the possibilities of responsible entrepreneurship in the context of regional development, taking into account the economic, social and environmental pillar.

**ORCID ID:** <https://orcid.org/0000-0001-5006-7535>

**Assoc. prof. Marcela TAUŠOVÁ, PhD.** works as an associate professor at the Department of Earth Resources Management, Faculty of BERG. Pedagogical, scientific-research and publishing activities are focused on the issues of business and financial management of companies. As part of his pedagogical activities at the bachelor's and master's level of study, he teaches subjects: Entrepreneurship in a company, Legislative framework of entrepreneurship, Economic statistics, Budget and accounting, Quantitative analysis tools, Data processing methodology and Energy management. She was a co-solver of two startups and a researcher of several VEGA and KEGA projects focused on the area of financial and non-financial management of enterprises. As a result, he also focuses his research activities on the assessment of the business environment in Slovakia.

**ORCID ID:** <https://orcid.org/0000-0001-5884-4036>

**Assoc. prof. Katarína TEPLICKÁ, PhD.** Works as an associate professor at the works as an associate professor at the Department of Earth Resources Management, Faculty of BERG. Pedagogical, scientific-research and publishing activities are focused on the issues of Business plan and innovation, Enterprise Economy, Budget and Accounting, Environmental Managerial System of the business, Tax systems, Economic Statistics, Audit and Taxes, Managerial Accounting, Economic Analysis. In her scientific and research activity she is orientated to the optimizing of the material, technical, technological and personnel sources from the view of business costs. She solves problems of quality management and environmental management systems, with application of controlling tools in the practice.

**ORCID ID:** <https://orcid.org/0000-0002-4827-6781>



**Publisher**

<http://jssidoi.org/esc/home>



---

## A FUZZY EVALUATION MODEL OF MANUFACTURING MACHINERY IN TERMS OF SUSTAINABLE BUSINESS\*

Simona Hašková<sup>1</sup>, Marek Vochozka<sup>2</sup>, Jiří Kučera<sup>3</sup>

<sup>1,2,3</sup> *Institute of Technology and Business in České Budějovice, Okružní 517/10, 37001 České Budějovice, Czech Republic*

E-mails: <sup>1</sup> [haskova@mail.vstecb.cz](mailto:haskova@mail.vstecb.cz); <sup>2</sup> [4017@mail.vstecb.cz](mailto:4017@mail.vstecb.cz); <sup>3</sup> [kuceraj@mail.vstecb.cz](mailto:kuceraj@mail.vstecb.cz)

*Received 11 February 2023; accepted 7 May 2023; published 30 June 2023*

**Abstract.** The inclusion of sustainability criteria in the investment decision processes requires application of tools that consider the vague nature of sustainable characteristics. Fuzzy approach can process the vagueness of sustainability measures. The aim of the paper is to develop a suitable model of the fuzzy assessment of investment alternatives measured by Sustainability Utility Index. Its scheme is described methodologically as a three-stage system of multi-criteria ex-ante evaluation. An algorithmic conception of the system is performed at its third stage by a “fuzzy processor”. The fuzzy model is applied to the task of the optimal type of building machinery selection in view of the cost and sustainable criteria. The results enable the manager to optimize his/her decision, who aims to minimize the investment and operation costs of the building machinery. Compared to the fuzzy approach based on Mandani’s system, our model avoids several complications associated with the semantics of fuzzy implications in various fuzzy logics, it is more user friendly and easily algorithmized. This model is thus suitable to apply not only in corporate sphere but also in areas of ecology, sociology, economics. The limits of the fuzzy system are twofold - on the general level the fuzzy systems lack the ability to learn and memorize; determining or tuning a suitable membership function and fuzzy rules is not always clear. The challenge is first to test the model in the corporate sphere and second to acquaint potential users with this computationally undemanding fuzzy procedure.

**Keywords:** multi-criteria decision-making; corporate production; ex-ante evaluation; fuzzy processor; fuzzification table; sustainability utility index

**Reference** to this paper should be made as follows: Hašková, S., Vochozka, M., Kučera, J. 2023. A fuzzy evaluation model of manufacturing machinery in terms of sustainable business. *Entrepreneurship and Sustainability Issues*, 10(4), 71-88. [http://doi.org/10.9770/jesi.2023.10.4\(5\)](http://doi.org/10.9770/jesi.2023.10.4(5))

**JEL Classifications:** D25, E22, G11, G31

### 1. Introduction to the issue of sustainability in corporate decision-making

A socially responsible company assumes responsibility for the impacts that result from its activities. It integrates environmental, social and ethical views, consumer interests and human rights into its strategy and business activities (Clarke & Boersma, 2017; Pan et al., 2022; Skare & Porada-Rochon, 2022). Corporate social

---

\* *This research was financially supported by the Institute of Technology and Business in České Budějovice.*

responsibility is based on the same pillars as sustainable development - both concepts are based on the same basic principle of the Triple Bottom Line (Hammer & Pivo, 2017). Business practice shows that most companies strive to promote the principles of social responsibility and sustainability in order to improve the image, reputation and brand. Good reputation increases stakeholder confidence in society (Kim, 2019; Gavurova et al., 2022; Belas et al., 2022). This goes hand in hand with growing customer satisfaction and loyalty, which can have a positive impact on economic results (Eklof et al., 2020). Businesses are responding to the shift in thinking of modern customers towards the principles of sustainable development (e.g., the number of consumers who take into account whether the product is eco-labelled, etc.) and trying to meet their expectations (Gold & Schleper, 2017). According to Nadanyiova & Das (2020), companies promoting corporate social responsibility are driven mainly by millennials, who prefer brands that use this approach as a means of communication with this group of customers.

Sustainability of production has become a global problem, especially in developed and rapidly developing countries (Yu et al., 2022; Xu et al., 2021; Qin et al., 2021; Susanto et al., 2017). An improved corporate sustainability performance does not automatically lead to an improved sustainability in the systems in which the company operates (Wyborn et al., 2019). Thus, it is necessary to identify a comprehensive evaluation framework in order to analyse whether an improving corporate sustainability can make a positive contribution to sustainable development in a broader sense. This includes first and second level performance of assessments (Awasthi et al., 2018). At the first level, direct impacts on sustainability are assessed, focusing on efficiency issues, while sustainability performance in a broader sense focuses on systemic efficiency and covers the impacts of sustainability on society and nature as a whole. This problem is often solved as a multicriteria optimization problem (Franciosi et al., 2018).

Incorporating principles of sustainability in the business decision-making processes requires the application of tools that can cover the vague concept of sustainable measures (e.g., quality of the relationship with the surrounding community, various forms of social and moral obligations, etc. – see Rostamnezhad et al., 2020). Karkalíková & Strhan (2018) analyzed the factors that affect the company's overall performance and also determined what factors can cause the company certain problems. This article focuses on a procedure by means of which a decision-maker, which takes into account vaguely defined parameters of sustainable development relevant to the company activities, reaches a rational solution. This solution should be an acceptable compromise of the requirements of all parties involved, i.e., the requirement to ensure the increase of the value of the company and to reflect the responsibility for the consequences of the company's activities.

The central aim of the paper is to develop a three-stage model of the fuzzy assessment of a sustainable production in terms of its cost indicators and vague sustainable characteristics. Within it we ask the question: RQ1 “Does the fuzzy model of multi-criteria evaluation have the property to state a rational decision from the point of view of stakeholders and principals of sustainability?”. Furthermore, we ask: RQ2 “Is there an intersection of agreement as well as differences in demands between the here presented fuzzy procedure and other model/models based on fuzzy logic?”.

The paper is structured to the review, methodological and practical part. The review part captures a selected overview of techniques for decision-making utilized in the case of vague and uncertain entry data. Methodology provides the insight to the basic principles of the fuzzy approach. This technique is applied to the solution of a machinery selection based on the cost and vague input parameters. Conclusion part summarises the most important points and discusses results and findings.

## 2. Review part

Problems with understanding sustainability, and its modelling, evaluating and managing, falls under the so-called “wicked problems” (Lönngren & Van Poeck, 2021). One of the main challenges in the sustainability issues, which addresses wicked problems, is the existence of uncertainty. To understand the tools that can assist the decision-makers under uncertainty is thus necessary (Bogachov et al., 2020). Starting from heuristics to the modern computational tools of dealing with uncertainty is a vast area of research. Let us mention e.g., Ahi et al. (2018) who proposed an original probabilistic weighting model for systematically allocating priorities in sustainability measurement; Mishra et al. (2020) who applied sensitivity analysis in order to get optimal feasible solution that validate the sustainable economic production; Ladu & Morone (2021) who introduced the scoring tool consisting of 48 sustainability indicators with proposed metrics based on existing standards, methodologies and best practices in sustainability assessment. The artificial neural networks were used by Vochozka et al. (2019) to analyse the sustainable investments in the capital market. The data envelopment analysis was proved to be an appropriate approach to select efficient sustainable projects (Fiala, 2018). The sustainability of a company's performance is largely dependent on the company's employees. Kovářiková et al. (2021) considered setting up an incentive system for the company's employees, which leads to maintaining or even increasing their performance as well as the performance of the whole company. Lavičková et al. (2021) identified the possibility of using subsidized language courses by the employer as the main motivational benefit for maintaining / increasing employee performance.

Fuzzy logic is an approach that has been effectively used to decide within sustainability assessments made under uncertainty (Ziyadin et al., 2019; Kelemen et al., 2022; Gavurova et al., 2022). It has been proved that it closely approximates human decision-making and perception processes. Fuzzy logic enables the researches to normalize quantitative and qualitative sustainability indicators and evaluate indicators with a vague definition (Zarte et al., 2018; Skare et al., 2023 a,b). In this fuzzy spirit we briefly review some of the fuzzy techniques utilized in managerial problems regarding sustainable investment decisions.

Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) developed by Hwang & Yoon (1981) and Intuitionistic Fuzzy Sets mathematically defined by Atanassov (1994) are applied in Onat et al. (2016) for a hybrid life cycle sustainability assessment for different conventional and alternative vehicles technologies. Expert judgement is projected to weight setting and applied to each dimension of different alternatives.

Zarte et al. (2018) present a concept for a fuzzy inference model to evaluate short- and mid-term production planning programs taking into account sustainable indicators. The formulation of the model lies upon common methods and fuzzy operators from the fuzzy set theory. As the authors state, the research can specifically support decision-making in e.g., decreasing production costs, saving resources, and improving employees' wellbeing. The drawback can be seen in not testing the functionality of the designed concept in practical use.

Wang (2019) used the fuzzy c-means model to predict the financial distress of companies listed on the Shenzhen and Shanghai Stock Exchange. Using the model used, he identified a total of 11 financial indicators, which can be used to predict the risk of financial distress with very different prediction results.

Hašková (2016) applied fuzzy logic to the evaluation of partial components of the business environment in selected European and Asian countries. These were levels of corruption, economic and political stability.

Boloş et al. (2019) propose a fuzzy logic tool for the assets acquisition. The algorithm lies on three main components - the matrix of the membership degree as fuzzy triangular numbers, the vector of the global membership degree, the maximum of the global membership degree. The result of two scenarios test of asset acquisition states that the acquisition cost of the assets can be well combined with their economic performance.

Amiri (2010) proposes a new methodology to provide an approach for assessing alternative projects to assist a decision-maker to select the best candidate. Within the AHP and fuzzy TOPSIS techniques author utilizes linguistic criterial preferences. The AHP (whose algorithm was developed by Ateş et al., 2006, who justified its application in the performance evaluation of a faculty in any department of any university) is used for analysing the structure of the problem and determining weights of the criteria. The fuzzy TOPSIS method (a general view of which development is precisely given by Nădăban et al., 2016) is used to obtain final ranking. The analysis confirms the importance of correctly set criteria weights in fuzzy TOPSIS method (also dealt with e.g. in Memari et al., 2019).

Rajesh (2019) proposes the Resilient Fuzzy Index for measuring the level of resilience of firms and the Performance Fuzzy Index that aids in identifying critical attributes affecting resilience in supply chains. The indexes could help the management in evaluating resilience capabilities of the supply chain and simultaneously include sustainability requirements within the decision making (Horák et al., 2020).

Jankova et al. (2021) performs an easy-to-use model containing input variables that fundamentally influence the investment decision in the US stock market. The study uses fuzzy Sugeno inference system T2FLS type. The T2FLS is then compared, based on statistical measures RMSE, R2, MAE, MAPE, with the T1FLS type of both Sugeno and Mamdani. The authors prove that compared to type-1 fuzzy logic using type-2 fuzzy logic leads to more realistic and accurate results. Authors justify the higher performance of type-2 fuzzy logic system mainly due to the three-dimensional membership function of the general type-2 fuzzy set (also confirmed in Muljono et al., 2018).

Sugeno fuzzy inference system is regarded as an alternative to Mamdani's system - both are often subjected to comparison (e.g., Saleh et al., 2017; Chaudhary, 2019). Comparing Sugeno's and Mamdani's defuzzification process, the Mamdani's is more computationally efficient, as it uses a weighted average or weighted sum of a few data points rather than compute a centroid of a two-dimensional area (Chaudhari, 2014). Janková & Dostál (2021) justifies the usage of the fuzzy inference system of the Mamdani type for the model construction to support investment decisions in Exchange-Traded Funds as it operates better with unstructured or poorly structured input data than the Sugeno type.

Amaral et al. (2019) propose the use of Computational Intelligence algorithms to predict cryptocurrencies values based on historical values. The Mamdani system is applied to suggest what to do with the invested value. Experiments show that the proposed approach is promising and competitive with alternatives reported in the literature.

When dealing with sustainable “fuzzy” issues many articles prefer the Mamdani's approach. As an example, let us mention Hendiani & Bagherpour (2019) who evaluated a sustainable construction, which ought to enhance the quality of social, environmental, and economic practices by stating the sustainability level and identifying the weaknesses and improving them. The reasons lay in the benefits that Mamdani's method offer: intuitiveness, suitability to human inputs, interpretability of the rule base, etc.

### 3. Methodology: the fuzzy approach

Let the set  $U$  be a field of consideration or discussion (universe). Let  $\mu_A: U \rightarrow \langle 0,1 \rangle$  be a membership function and let  $\underline{A} = \{(y, \mu_A(y)): y \in U\}$  be the set of all pairs  $(y, \mu_A(y))$ , in which the number  $0 \leq \mu_A(y) \leq 1$  states the degree of membership of the pair  $(y, \mu_A(y))$  to the set  $\underline{A}$  on the given  $y \in U$ . Then  $\underline{A}$  is a *fuzzy subset* on the universe  $U$ . The significant characteristic of the fuzzy subset  $\underline{A}$  is its support  $U_{\underline{A}} = \{y: 0 < \mu_A(y) \leq 1, y \in U\} \subset U$ . In terms of fuzzy logic  $\mu_A(y) = |y \in U_{\underline{A}}|$ , where  $|y \in U_{\underline{A}}|$ , denotes the degree of veracity of the proposition that  $y$  is the element of the

support of the fuzzy set  $\underline{A}$ . The element  $y \in U$  with  $\mu_{\underline{A}}(y) = 0.5$  is called the *crossover point* in  $\underline{A}$ . Values that are greater than 0.5 signal that the element  $y$  rather belongs to  $U_{\underline{A}}$ , the values smaller suggest it rather does not belong to it (the details in e. g., Běhounek & Daňková, 2016; Padilla-Rivera et al., 2021).

The fuzzy subset  $\underline{A}$  (whose support  $U_{\underline{A}} \subset U \subset R$ , where  $R$  is the set of real numbers, and its function  $\mu_{\underline{A}}$  is gifted by the property of normality and convexity (i.e., at least in the case of one element  $x \in U_{\underline{A}}$  it applies  $\mu_{\underline{A}}(x) = 1$ , and  $\mu_{\underline{A}}(x') \geq \min\{\mu_{\underline{A}}(x_1), \mu_{\underline{A}}(x_2)\}$  for all  $x' \in \langle x_1, x_2 \rangle \subset U_{\underline{A}}$ ) is called the *fuzzy number* (Torkabadi et al., 2018). The fuzzy numbers are also formal models of linguistic terms (i.e., expressed in natural language) of variables occurring in managerial decision-making tasks (see e.g., Holčápek et al., 2021).

Linguistic variables thus acquire their values at two levels: at the linguistic level and the numerical level. At the linguistic level they are usually performed by terms (fuzzy numbers) of the type, e.g., the low value ( $\underline{L}$ ), common value ( $\underline{M}$ ) and high value ( $\underline{H}$ ); at the numerical level they are represented by the real numbers from the interval  $U = \langle 0, 100 \rangle$  (in detail, e.g., Hašková & Fiala, 2019).

The relationship between the two mentioned levels of values of the linguistic variable is evident from the fuzzification Table 1. It defines the projection of  $\mu: \{\underline{L}, \underline{M}, \underline{H}\} \times U \rightarrow \langle 0, 1 \rangle$  in the form  $\mu(\underline{T}, u) = \mu_{\underline{T}}(u)$ , which is based on the model with one internal and two border fuzzy sets for the terms *low* ( $\underline{L}$ ), *common* ( $\underline{M}$ ), and *high* ( $\underline{H}$ ). Interval  $U$  is thus divided with the constants  $a, b, c, d$  into five sections and described by the membership functions (1), in which  $a, b, c, d \in \langle 0, 100 \rangle, 0 \leq a \leq b \leq c \leq d \leq 100$  are given by an expert:

$$\begin{aligned}
 & \mu_{\underline{L}}(y) = 1 \text{ for } y < a, \\
 (\underline{L}) \quad & \mu_{\underline{L}}(y) = (b - y) / (b - a) \text{ for } a \leq y < b, \\
 & \mu_{\underline{L}}(y) = 0 \text{ otherwise.} \\
 & \mu_{\underline{M}}(y) = (y - a) / (b - a) \text{ for } a \leq y < b, \\
 (\underline{M}) \quad & \mu_{\underline{M}}(y) = 1 \text{ for } b \leq y < c, \\
 & \mu_{\underline{M}}(y) = (d - y) / (d - c) \text{ for } c \leq y < d, \\
 & \mu_{\underline{M}}(y) = 0 \text{ otherwise.} \\
 & \mu_{\underline{H}}(y) = 0 \text{ for } y < c, \\
 (\underline{H}) \quad & \mu_{\underline{H}}(y) = (y - c) / (d - c) \text{ for } c \leq y < d, \\
 & \mu_{\underline{H}}(y) = 1 \text{ otherwise.}
 \end{aligned} \tag{1}$$

Table 1. Fuzzification table

Interval	$u < a$	$a \leq u < b$	$b \leq u < c$	$c \leq u < d$	$u \geq d$
$\underline{L}$	1	$(b - u) / (b - a)$	0	0	0
$\underline{M}$	0	$(u - a) / (b - a)$	1	$(d - u) / (d - c)$	0
$\underline{H}$	0	0	0	$(u - c) / (d - c)$	1

Source: own processing

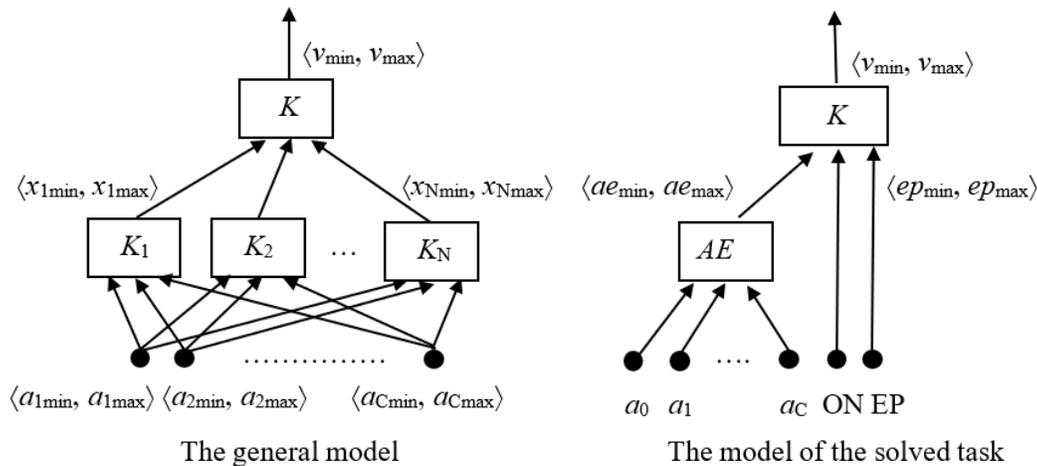
The inner nonzero fields of the fuzzification table define one-element or two-element subset  $h(u) = \{\underline{T}: \underline{T} \in \{\underline{L}, \underline{M}, \underline{H}\}, \mu(\underline{T}, u) > 0\}$  of the set  $\{\underline{L}, \underline{M}, \underline{H}\}$  for each  $u \in U$ .

**4. The formulation of the three-stage fuzzy system of multicriteria alternative evaluation**

The scheme of the three-stage fuzzy system of multicriteria ex-ante evaluation is introduced in Fig. 1. The basic functions of all elements of the fuzzy system structure (the right scheme in Fig. 1) corresponds with the case of ex-post evaluation (certainty on the inputs side, where only specific point values enter the system at the first stage). The point values are the outputs of the criterion functions at the second stage entering the third stage of the system (block  $K$  in Fig. 1). The number  $v \in \langle 0, 100 \rangle$  on output side of the block  $K$  is the numerical value of the output linguistic variable of the ex-post evaluated alternative.

**4.1 The three-stage fuzzy system of multicriteria alternative for ex-ante evaluation**

In the case of ex-ante evaluation, the fuzzy system appears in the situation of uncertainty on the input data side. At its first stage, only the uncertain data characterized by intervals of values of their possible occurrences or mixes of uncertain and numerical data enter the solving process (in Fig. 1 the intervals  $\langle a_{1min}, a_{1max} \rangle \dots \langle a_{Cmin}, a_{Cmax} \rangle$  to  $\langle ep_{min}, ep_{max} \rangle$ ). This external uncertainty is then transferred by the criterion functions to the internal uncertainty of the inputs to block  $K$  (see intervals  $\langle x_{1min}, x_{1max} \rangle \dots \langle x_{Nmin}, x_{Nmax} \rangle$  to  $\langle ae_{min}, ae_{max} \rangle$  at the second stage of the model), as well as to its output (see interval  $\langle v_{min}, v_{max} \rangle$ ). The right picture of Fig. 1 shows a case where some external uncertain data enter block  $K$  directly. They usually represent subjective quantification of qualitative data expressed by intervals at the value scale from 0 to 10 or from 0 to 100.



**Figure 1.** Structure of the three-stage fuzzy system of multicriteria ex-ante evaluation

Source: own processing

In the first step the conversion of external uncertainty to internal uncertainty is carried out. For this purpose, the relations defining the individual criterion functions are translated into the language of interval algebra, defined and discussed by (Yuan et al., 2009). The input intervals are converted to output intervals by applying interval algebra operations. At the second stage of the model,  $N$  intervals are created that are presented by at most two-element sets of their extreme values (in the case of a mix of uncertain and numerical data, the numerical value is considered as an interval with two identical extreme values). The Cartesian product can result in the creation of up to  $2^N$   $N$ -dimensional numerical vectors entering the block  $K$ . By the gradual processing of each of them by the computational fuzzy algorithm, whose block scheme is in Fig. 2, a set of partial calculation results (numbers  $v$ ) is calculated. The arithmetic mean  $y = (v_{min} + v_{max}) / 2$  of the minimum and maximum of this set is then the

subjectively expected numerical value of the output linguistic variable *SUI* (Sustainability Utility Index) of the evaluated alternative. It performs the sustainable social costs.

#### 4.2 Computational algorithm of the fuzzy process

The procedures by which the fuzzy system (block *K*) processes its numerical inputs are analogous to the procedures by which the human mind processes visual, auditory, tactile and other stimuli and generates corresponding responses.

The *N*-dimensional vector  $(x_1, \dots, x_N)$  entering the block *K* is transformed into a vector  $(u_1, \dots, u_N)$  by converting the coordinates  $x_i$  into a scale in the range 0 to 100. Its coordinates  $u_i$ ,  $i = 1, \dots, N$ , are included in the adequate input fuzzy sets; together they select suitable inference rules for their manipulation, define their “strength” and generate the membership function  $\mu_{agg}$  on the field  $V = \langle 0, 100 \rangle$  of the output linguistic variable *SUI*. The horizontal coordinate of the centre of gravity below its course  $\mu_{agg}(v)$  is the result of the calculation.

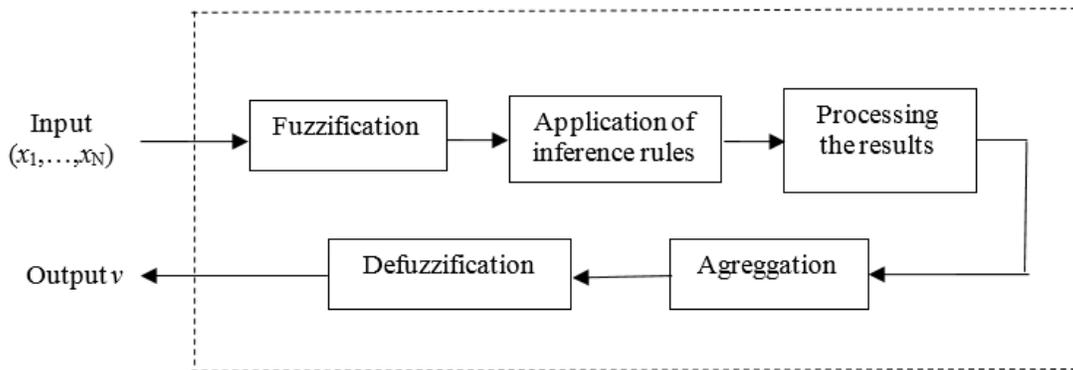


Figure 2. The continuity diagram of individual phases of the fuzzy approach of the computational algorithm

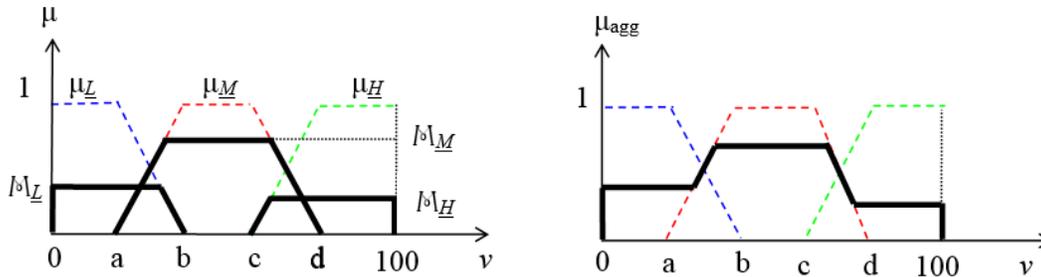
Source: own processing

In the fuzzification phase, the expected influence of the  $x_i$  coordinate of the vector  $(x_1, \dots, x_N)$  on the output  $v$  is first taken into account. If positive,  $x_i$  is converted to the *internal* value  $u_i$  according to the formula  $u_i = 100 \cdot (x_i - X_{i_{\min}}) / x_{i_{\text{ref}}}$ ,  $x_{i_{\text{ref}}} = X_{i_{\max}} - X_{i_{\min}}$ , where  $\langle X_{i_{\max}}, X_{i_{\min}} \rangle$  is a domain of numerical values of a linguistic variable on the *i*-th input. If the effect is negative, this formula  $u_i = 100 - 100 \cdot (x_i - X_{i_{\min}}) / x_{i_{\text{ref}}}$  for the conversion is used. If the positive effects prevail, the resulting *SUI* has the character of a contribution, if the negative effects prevail, it has the character of a harm (cost).

Each *i*-th input,  $i = 1$  to *N*, has its own fuzzification table, which generates its own set  $h(u_i) = \{ \underline{T}_i: \underline{T}_i \in \{ \underline{L}_i, \underline{M}_i, \underline{H}_i \}, \mu(\underline{T}_i, u_i) > 0 \}$ . The Cartesian product  $H = h(u_1) \times \dots \times h(u_N) = \{ (\underline{T}_1, \dots, \underline{T}_N): \underline{T}_1 \in h(u_1), \dots, \underline{T}_N \in h(u_N) \}$  with  $2^\alpha$  elements is formed from them, where  $\alpha$ ,  $0 \leq \alpha \leq N$  is the number of two-element sets  $h(u_i)$  in the Cartesian product *H*. The interference rule is the element of the projection  $p: \{ \underline{L}_1, \underline{M}_1, \underline{H}_1 \} \times \dots \times \{ \underline{L}_N, \underline{M}_N, \underline{H}_N \} \rightarrow \{ \underline{L}, \underline{M}, \underline{H} \}$ , where  $\underline{L}$ ,  $\underline{M}$  and  $\underline{H}$  are the terms of the output linguistic variable *SUI* with a domain of numerical values  $V = \langle 0, 100 \rangle$ . The set of inference rules thus consists of a total  $3^N$  pairs of the type  $((\underline{T}_1, \dots, \underline{T}_N), T)$ , which are formulated by a knowledgeable expert. In the phase of inference rules application, three classes are created  $H(\underline{T}) = \{ (\underline{T}_1, \dots, \underline{T}_N): (\underline{T}_1, \dots, \underline{T}_N) \in H \cap p^{-1}(T) \}$ ,  $T = \underline{L}, \underline{M}, \underline{H}$  of decomposition of the set *H* according to the terms of the output linguistic variable *SUI*, where the relation  $p^{-1}$  is the inversion of the projection *p*. To each in such a way created class  $H(\underline{T})$  its characteristic number  $M_T \in \langle 0, 1 \rangle$  is then assigned:

- if the class is empty ( $H(\underline{T}) = \emptyset$ ), then  $M_T = 0$ ;
- if  $H(\underline{T}) \neq \emptyset$ , then  $M_T = \max \{ \min \{ \mu(\underline{T}_1, u_1), \dots, \mu(\underline{T}_N, u_N) \} : (\underline{T}_1, \dots, \underline{T}_N) \in H(\underline{T}) \}$ .

In the processing phase of results, the fuzzy algorithm by means of the numbers  $M_L$ ,  $M_M$  and  $M_H$  restricts (cuts off) the courses of the functions  $\mu_L(v)$ ,  $\mu_M(v)$  and  $\mu_H(v)$  of the terms  $\underline{L}$ ,  $\underline{M}$  and  $\underline{H}$  of the output linguistic variable  $SUI$  on the domain of its numerical values  $V = \langle 0, 100 \rangle$  from the above - see Fig. 3 on the left. Then, in the aggregation phase, the fuzzy algorithm fuzzy logically adds their torso, by means of which it aggregates them into the resulting function  $\mu_{agg}(v)$ , which creates their “wrapping” - see Fig. 3 on the right.



**Figure 3.** Example of cutting off the functions  $\mu_L(v)$ ,  $\mu_M(v)$ ,  $\mu_H(v)$  and their aggregation into the resulting  $\mu_{agg}(v)$

Source: own processing

In such a way formed  $\mu_{agg}(v)$  can be included in one of the seven classes based on mutual relationships between the characteristic numbers  $M_L$ ,  $M_M$  and  $M_H$ , as depicted in the final component of the flowchart of the algorithm of fuzzy process (see Fig. 4) by means of the blocks  $\mu = \mu_I$  to  $\mu = \mu_{VII}$ . In the case of the example shown in Fig. 3 it follows that the path takes us through its “maze” to the class  $\mu = \mu_{VI}$ . For each of these classes, a general analytical description of the function  $\mu_{agg}(v)$  is given, including formulas for calculating the values of its certain integrals  $\Delta = \int v \cdot \mu_{agg}(v) \cdot dv$  and  $\Gamma = \int \mu_{agg}(v) \cdot dv$ , which are part of the defuzzification phase and whose division is the result of the calculation.

Specifically, for the class  $\mu = \mu_{VI}$ , to which the example in Fig. 3 belongs, the following applies:

$$\begin{aligned} \mu_{agg}(v) &= M_L \text{ for } v < a + (b - a) \cdot M_L, \\ &= (v - a) / (b - a) \text{ for } a + (b - a) \cdot M_L \leq v < a + (b - a) \cdot M_M, \\ &= M_M \text{ for } a + (b - a) \cdot M_M \leq v < c + (d - c) \cdot (1 - M_M), \\ &= (d - v) / (d - c) \text{ for } c + (d - c) \cdot (1 - M_M) \leq v < c + (d - c) \cdot (1 - M_H), \\ &= M_H \text{ for } c + (d - c) \cdot (1 - M_H) \leq v. \\ \int \mu_{agg}(v) \cdot dv &= (a + (b - a) \cdot M_L) \cdot M_L + \\ &\quad (b - a) \cdot (M_M^2 - M_L^2) / 2 + \\ &\quad M_M \cdot ((c - a) + (d - c) \cdot (1 - M_M) - (b - a) \cdot M_M) + \\ &\quad (d - c) \cdot (M_M^2 - M_H^2) / 2 + \\ &\quad M_H \cdot (100 - c - (d - c) \cdot (1 - M_H)). \\ \int v \cdot \mu_{agg}(v) \cdot dv &= (a + (b - a) \cdot M_L)^2 \cdot M_L / 2 + \\ &\quad (b - a) \cdot (a \cdot (M_M^2 - M_L^2) / 2 + (b - a) \cdot (M_M^3 - M_L^3) / 3) + \\ &\quad M_M \cdot ((c + (d - c) \cdot (1 - M_M))^2 - (a + (b - a) \cdot M_M)^2) / 2 + \\ &\quad (d - c) \cdot (c \cdot (M_M - M_H) + (d/2 - c) \cdot ((1 - M_H)^2 - (1 - M_M)^2) - (d - c) \cdot ((1 - M_H)^3 - (1 - M_M)^3) / 3) + \\ &\quad M_H \cdot (5\,000 - (c + (d - c) \cdot (1 - M_H))^2 / 2). \end{aligned}$$

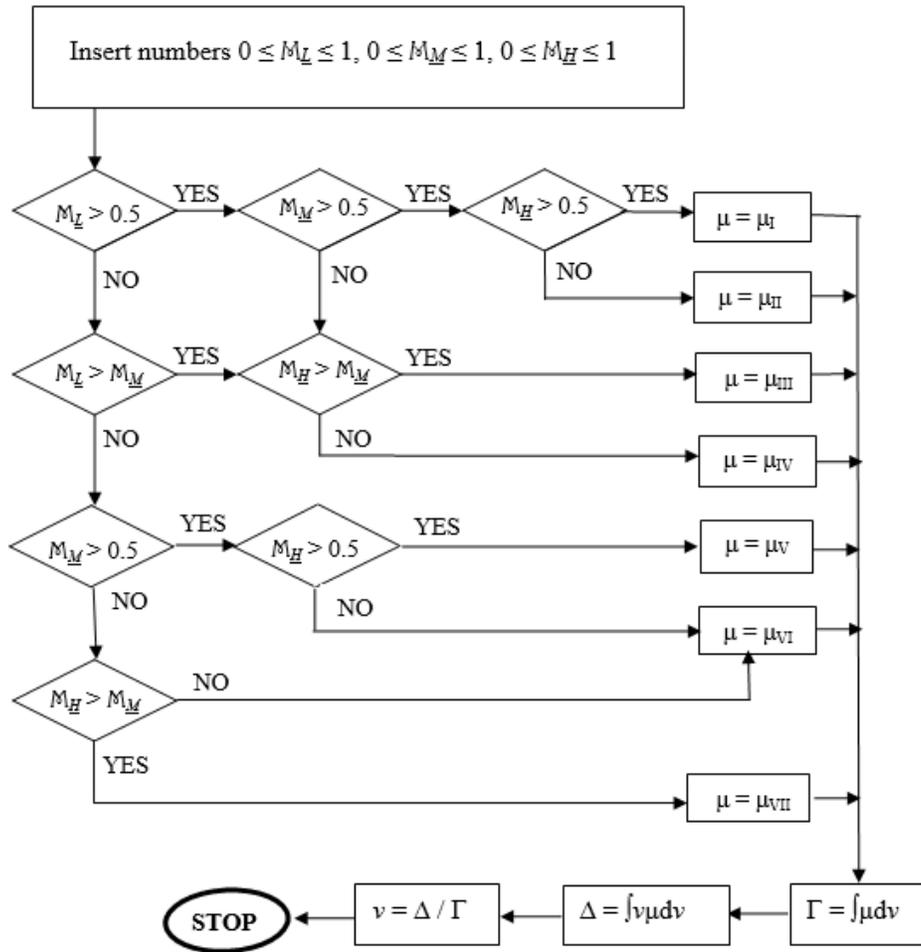


Figure 4. The flowchart of the fuzzy process algorithm

Source: own processing

## 5. Application

The fuzzy technique is applied to the optimal solution of a building machinery selection based on the cost and vague input parameters. Several ways exist to calculate the expected optimal life of a machinery. These methods incorporate the purchase price, annual operating costs and annual operating profits, and final value. It is assumed for the machinery to gradually lose productivity and/or the gradual increase of operating costs. The building company evaluative framework works both at the production system grade and the environmental and society grade. The task is to assess a purchase of a building machinery.

### 5.1 Database

The source estimates are based on the data research from the Albertina database (2020) and data research and estimates in the Czech machinery market aimed for building construction that was conducted by the authors with cooperation of experts of the building companies. The research resulted in four alternative variants that poses the technological requirements; in the next we denote them machinery A, B, C, D – Table 2.

The revenues from the expected annual sale of services generated by the machinery employment do not depend on the contemplated variant. The optimality of the choice is thus assessed according to the economic, environmental, and social criteria: annual expenses (A), machine operation noise (ON) and environmental pollution (EP). These criteria perform economic, environmental and social costs for which the lowest value is desirable.

The entry data are presented by Table 2. The purchase price of the machineries and the economic lifetime are certain data. Other input data are uncertain, for which only estimates of intervals are available, i.e., A, ON and EP.

**Table 2.** The purchase price and intervals of possible values of annual expenses (A) in thousands EUR; intervals of values of machine operation noise (ON) and environmental pollution (EP)

	0	1	2	3	4	5	6	ON	EP
Machinery A	31,0	⟨7, 9⟩	⟨11, 14⟩	⟨16, 20⟩	⟨24, 30⟩			⟨20, 40⟩	⟨50, 70⟩
Machinery B	42,5	⟨5, 6⟩	⟨8, 10⟩	⟨12, 15⟩	⟨16, 20⟩	⟨20, 25⟩	⟨24, 30⟩	⟨60, 70⟩	⟨60, 80⟩
Machinery C	57,6	⟨4, 5⟩	⟨7, 9⟩	⟨10, 12⟩	⟨14, 18⟩	⟨19, 22⟩		⟨30, 50⟩	⟨40, 60⟩
Machinery D	62,3	⟨3, 4⟩	⟨6, 8⟩	⟨9, 11⟩	⟨12, 14⟩	⟨16, 20⟩	⟨23, 31⟩	⟨60, 70⟩	⟨50, 70⟩

Source: own processing

The column 0 states the machinery purchase price. The machineries differ with their economic operation life that ranges between 1 – 6 years and intervals of possible values of annual operation expenses (columns 1 – 6). In Fig. 1 on the right, the operation expenses are given as the symbols  $a_0$  to  $a_c$  ( $a_c = a_4$  for machinery A,  $a_c = a_6$  for machinery B,  $a_c = a_5$  for machinery C,  $a_c = a_6$  for machinery D).

The interval values in the ON and EP columns are the values of subjective estimates of the operation noise and environmental pollution projected to a scale ⟨0, 100⟩ by a machinery expert, where 0 is the best desirable result. These data perform the first stage of the three-stage fuzzy system of multicriteria evaluation of alternatives (see Fig. 1).

## 5.2 Results

At the first-stage of the model in Fig. 1 it is not obvious from the data of Table 2 what machinery is optimal from the economic, social and ecological point view. Thus, the data are used for the calculation of the interval  $\langle ae_{\min}, ae_{\max} \rangle$  of the annual expenditure equivalent (AE) for each machinery A, B, C, D. The  $ae$  value calculations require to determine the value of cost of capital of the project; the authors with the cooperation of experts estimate it at the 10 % p.a. The upper limit of  $ae$  acceptability is given by 50 thousand EUR. For the annual expenditure equivalent (AE) it applies (Han et al., 2014):

$$AE = NPV/A_{t^*,i}, \text{ where } NPV = \sum_{t=0}^{t^*} CF_t / (1+i)^t \text{ and } A_{t^*,i} = \sum_{t=1}^{t^*} 1/(1+i)^t \quad (2)$$

where NPV is the net present value of annual expenditures,  $CF_t$  is the annual expenditure at the time  $t = 1 \dots t^*$  and  $i$  is a discount rate at the level of the cost of capital of the project.

From (2) we calculate the AE interval limits for each machinery.

For the machinery A it applies:

- $ae_{\min} = (31 + 7 / 1.1 + 11 / 1.1^2 + 16 / 1.1^3 + 24 / 1.1^4) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4) = 23.61,$
- $ae_{\max} = (31 + 9 / 1.1 + 14 / 1.1^2 + 20 / 1.1^3 + 30 / 1.1^4) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4) = 27.14.$

For the machinery B it applies:

- $ae_{\min} = (42.5 + 5 / 1.1 + 8 / 1.1^2 + 12 / 1.1^3 + 16 / 1.1^4 + 20 / 1.1^5 + 24 / 1.1^6) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4 + 1 / 1.1^5 + 1 / 1.1^6) = 22.86,$
- $ae_{\max} = (42.5 + 6 / 1.1 + 10 / 1.1^2 + 15 / 1.1^3 + 20 / 1.1^4 + 25 / 1.1^5 + 30 / 1.1^6) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4 + 1 / 1.1^5 + 1 / 1.1^6) = 26.09.$

For the machinery C it applies:

- $ae_{\min} = (57.6 + 4 / 1.1 + 7 / 1.1^2 + 10 / 1.1^3 + 14 / 1.1^4 + 19 / 1.1^5) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4 + 1 / 1.1^5) = 25.3,$
- $ae_{\max} = (57.6 + 5 / 1.1 + 9 / 1.1^2 + 12 / 1.1^3 + 18 / 1.1^4 + 22 / 1.1^5) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4 + 1 / 1.1^5) = 27.58.$

And for the machinery D it applies:

- $ae_{\min} = (62.3 + 3 / 1.1 + 6 / 1.1^2 + 9 / 1.1^3 + 12 / 1.1^4 + 16 / 1.1^5 + 23 / 1.1^6) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4 + 1 / 1.1^5 + 1 / 1.1^6) = 24.63,$
- $ae_{\max} = (62.3 + 4 / 1.1 + 8 / 1.1^2 + 11 / 1.1^3 + 14 / 1.1^4 + 20 / 1.1^5 + 31 / 1.1^6) / (1 / 1.1 + 1 / 1.1^2 + 1 / 1.1^3 + 1 / 1.1^4 + 1 / 1.1^5 + 1 / 1.1^6) = 27.62.$

The resulting limits of AE, ON and EP are summarized in Table 3. They perform the data at the second- stage of the model in Fig. 1. As we see, machinery B shows the best outcomes in terms of the economic criterion AE. However, the criteria ON and EP rank it as the worst variant.

**Table 3.** Intervals of possible values of annual expenditure equivalent (AE) in thousands of EUR, machine operation noise (ON) and environmental pollution (EP) of machinery A, B, C, D

Variant / Criterion	AE	ON	EP
Machinery A	⟨23.61, 27.14⟩	⟨20, 40⟩	⟨50, 70⟩
Machinery B	⟨22.86, 26.09⟩	⟨60, 70⟩	⟨60, 80⟩
Machinery C	⟨25.3, 27.58⟩	⟨30, 50⟩	⟨40, 60⟩
Machinery D	⟨24.63, 27.62⟩	⟨60, 70⟩	⟨50, 70⟩

Source: own processing

The problem is thus going to be resolved at the third stage of the model – in block *K* (see Fig. 1 on the right).

The block *K* is entered by the numerical vectors  $(ae, on, ep)$ ,  $ae \in \langle 0, 50 \rangle$ ,  $on \in \langle 0, 100 \rangle$ ,  $ep \in \langle 0, 100 \rangle$  of the triple of linguistic variables AE, ON and EP with terms  $\underline{L}_i$ ,  $\underline{M}_i$  and  $\underline{H}_i$ ,  $i = ae, on, ep$ . Let us assume their fuzzification tables are symmetric and, except for the indices, they are identical (i.e., for all  $i = ae, on, ep$  it applies:  $a_i = 20$ ,  $b_i = 40$ ,  $c_i = 60$ ,  $d_i = 80$ ).

From the block *K* the number  $v \in \langle 0, 100 \rangle$  of the linguistic variable SUI is derived with the terms  $\underline{L}$ ,  $\underline{M}$  and  $\underline{H}$  that has a character of sustainable economic, social and environmental costs. The set of inference rules of the type  $((\underline{T}_{ae}, \underline{T}_{on}, \underline{T}_{ep}), \underline{T})$ ,  $\underline{T}_i \in \{\underline{L}_i, \underline{M}_i, \underline{H}_i\}$ ,  $\underline{T} \in \{\underline{L}, \underline{M}, \underline{H}\}$  has  $3^3$  elements formed by the strategy of the predominant element. This strategy assigns to the given left side of the rule the very term  $\underline{T}$ , which prevails on the left side. If there is no such a prevailing term  $\underline{T}$ , the term  $\underline{M}$  is chosen.

By converting the coordinates of the numerical vector  $x_i$  into a scale in the range 0 to 100 we get the recalculated vectors  $(u_1, u_2, u_3)$ , for which it applies:  $u_1 = 100 \cdot ae / 50 = 2 \cdot ae$ ,  $u_2 = on$  and  $u_3 = ep$ . In the general case, to obtain the outputs  $v_{\min}$  and  $v_{\max}$ , it would be necessary for all machineries to calculate the values of  $v$  to the eight recalculated vectors of all combinations of the interval limits of uncertain values. In this case the combination  $(u_{1\min}, u_{2\min}, u_{3\min})$  for  $v_{\min}$  and  $(u_{1\max}, u_{2\max}, u_{3\max})$  for  $v_{\max}$  is fully sufficient.

The flowchart of the fuzzy algorithm (see Fig. 4) leads to a system of equations of the class  $\mu = \mu_{VI}$  (stated above the Fig. 4) based on which the results are calculated. The results  $v_{min}$ ,  $v_{max}$  of the fuzzy procedure in the block  $K$  and arithmetic mean  $y$  as SUI index are summarized in Table 4.

**Table 4.** The results  $v_{min}$ ,  $v_{max}$  of the fuzzy procedure in the block  $K$  and  $y$  of analysed machineries representing the SUI index

<p>Machinery A:</p> <ul style="list-style-type: none"> <li><math>v_{min}</math>: <math>h(u_{1min}) = h(47.22) = \{M_{ae}\}</math>, <math>h(u_{2min}) = h(20) = \{L_{on}\}</math>, <math>h(u_{3min}) = h(50) = \{M_{ep}\}</math>, <math>H = \{(M_{ae}, L_{on}, M_{ep})\}</math>, <math>M_L = M_H = 0</math>, <math>M_M = \max\{\min\{1, 1, 1\}\} = 1</math>, <math>\mu = \mu_{VI}</math>, <math>v_{min} = 2000 / 40 = 50</math>.</li> <li><math>v_{max}</math>: <math>h(u_{1max}) = h(54.28) = \{M_{ae}\}</math>, <math>h(u_{2max}) = h(40) = \{M_{on}\}</math>, <math>h(u_{3max}) = h(70) = \{M_{ep}, H_{ep}\}</math>, <math>H = \{(M_{ae}, M_{on}, M_{ep}), (M_{ae}, M_{on}, H_{ep})\}</math>, <math>M_L = M_H = 0</math>, <math>M_M = \max\{\min\{1, 1, 0.5\}, \min\{1, 1, 0.5\}\} = \max\{0.5, 0.5\} = 0.5</math>, <math>\mu = \mu_{VI}</math>, <math>v_{max} = 1250 / 25 = 50</math>.</li> <li><math>y_A = (50 + 50) / 2 = 50</math>.</li> </ul>
<p>Machinery B:</p> <ul style="list-style-type: none"> <li><math>v_{min}</math>: <math>h(u_{1min}) = h(45.72) = \{M_{ae}\}</math>, <math>h(u_{2min}) = h(60) = \{M_{on}\}</math>, <math>h(u_{3min}) = h(60) = \{M_{ep}\}</math>, <math>H = \{(M_{ae}, M_{on}, M_{ep})\}</math>, <math>M_L = M_H = 0</math>, <math>M_M = \max\{\min\{1, 1, 1\}\} = 1</math>, <math>\mu = \mu_{VI}</math>, <math>v_{min} = 2000 / 40 = 50</math>.</li> <li><math>v_{max}</math>: <math>h(u_{1max}) = h(52.18) = \{M_{ae}\}</math>, <math>h(u_{2max}) = h(70) = \{M_{on}, H_{on}\}</math>, <math>h(u_{3max}) = h(80) = \{H_{ep}\}</math>, <math>H = \{(M_{ae}, M_{on}, H_{ep}), (M_{ae}, H_{on}, H_{ep})\}</math>, <math>M_L = 0</math>, <math>M_M = \max\{\min\{1, 0.5, 1\}\} = \max\{0.5\} = 0.5</math>, <math>M_H = \max\{\min\{1, 0.5, 1\}\} = \max\{0.5\} = 0.5</math>, <math>\mu = \mu_{VI}</math>, <math>v_{max} = 2341.66 / 37.5 = 62.44</math>.</li> <li><math>y_B = (50 + 62.44) / 2 = 56.22</math>.</li> </ul>
<p>Machinery C:</p> <ul style="list-style-type: none"> <li><math>v_{min}</math>: <math>h(u_{1min}) = h(50.6) = \{M_{ae}\}</math>, <math>h(u_{2min}) = h(30) = \{L_{on}, M_{on}\}</math>, <math>h(u_{3min}) = h(40) = \{M_{ep}\}</math>, <math>H = \{(M_{ae}, L_{on}, M_{ep}), (M_{ae}, M_{on}, M_{ep})\}</math>, <math>M_L = M_H = 0</math>, <math>M_M = \max\{\min\{1, 1, 1\}\} = 1</math>, <math>\mu = \mu_{VI}</math>, <math>v_{min} = 2000 / 40 = 50</math>.</li> <li><math>v_{max}</math>: <math>h(u_{1max}) = h(55.16) = \{M_{ae}\}</math>, <math>h(u_{2max}) = h(50) = \{M_{on}\}</math>, <math>h(u_{3max}) = h(60) = \{M_{ep}\}</math>, <math>H = \{(M_{ae}, M_{on}, M_{ep})\}</math>, <math>M_L = M_H = 0</math>, <math>M_M = \max\{\min\{1, 1, 1\}\} = 1</math>, <math>\mu = \mu_{VI}</math>, <math>v_{max} = 2000 / 40 = 50</math>.</li> <li><math>y_C = (50 + 50) / 2 = 50</math>.</li> </ul>
<p>Machinery D:</p> <ul style="list-style-type: none"> <li><math>v_{min}</math>: <math>h(u_{1min}) = h(49.26) = \{M_{ae}\}</math>, <math>h(u_{2min}) = h(60) = \{M_{on}\}</math>, <math>h(u_{3min}) = h(50) = \{M_{ep}\}</math>, <math>H = \{(M_{ae}, M_{on}, M_{ep})\}</math>, <math>M_L = M_H = 0</math>, <math>M_M = \max\{\min\{1, 1, 1\}\} = 1</math>, <math>\mu = \mu_{VI}</math>, <math>v_{min} = 2000 / 40 = 50</math>.</li> <li><math>v_{max}</math>: <math>h(u_{1max}) = h(55.24) = \{M_{ae}\}</math>, <math>h(u_{2max}) = h(70) = \{M_{on}, H_{on}\}</math>, <math>h(u_{3max}) = h(70) = \{M_{ep}, H_{ep}\}</math>, <math>H = \{(M_{ae}, M_{on}, M_{ep}), (M_{ae}, H_{on}, H_{ep})\}</math>, <math>M_L = 0</math>, <math>M_M = \max\{\min\{1, 0.5, 0.5\}\} = \max\{0.5\} = 0.5</math>, <math>M_H = \max\{\min\{1, 0.5, 0.5\}\} = \max\{0.5\} = 0.5</math>, <math>\mu = \mu_{VI}</math>, <math>v_{max} = 2341.66 / 37.5 = 62.44</math>.</li> <li><math>y_D = (50 + 62.44) / 2 = 56.22</math>.</li> </ul>

Source: own processing

Since  $y_A = y_C < y_B = y_D$ , machineries A and C should be preferred to B and D.

## 6. Discussion

We applied the three-stage fuzzy model that sophisticatedly projected the results of partial criteria AE, ON and EP into the value  $y$  representing the here introduced ‘‘Sustainability Utility Index’’ (SUI). The alternatives were given by four equally powerful building machineries differentiating in their lengths of economic life, expenditure and cost characteristics, and the vague characteristics of traffic noise and environmental pollution.

Regarding the RQ1 ‘‘Does the fuzzy model of multi-criteria evaluation have the property to state a rational decision from the point of view of stakeholders and principals of sustainability?’’ we state that the used version of the fuzzy model is optimally set to solve multicriteria problems under conditions of uncertainty and different characteristics of input variables. The result of the fuzzy process allows the stakeholders to take optimal decisions in view of financial and sustainability criteria. Specifically in this study, SUI measured by  $y$  points to the optimal choice from a set of considered alternatives, which is  $y_A = y_C < y_B = y_D$ . Machineries A and C should be investment-preferred as their complex contribution to the cost minimalization and sustainability pursue is better.

The specifics of the fuzzy method allow the users to consider and process inputs of diverse nature and thus enable a wide application when deciding on the optimal choice and setting properties of machinery from the operational point of view and on the industrial investment management strategy. The first aspect was confirmed by Luo et al. (2020) when developing one-tail confidence-interval-based fuzzy testing method to evaluate quality characteristic of machinery while considering statistical parameters of process management. From the strategic point of view good results were achieved by Ghorabae et al. (2018) who applied the hybrid approach based on the fuzzy extension of Stepwise Weight Assessment Ratio Analysis and Criteria Importance Through Inter Criteria Correlation methods for sustainability assessment of construction equipment. Ayağ & Özdemir (2006) understood the need to support the sustainable development of the manufacturing industry with regards to various uncertainties of waste components (Hašková et al. 2019). They proposed fuzzy comprehensive evaluation method based on the process of analytical hierarchy of fuzzy extension.

Generally, we can state that the fuzzy methods differ in the degree of complexity of the computational process and the volume of reflected data (Skare et al. 2023a,b). The first point is a consequence of different versions of fuzzy approaches used, the second point is given by the characteristics of the problem and the scope.

Regarding RQ2 our presented inference fuzzy system most resembles the Mamdani's inference system. The difference between Mamdani's and our approach is that Mamdani's rules are based on fuzzy implications (i.e., deductively invalid modus ponens judgments), while rules used by our approach are based on the "principle of extension" (an n-dimensional case of image induction). Therefore, our system avoids several complications associated with the semantics of fuzzy implications in various fuzzy logics, it is more "user friendly" from the point of view of a manager and a user and it is easily algorithmized. Unlike Mamdani's and other fuzzy systems, whose behavior is derived from mathematical models of open-loop process control (Aksjonov et al., 2020; Camacho et al., 2021), this fuzzy system mimics the processes ongoing when solving problems intuitively and deductively in the human mind.

## **Conclusions**

The sustainability measures (economic, environmental, and social) were treated within the multicriteria ex-ante evaluation of alternatives of production systems in terms of uncertainty of input data. Sustainability criteria were expressed by sustainable parameters of a vague nature.

The professional and scientific literature describes many methods that are used to solve multicriteria decision-making problems under vague inputs and uncertain conditions. The fuzzy approach suits this type of tasks very well. Compared to classical methods, its main advantage is that it approaches to human thinking and the way people express themselves. Thus, it is possible to model the meaning of words and expressions using the theory of fuzzy sets. As a result, fuzzy systems achieve more realistic outcomes than conventional systems.

The novelty of the paper is a construction of the three-stage model of the fuzzy assessment of a sustainable production in terms of its cost indicators and vague sustainable characteristics. The third step of the model is a computational algorithm the "fuzzy processor" the core of which is introduced in methodology. The fuzzy technique was applied to the optimal solution of a building machinery selection based on the cost and vague input parameters.

We see two-fold limits of the fuzzy system application: 1) on the general level the fuzzy systems lack the ability to learn and memorize 2) determining or tuning a suitable membership function and fuzzy rules is not always clear; an extensive testing often fails to say how many membership functions are needed.

The strengths of our system are its intelligible and computationally undemanding procedure, which helps the managers when solving problems with sharp and vague inputs considering the maximum uncertainty in the occurrence of linguistic variables considered. This fuzzy application provides managers with a faster, more accurate and more user-friendly method in comparison with methods based on analytical description. Thus, it aims to optimize the manager's decision, who minimizes the investment and operation costs of the building machine. The future challenge is to acquaint potential users with this computational tool. The aim of the paper both on the theoretical and application level specified by two RQ was fulfilled.

## References

- Ahi, P., Searcy, C., & Jaber, M. Y. (2018). A probabilistic weighting model for setting priorities in assessing sustainability performance. *Sustainable Production and Consumption*, 13, 80-92. <https://doi.org/10.1016/j.spc.2017.07.007>
- Dun & Bradstreet (2020). Albertina online [https://www.bisnode.cz/produkty/albertina/?gclid=EAIaIQobChMI8bWmiaLT8AIVFMPVCh36pQ51EAAAYASABEgKkJfD\\_BwE](https://www.bisnode.cz/produkty/albertina/?gclid=EAIaIQobChMI8bWmiaLT8AIVFMPVCh36pQ51EAAAYASABEgKkJfD_BwE)
- Aksjonov, A., Ricciardi, V., Augsborg, K., Vodovozov, V., & Petlenkov, E. (2020). Hardware-in-the-loop test of an open-loop fuzzy control method for decoupled electrohydraulic antilock braking system. *IEEE Transactions on Fuzzy Systems*, 29(5), 965-975. <https://doi.org/10.1109/TFUZZ.2020.2965868>
- Amaral, V. L., Affonso, E. T. F., Silva, A. M., Moita, G. F., & Almeida, P. E. M. (2019, June). New Fuzzy Approaches to Cryptocurrencies Investment Recommendation Systems. In *International Fuzzy Systems Association World Congress* (pp. 135-147). Springer, Cham. [https://doi.org/10.1007/978-3-030-21920-8\\_13](https://doi.org/10.1007/978-3-030-21920-8_13)
- Amiri, M. P. (2010). Project selection for oil-fields development by using the AHP and fuzzy TOPSIS methods. *Expert Systems with Applications*, 37(9), 6218-6224. <https://doi.org/10.1016/j.eswa.2010.02.103>
- Atanassov, K. T. (1994). New operations defined over the intuitionistic fuzzy sets. *Fuzzy Sets and Systems*, 61(2), 137-142. [https://doi.org/10.1016/0165-0114\(94\)90229-1](https://doi.org/10.1016/0165-0114(94)90229-1)
- Ateş, N. Y., Çevik, S., Kahraman, C., Gülbay, M., & Erdoğan, S. A. (2006). Multi attribute performance evaluation using a hierarchical fuzzy TOPSIS method. In *Fuzzy applications in industrial engineering* (pp. 537-572). Springer, Berlin, Heidelberg. [https://doi.org/10.1007/3-540-33517-X\\_22](https://doi.org/10.1007/3-540-33517-X_22)
- Awasthi, A., Govindan, K., & Gold, S. (2018). Multi-tier sustainable global supplier selection using a fuzzy AHP-VIKOR based approach. *International Journal of Production Economics*, 195, 106-117. <https://doi.org/10.1016/j.ijpe.2017.10.013>
- Ayağ, Z., & Özdemir, R. G. (2006). A fuzzy AHP approach to evaluating machine tool alternatives. *Journal of Intelligent Manufacturing*, 17(2), 179-190. <https://doi.org/10.1007/s10845-005-6635-1>
- Běhounek, L., & Daňková, M. (2016). Towards fuzzy partial set theory. In *International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems* (pp. 482-494). Springer, Cham. [https://doi.org/10.1007/978-3-319-40581-0\\_39](https://doi.org/10.1007/978-3-319-40581-0_39)
- Belas, J., Škare, M., Gavurova, B., Dvorsky, J., & Kotaskova, A. (2022). The impact of ethical and CSR factors on engineers' attitudes towards SMEs sustainability. *Journal of Business Research*, 149, 589-598. <https://doi.org/10.7441/joc.2022.02.02>
- Bogachov, S., Kwilinski, A., Miethlich, B., Bartosova, V., & Gurnak, A. (2020). Artificial intelligence components and fuzzy regulators in entrepreneurship development. *Entrepreneurship and Sustainability Issues*, 8(2), 487. [https://doi.org/10.9770/jesi.2020.8.2\(29\)](https://doi.org/10.9770/jesi.2020.8.2(29))
- Boloş, M. I., Bradea, I. A., & Delcea, C. (2019). A fuzzy logic algorithm for optimizing the investment decisions within companies. *Symmetry*, 11(2), 186. <https://doi.org/10.3390/sym11020186>
- Camacho, O., Iglesias, E., Herrera, M., & Aboukheir, H. (2021). Fuzzy logic-based control: From fundamentals to applications. *Revista Digital Novasinerzia*, 4(2), 6-37.

- Clarke, T., & Boersma, M. (2017). The governance of global value chains: Unresolved human rights, environmental and ethical dilemmas in the apple supply chain. *Journal of Business Ethics*, 143(1), 111-131. <https://doi.org/10.1007/s10551-015-2781-3>
- Eklöf, J., Podkorytova, O., & Malova, A. (2020). Linking customer satisfaction with financial performance: an empirical study of Scandinavian banks. *Total Quality Management & Business Excellence*, 31(15-16), 1684-1702. <https://doi.org/10.1080/14783363.2018.1504621>
- Fiala, P. (2018). Project portfolio designing using data envelopment analysis and De Novo optimisation. *Central European Journal of Operations Research*, 26(4), 847-859. <https://doi.org/10.1007/s10100-018-0571-6>
- Franciosi, C., Iung, B., Miranda, S., & Riemma, S. (2018). Maintenance for sustainability in the industry 4.0 context: A scoping literature review. *IFAC-PapersOnLine*, 51(11), 903-908. <https://doi.org/10.1016/j.ifacol.2018.08.459>
- Gavurova, B., Schönfeld, J., Bilan, Y., & Dudáš, T. (2022). Study of the differences in the perception of the use of the principles of corporate social responsibility in micro, small and medium-sized enterprises in the V4 countries. *Journal of Competitiveness*, 14(2), 23-40. <https://doi.org/10.7441/joc.2022.02.02>
- Gavurova, B., Kelemen, M., & Polishchuk, V. (2022). Expert model of risk assessment for the selected components of smart city concept: From safe time to pandemics as COVID-19. *Socio-Economic Planning Sciences*, 82, 101253. <https://doi.org/10.1016/j.seps.2022.101253>
- Gold, S., & Schleper, M. C. (2017). A pathway towards true sustainability: A recognition foundation of sustainable supply chain management. *European Management Journal*, 35(4), 425-429. <https://doi.org/10.1016/j.emj.2017.06.008>
- Ghorabae, M. K., Amiri, M., Zavadskas, E. K., & Antucheviciene, J. (2018). A new hybrid fuzzy MCDM approach for evaluation of construction equipment with sustainability considerations. *Archives of Civil and Mechanical Engineering*, 18(1), 32-49. <https://doi.org/10.1016/j.acme.2017.04.011>
- Hammer, J., & Pivo, G. (2017). The triple bottom line and sustainable economic development theory and practice. *Economic Development Quarterly*, 31(1), 25-36. <https://doi.org/10.1177/0891242416674808>
- Han, D., Qi, H., & Xie, A. (2014). On the equivalent annual cost method. *Journal of Finance Issues*, 13(2), 1. <https://doi.org/10.58886/jfi.v13i2.2502>
- Hašková, S. (2016). Evaluation of the Quality of the Entrepreneurial Environment on the Basis of Fuzzy Logic. *Littera Scripta*, 9(3), 10-23.
- Hašková, S. & Fiala, P. (2019). A fuzzy approach for the estimation of foreign investment risk based on values of rating indices. *Risk Management*, 21(3), 1-17. <https://doi.org/10.1057/s41283-019-00051-1>
- Hašková, S., Suler, P., Machova, V., Krulicky, T. (2019). Determining the price of the business share of a business in a group. *Ad alta-Journal of Interdisciplinary Research*, 9(2), 60-70.
- Hendiani, S., & Bagherpour, M. (2019). Developing an integrated index to assess social sustainability in construction industry using fuzzy logic. *Journal of Cleaner Production*, 230, 647-662. <https://doi.org/10.1016/j.jclepro.2019.05.055>
- Holčapek, M., Škorupová, N., & Štěpnička, M. (2021). Fuzzy Interpolation with Extensional Fuzzy Numbers. *Symmetry*, 13(2), 170. <https://doi.org/10.3390/sym13020170>
- Horak, J., Vrbka, J., Suler, P. (2020). Support Vector Machine Methods and Artificial Neural Networks Used for the Development of Bankruptcy Prediction Models and their Comparison. *Journal of Risk and Financial Management*, 13(3), 60. <https://doi.org/10.3390/jrfm13030060>
- Hwang, C.L., Yoon, K. (1981). Multiple Attributes Decision Making Methods and Application, Springer, Berlin Heidelberg. [https://doi.org/10.1007/978-3-642-48318-9\\_3](https://doi.org/10.1007/978-3-642-48318-9_3)
- Chaudhary, A. (2019). Mamdani and Sugeno Fuzzy Inference Systems' Comparison for Detection of Packet Dropping Attack in Mobile Ad Hoc Networks. *Emerging Technologies in Data Mining and Information Security* (pp. 805-811). Springer, Singapore. [https://doi.org/10.1007/978-981-13-1501-5\\_70](https://doi.org/10.1007/978-981-13-1501-5_70)

- Chaudhari, S., Patil, M., & Bambhori, J. (2014). Study and review of fuzzy inference systems for decision making and control. *American International Journal of Research in Science, Technology, Engineering & Mathematics*, 14(147), 88-92.
- Jankova, Z., Jana, D. K., & Dostal, P. (2021). Investment decision support based on interval type-2 fuzzy expert system. *Engineering Economics*, 32(2), 118-129. <https://doi.org/10.5755/j01.ee.32.2.24884>
- Janková, Z., & Dostál, P. (2021). Type-2 Fuzzy Expert System Approach for Decision-Making of Financial Assets and Investing under Different Uncertainty. *Mathematical Problems in Engineering* <https://doi.org/10.1155/2021/3839071>
- Karkalikova, M., & Strhan, R. (2018). Integrated Management Systems as a Tool for Achieving Continuous Improvements in Performance. *Littera Scripta*, 11(1), 81-92.
- Kelemen, M., Gavurova, B., & Polishchuk, V. (2022). A Complex Hybrid Model for Evaluating Projects to Improve the Sustainability and Health of Regions and Cities. *International Journal of Environmental Research and Public Health*, 19(13), 8217. <https://doi.org/10.3390/ijerph19138217>
- Kim, S. (2019). The process model of corporate social responsibility (CSR) communication: CSR communication and its relationship with consumers' CSR knowledge, trust, and corporate reputation perception. *Journal of Business Ethics*, 154(4), 1143-1159. <https://doi.org/10.1007/s10551-017-3433-6>
- Kovarikova, V., Balkova, M. & Klementova, I. (2021). Motivated employees as key to success of any organization. *Littera Scripta*, 14(1), 61-70.
- Ladu, L., & Morone, P. (2021). Holistic approach in the evaluation of the sustainability of bio-based products: An Integrated Assessment Tool. *Sustainable Production and Consumption*, 28, 911-924e6. <https://doi.org/10.1016/j.spc.2021.07.006>
- Lavickova, M., Kolafova, P. M. & Turinska, L. (2021). Language courses as tool to motivate employees in South Bohemian enterprises. *Littera Scripta*, 14(1), 86-106.
- Lönngren, J., & Van Poeck, K. (2021). Wicked problems: a mapping review of the literature. *International Journal of Sustainable Development & World Ecology*, 28(6), 481-502. <https://doi.org/10.1080/13504509.2020.1859415>
- Luo, W. J., Chen, K. S., Yu, C. M., & Hsu, T. H. (2020). The fuzzy process quality evaluation model for the stb quality characteristic of machining. *Applied Sciences*, 10(22), 8272. <https://doi.org/10.3390/app10228272>
- Memari, A., Dargi, A., Jokar, M. R. A., Ahmad, R., & Rahim, A. R. A. (2019). Sustainable supplier selection: A multi-criteria intuitionistic fuzzy TOPSIS method. *Journal of Manufacturing Systems*, 50, 9-24. <https://doi.org/10.1016/j.jmsy.2018.11.002>
- Mishra, U., Wu, J. Z., & Sarkar, B. (2020). A sustainable production-inventory model for a controllable carbon emissions rate under shortages. *Journal of Cleaner Production*, 256, 120268. <https://doi.org/10.1016/j.jclepro.2020.120268>
- Muljono, A. B., Ginarsa, I. M., Nrartha, I. M. A., & Dharma, A. (2018). Coordination of Adaptive Neuro Fuzzy Inference System (ANFIS) and Type-2 Fuzzy Logic System-Power System Stabilizer (T2FLS-PSS) to Improve a Large-scale Power System Stability. *International Journal of Electrical & Computer Engineering* (2088-8708), 8(1). <https://doi.org/10.11591/ijece.v8i1.pp76-86>
- Nădăban, S., Dzitac, S., & Dzitac, I. (2016). Fuzzy TOPSIS: a general view. *Procedia Computer Science*, 91, 823-831. <https://doi.org/10.1016/j.procs.2016.07.088>
- Nadanyiova, M. & Das, S. (2020). Millennials as a Target Segment of Socially Responsible Communication within the Business Strategy. *Littera Scripta*, 13(1), 119-134. [https://doi.org/10.36708/Littera\\_Scripta2020/1/8](https://doi.org/10.36708/Littera_Scripta2020/1/8)
- Onat, N. C., Gumus, S., Kucukvar, M., & Tatari, O. (2016). Application of the TOPSIS and intuitionistic fuzzy set approaches for ranking the life cycle sustainability performance of alternative vehicle technologies. *Sustainable Production and Consumption*, 6, 12-25. <https://doi.org/10.1016/j.spc.2015.12.003>
- Padilla-Rivera, A., do Carmo, B. B. T., Arcese, G., & Merveille, N. (2021). Social circular economy indicators: Selection through fuzzy delphi method. *Sustainable Production and Consumption*, 26, 101-110. <https://doi.org/10.1016/j.spc.2020.09.015>
- Pan, L., Xu, Z. & Skare, M. (2023). Sustainable business model innovation literature: a bibliometrics analysis. *Rev Manag Sci*, 17, 757–785. <https://doi.org/10.1007/s11846-022-00548-2>

- Qin, Y., Xu, Z., Wang, X., & Škare, M. (2021). Are family firms in the eyes of economic policy? *International Entrepreneurship and Management Journal*, 17, 1233-1259. <https://doi.org/10.1007/s11365-020-00699-2>
- Rajesh, R. (2019). A fuzzy approach to analyzing the level of resilience in manufacturing supply chains. *Sustainable Production and Consumption*, 18, 224-236. <https://doi.org/10.1016/j.spc.2019.02.005>
- Rostamnezhad, M., Nasirzadeh, F., Khanzadi, M., Jarban, M. J., & Ghayoumian, M. (2020). Modeling social sustainability in construction projects by integrating system dynamics and fuzzy-DEMATEL method: a case study of highway project. *Engineering, Construction and Architectural Management*, 27(7), 1595-1618. <https://doi.org/10.1108/ECAM-01-2018-0031>
- Saleh, A., Rosnelly, R., Puspita, K., & Sanjaya, A. (2017). A comparison of Mamdani and Sugeno method for optimization prediction of traffic noise levels. In *2017 5th International Conference on Cyber and IT Service Management (CITSM)* (pp. 1-4). IEEE. <https://doi.org/10.1109/CITSM.2017.8089310>
- Skare, M., & Porada-Rochon, M. (2022). The role of innovation in sustainable growth: A dynamic panel study on micro and macro levels 1990–2019. *Technological Forecasting and Social Change*, 175, 121337. <https://doi.org/10.1016/j.techfore.2021.121337>
- Skare, M., Gavurova, B., & Polishchuk, V. (2023a). A Fuzzy Multicriteria Model of Sustainable Tourism: Examples From the V4 Countries. *IEEE Transactions on Engineering Management*, 1-12. <https://doi.org/10.1109/tem.2023.3239519>
- Skare, M., Gavurova, B., & Polishchuk, V. (2023b). A decision-making support model for financing start-up projects by venture capital funds on a crowdfunding platform. *Journal of Business Research*, 158, 113719. <https://doi.org/10.1016/j.jbusres.2023.113719>
- Susanto, F., Arafah, W., & Husin, Z. (2017). Ambidextrous sustainability and manufacturing industry performance: The role of potential non-economic benefits as mediation pathways. *Polish Journal of Management Studies*, 16(2), 278-289. <https://doi.org/10.17512/pjms.2017.16.2.24>
- Torkabadi, A. M., Pourjavad, E., & Mayorga, R. V. (2018). An integrated fuzzy MCDM approach to improve sustainable consumption and production trends in supply chain. *Sustainable Production and Consumption*, 16, 99-109. <https://doi.org/10.1016/j.spc.2018.05.008>
- Vochozka, M., Horak, J., Suler, P. (2019). Equalizing Seasonal Time Series Using Artificial Neural Networks in Predicting the Euro-Yuan Exchange Rate. *Journal of Risk and Financial Management*, 12(2), 76. <https://doi.org/10.3390/jrfm12020076>
- Wang, L. (2019). Financial distress prediction for listed enterprises using Fuzzy C-Means. *Littera Scripta*, 12(1), 169-177.
- Wyborn, C., Datta, A., Montana, J., Ryan, M., Leith, P., Chaffin, B., ... & Van Kerkhoff, L. (2019). Co-producing sustainability: reordering the governance of science, policy, and practice. *Annual Review of Environment and Resources*, 44, 319-346. <https://doi.org/10.1146/annurev-environ-101718-033103>
- Xu, Z., Wang, X., Wang, X., & Skare, M. (2021). A comprehensive bibliometric analysis of entrepreneurship and crisis literature published from 1984 to 2020. *Journal of Business Research*, 135, 304-318. <https://doi.org/10.1016/j.jbusres.2021.06.051>
- Yu, Y., Qin, Y., Xu, Z., & Škare, M. (2022). Bibliometric analysis of strategic entrepreneurship literature. *International Entrepreneurship and Management Journal*, 18(4), 1475-1502. <https://doi.org/10.1007/s11365-022-00804-7>
- Yuan, X., Li, H., & Sun, K. (2009). Theory Based Level Cut Sets of Zadeh Fuzzy Sets on Interval-Valued. *Advances in Soft Computing Fuzzy Information and Engineering*, 2, 501-510. [https://doi.org/10.1007/978-3-642-03664-4\\_55](https://doi.org/10.1007/978-3-642-03664-4_55)
- Zarte, M., Pechmann, A., & Nunes, I. L. (2018). Sustainable Evaluation of Production Programs Using a Fuzzy Inference Model—A Concept. *Procedia CIRP*, 73, 241-246. <https://doi.org/10.1016/j.procir.2018.04.012>
- Ziyadin, S., Borodin, A., Streltsova, E., Suieubayeva, S., & Pshembayeva, D. (2019). Fuzzy logic approach in the modeling of sustainable tourism development management. *Polish Journal of Management Studies*, 19(1), 492-504. <https://doi.org/10.17512/pjms.2019.19.1.37>

**Funding:** This research was financially supported by the Institute of Technology and Business in České Budějovice.

**Author Contributions:** Conceptualization: *Simona Hašková*; methodology: *Simona Hašková*; data analysis: *Marek Vochozka*, writing—original draft preparation: *Marek Vochozka*, writing; review and editing: *Jiří Kučera*; visualization: *Jiří Kučera*. All authors have read and agreed to the published version of the manuscript.

**Simona HAŠKOVÁ** is the Doctor at the Institute of Technology and Business in České Budějovice. Research interests: fuzzy logic, corporate finance, corporate finance prediction, controlling.

**ORCID ID:** <https://orcid.org/0000-0002-4971-7972>

**Marek VOCHOZKA** is the Professor at the Institute of Technology and Business in České Budějovice. Research interests: corporate finance, corporate finance prediction, artificial neural network.

**ORCID ID:** <https://orcid.org/0000-0001-9923-7814>

**Jiří KUČERA** is the Master at the Institute of Technology and Business in České Budějovice. Research interests: corporate value, corporate finance, corporate finance prediction.

**ORCID ID:** <https://orcid.org/0000-0002-0847-7781>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





**Publisher**

<http://jssidoi.org/esc/home>



---

## CHANGES IN EMPLOYEE MOTIVATION FOR EDUCATION IN COMPANIES BEFORE AND DURING THE COVID-19 PANDEMIC\*

Iva Klementová <sup>1</sup>, Zdeněk Caha <sup>2</sup>, Tomáš Mrhálek <sup>3</sup>

<sup>1,2,3</sup>*Faculty of Corporate Strategy, Institute of Technology and Business in České Budějovice, Okružní, 517/10, 370 01 České Budějovice, Czech Republic*

E-mails: <sup>1</sup>[klementova@mail.vstecb.cz](mailto:klementova@mail.vstecb.cz); <sup>2</sup>[caha@mail.vstecb.cz](mailto:caha@mail.vstecb.cz); <sup>3</sup>[tmrhalek@mail.vstecb.cz](mailto:tmrhalek@mail.vstecb.cz)

*Received 14 February 2023; accepted 8 May 2023; published 30 June 2023*

**Abstract.** This article is based on an extensive longitudinal quantitative and qualitative analysis of a wide sample of Czech companies of various types and sizes. The focus is on the development of trends in employee motivation for education within Czech companies (N=1114) in the years 2016 and 2021. The aim is to analyse changes in the application of individual motives in time and to examine in detail their relationship to company size. Whereas the majority of current research into this topic examines the intrinsic motivation for education directly among employees, this article deals with the extrinsic sphere and concentrates on motivation strategies from the point of view of companies in the examined period and the effects of the Covid-19 pandemic. Three external motives for employee motivation were examined in detail, namely career growth, financial remuneration, and the inclusion of education in regular evaluations. The research results suggest that large companies pay greater attention to motivating their employees to participate in further education, and that regardless of company size, companies prefer using non-financial means to do so, which is in line with current trends.

**Keywords:** employee motivation; motivation for education; Covid-19 pandemic; competence; career growth; employee evaluation; company size category

**Reference** to this paper should be made as follows: Klementova, I., Caha, Z., Mrhálek, T. 2023. Changes in Employee Motivation for Education in Companies before and during the Covid-19 Pandemic. *Entrepreneurship and Sustainability Issues*, 10(4), 89-104. [http://doi.org/10.9770/jesi.2023.10.4\(6\)](http://doi.org/10.9770/jesi.2023.10.4(6))

**JEL Classifications:** I25, J24, M53, O15

**Additional disciplines:** Company management, human resources management

---

\* This paper was supported by the project IVSUPS003 Current Trends in Human Resource Management, Czech Republic

## 1. Introduction

A qualified workforce is one of the most important factors of competition (Almotairi, et al., 2019). Mabey, et al. (1998) consider permanent education to be one of the five key components of human resources management. If an organisation is to develop in today's highly competitive environment, it cannot do so without the continuous training and development of its employees (Snieska et al., 2020; Urbancová, et al., 2021). Employee education is a continuous process, which leads to the adaptation of and changes in the work behaviour, knowledge, skills levels and motivation of employees by means of various strategies, styles and methods (Depesova, et al., 2015). Employees can only be competent at their work if they have the skills that the particular organisation requires, for which permanent education directly within companies is key. The European Commission (2018) states that education in the workplace can make an important contribution to both the work and private lives of adults by maintaining and updating their knowledge and skills. Corporate education is an effective way for employers to update the skills of their employees, as well as motivate and retain them, thereby improving their competitiveness. The results of research conducted by Bernsteiner et al. (2013) show that in recent years, the importance of further education has grown for the majority of employees and that the management of competences is one of the ways in which companies can motivate employees to participate in further education initiatives. Goldstein (1992), in dealing with education among employees, emphasises the importance of motivation: "Before trainees can benefit from any form of training, they must be ready to learn. That is, they must have the particular background and experience necessary for being successful in the training programme and they must be motivated." In current research, the topic of further vocational education has primarily been explored from the point of view of intrinsic motivation (Pasaribu et al., 2022; Bartlett, 2001; Tharenou, 2001) in relation to the personality characteristics of an employee and their commitment to work (Bertolino, et al., 2011; Gavurova et al., 2022a).

One of the prerequisites for a business to succeed in a rapidly evolving world is the ability to respond to change. This was confirmed during the Covid-19 pandemic, with companies having to react to situations and problems they had never encountered before (Gavurova et al., 2022b). This also had a major impact on the field of human resources management, with the pandemic revealing how difficult it is to motivate people from afar, without personal, face-to-face contact, and not only in terms of their further education.

This notwithstanding, it is recognised that extrinsic motivation, in the form of company incentives, is also an important factor in motivating employees to undertake further education. We therefore set out to examine this issue in a sample set of Czech companies. The main focus being developments in various forms of motivation in the field of corporate education and how these have been affected by the Covid-19 pandemic.

The aim was to determine how the importance of motivational factors for employees to participate in further education have changed, and how this differs according to company size. For this purpose, the years 2016 and 2021 were selected, i.e. before and during the Covid-19 pandemic.

## 2. Theoretical background

The human capital of an organisation consists of the knowledge, skills and abilities the organisation can utilise to achieve its goals (Ahmad, et al., 2019). The people with the knowledge, skills and abilities that an organisation needs at a particular moment are not always available on the labour market. According to Balkova et al. (2022), the increasing degree of automation, and the interconnection of the digital and real worlds, creates an environment in which human creativity plays an essential role. Within this context, employee education is important. This can be understood to be a continuous process, which leads to the adaptation of and changes in the work behaviour, knowledge, skills levels and motivation of employees by means of various strategies, styles and methods (Depesova, et al., 2015; Stefko et al., 2017). Numerous studies deal with research that has been conducted into the influence of employee education on company performance (Birdi et al., 2008; Collier, et al., 2011; Garavan,

2012; Ključnikov et al., 2020). Rauch & Hatak (2016), in their meta-analysis of 56 studies focused on small and medium-sized enterprises (SMEs), showed that procedures for strengthening the human resource within companies correlated with improved company performance in all instances. Longitudinal analysis performed by Roca-Puig, et al. (2019) confirmed a two-way relationship between investment in human resources and profitability over time. It has been proven that employee education has an influence on company performance even in the case of managers (Aragon & Valle, 2013; Caha, 2017). The importance of education for the development of businesses was also confirmed by Moideenkutty, et al. (2011). Employees are holders of knowledge and experience, with the success of an organisation depending wholly on this and their creativity, attitude and performance (Belas et al., 2022, 2023). Hansen et al. (1999) argues that competitiveness is not only influenced by the achieved knowledge of employees, but also by the fact whether and how this knowledge is applied. Such knowledge also has to be shared within a company. Israilidis, et al. (2020) offer insight into what can happen if a company fails to share knowledge internally or has inefficient mechanisms for doing so.

Rowden & Conine (2005) studied employee education and concluded that it is an efficient means of improving employees' satisfaction with their work. According to their findings, employees that successfully complete training are also better able to satisfy the needs of their customers. In today's business environment, the success of a company depends to a significant extent on the competences and motivation of its employees. Maintaining the motivation and involvement of employees in order to achieve the required business results is a difficult task. According to Milic, et al. (2020), employee education is an important factor in the solution of this challenge.

Mahmoud et al. (2021) point out the differences between three generations of workers and the necessity to offer employees motivators that each generation appreciates in order to create and support a multigenerational workplace environment.

Research carried out by Deloitte (2018) showed that 48% of representatives of generation Z and 44% of representatives of generation Y consider education and development a very important factor. In contrast, a study by MetLife (2013), which dealt with generation X, makes no mention of education and development as being a motivational factor for this generation. The findings suggested that only a third of the representatives of generation X see insufficient development as a reason for dissatisfaction. Zientara (2009) states that older employees are motivated by the desire to improve their financial situation and to remain active. Employee education plays a positive role in the removal of work stereotypes among older employees and also increases their productivity (Appelbaum, et al., 2016; Kuba & Milichovský, 2019, Xu et al., 2020). Hitka, et al. (2018), through their research into motivational factors in the Czech Republic, Slovakia and Lithuania, found that there are differences linked to nationality, but not age. In Lithuania, unlike Slovakia and the Czech Republic, motivational factors linked to personal development and career were considered the most important. Ližbětínová, et al. (2017) identify differences in employee motivation related to gender.

Competence management positively affects the relationship with the employer and can therefore improve the motivation and the willingness of employees to perform. Training and other competence measures have an influence not only on personal development, but also on motivation (Mirsky, et al., 2013). Employee education is also linked to employability (Houben et al., 2019; Domaracká et al., 2020). By extension, the relationship with the employer influences staff turnover. The conditions created for knowledge sharing, and the inner motivation and confidence of employees are some of the factors that determine the level of staff turnover (Linhartová & Urbancová, 2011).

Zhang & Chen (2017) illustrate the positive effects of motivation for learning on the efficacy of the learning itself and the ability to innovate. Vanthournout, et al. (2014) examine the relationships between workplace environment/atmosphere, motivation and attitudes to learning. The research showed that both workplace environment/atmosphere and motivation directly influence the attitude to learning among employees. Tarábková

(2014) emphasises the importance of the approach of managers to corporate education and their ability to motivate their subordinates. The better employees are informed about the educational goals, the more they are involved and willing to transfer their knowledge in practice. Verswijvel, et al. (2016) deal with the relationship between employee motivation to participate in formal educational activities, the character of their goals and their learning.

The workplace environment is an important factor affecting the results of employee education. The term workplace environment can include factors such as managerial support, opportunities to apply learnt skills, support from colleagues, technical support, etc. (Colquitt, et al., 2000; Burke & Hutchins, 2008; Kontoghiorghes, 2001; Lim & Morris, 2006; Martin, 2010; Krajčik, 2022). According to Puhakka, et al. (2021), the greater the attention paid to the learning environment within the workplace, the greater the satisfaction of an employee's basic psychological needs. An employee's motivation or desire to change their behaviour is closely related to their ability to gain and successfully transfer a target ability. Employees with a high self-efficacy level are usually more motivated and achieve greater study success (Chiaburu & Marinova, 2005).

Diamantidis & Chatzoglou (2019) prove that workplace environment and management support have the strongest impacts (direct and indirect) on work performance, with adaptability and inner motivation directly influencing work performance. McLoughlin & Jennings (2018) remind us that when talking about employee motivation for education, it is important not to forget that the quality of educational services is also an important motivating factor.

At present, corporate education is going through a process of huge change in relation to the Covid-19 pandemic, with the rapid introduction of new trends and digitalization (Ejdys & Kozłowska, 2021; Skare & Riberio Soriano, 2022; Chen et al., 2022; Wang et al., 2022). For example, numerous companies are embracing the advantages of online education. Gregorc (2015) points out that new forms of education and training are making it possible to rationalise educational processes and motivate employees to get involved in self-study and pass on their knowledge to others.

Increasing labour mobility requires the time- and place-independent transfer of knowledge. The quality of corporate education reflects the implementation and use of new technologies in the education of adults. These technologies make the learning process more intensive and active, and contribute to the quick achievement of positive results (Decker et al., 2016; Vaganova, et al., 2020; Szostek et al., 2020). The approach to relevant educational content in situations when employees need it leads to greater flexibility and motivation in employees. Companies are aware of the necessity to introduce adequate learning methods to strengthen the motivation of employees. Methods like learning through practice, computer simulation and virtual reality support the acquisition of knowledge by employees and also improves their awareness of the opportunities to improve themselves (Stadnicka et al., 2019). Companies can also apply distance education, which can deliver both time and cost savings for employees and the employer (Ananchenkova & Ponomareva, 2016).

The application of new trends in education, like gamification, improves the motivation of employees. Gamification can be utilised to support motivation and engagement in the workplace (Miri & Macke, 2021).

The education of employees traditionally focused on the provision of a huge quantity of information in a short period of time. The use of modern methods, like microlearning, enables employees to learn in short time intervals with just-in-time information, which is always accessible and within arms reach (Siminovich & Provost, 2020). It has been proven that the utilisation of new methods contributes to increasing employee motivation for education. However, even if this is true, it is necessary that the motivation and first impulse comes from company management. The choice of suitable managers and human resources management also play an important role in the motivation and drive for knowledge sharing (Caha & Urban, 2020; Matoskova, et al., 2013). Randall et al.

(2021) emphasise the key role that organisations play in supporting the permanent education of their employees, particularly in times of crisis. Companies can utilise numerous tools to motivate their employees to acquire and extend their knowledge.

**Research objectives, methodology and data**

The aim was to determine how the importance of motivational factors for employees to participate in education have changed in a particular time period, and how this differs according to company size (on the basis of the number of employees). The analysis utilises the results of a repeated questionnaire survey conducted among companies in the years 2016 and 2021. The questionnaire was sent to HR officers of companies based in the Czech Republic (stratified random sampling).

The following research questions were formulated:

RQ1: What is the frequency of the selected extrinsic motives for employees to participate in further education in Czech companies and how do these differ according to company size?

RQ2: To what extent has employee motivation for education changed in the Czech Republic between 2016 and 2021?

The sample set (N=1114) consisted of 607 companies in 2016 and 507 in 2021. The companies were divided into four groups: micro companies (1-9 employees); small companies (10-49 employees); medium-sized companies (50-249 employees); large companies (250 or more employees). The 2016 sample set consisted of 142 (23.4%) micro companies, 180 (29.7%) small companies, 163 (26.9%) medium-sized companies and 122 (20.1%) large companies. The 2021 sample set consisted of 130 (25.6%) micro companies, 139 (27.4%) small companies, 109 (21.5%) medium-sized companies and 129 (25.4%) large companies. The structure of the sample sets for both years are presented in Table 1.

The statistical analysis was carried out using IBM SPSS 24 software. The following aspects of employee motivation for education were used as the dependent variables: career growth, financial remuneration and inclusion of education in regular evaluations. These factors were chosen on the basis of research carried out into employee motivation (Bercu, 2015; Ferguson & Reio, 2010; Hitka & Balážová, 2015; Kakhovska et al., 2018; Ng & Dastmalchian, 2011). The statistical processing was carried out by means of an independence analysis in contingency tables. This was done according to company size and the difference between the data for 2016 and 2021 by means of a Chi-square test and Cramer's test for nominal dependent variables.

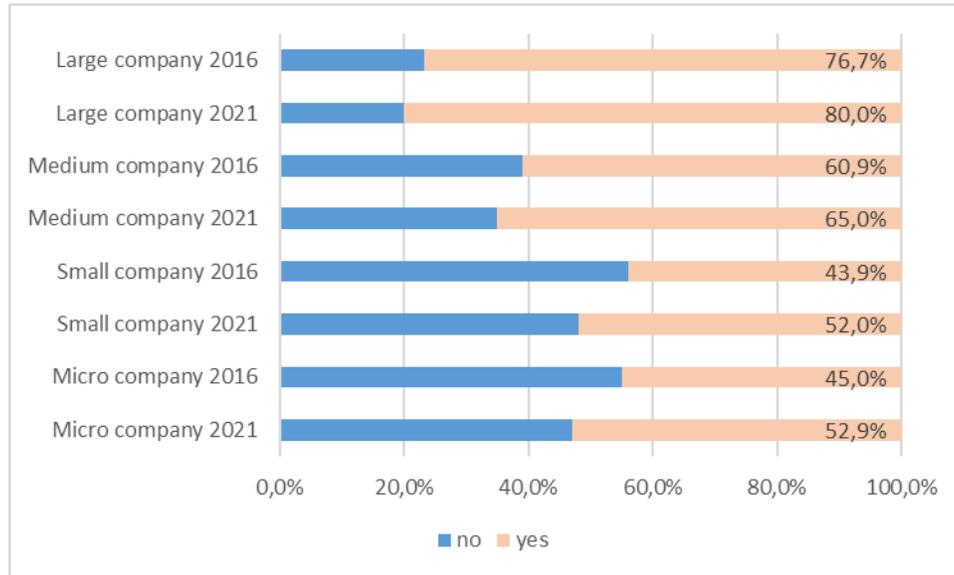
Company type	No. of companies 2016	No. of companies 2021
Micro company (1-9 employees)	142	130
Small company (10-49 employees)	180	139
Medium-sized company (50-249 employees)	163	109
Large company (250 or more employees)	122	129
Total	607	507

**Table 1.** The number of companies by size in the sample sets for 2016 and 2021

Source: authors

**Results and discussion**

Figure 1 shows the change (between 2016 and 2021) in the number of companies (by size) that utilise a motivational system to encourage employees to undertake education. The connection between employee education and the presence of a motivation system is the strongest in large companies (in 80% of large companies in 2016 and in 76.7% of the companies in 2021), followed by medium-sized companies (65% in 2016 and 60.9% in 2021, respectively). In contrast, this is lower, but stable, in small and micro companies.



**Fig. 1.** The numbers of companies utilising a motivation system to encourage employee education  
*Source:* authors

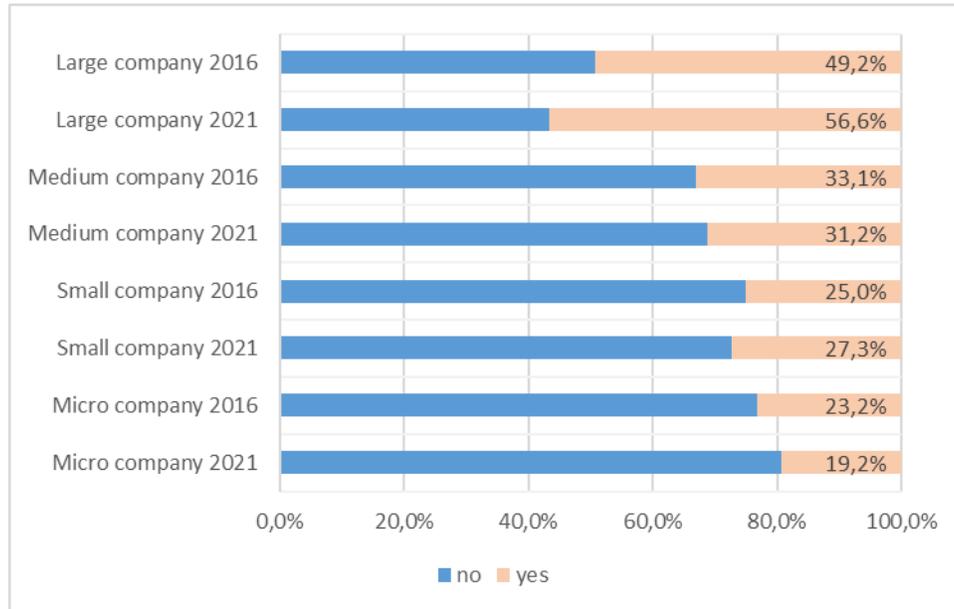
The selected motivational factors that encourage employees to undertake education, namely career growth, financial remuneration, and the inclusion of education in regular evaluations, were used as partial variables.

***Career growth as motivational factor***

The results for 2016 show that there is a difference in the utilisation of the motive of career growth to encourage employees to participate in further education according to company size ( $\chi^2 = 25.827$ ;  $p < 0.001$ ). Micro companies reported that this applied to 23.2% of cases, small companies to 25.0% of cases, medium-sized companies to 33.1% of cases, and large companies to 49.2% of cases. Cramer’s coefficient of association reached the value of  $V=0.250$ .

The difference to the previous sample set was confirmed in 2021 ( $\chi^2 = 45.360$ ;  $p < 0.001$ ). Micro companies reported that the motive of career growth to encourage employees to participate in further education applied in 19.2% of cases, with small companies reporting the same in 27.3% of cases, medium-sized companies in 31.2% of cases, and large companies in 56.6% of cases. This upward trend was confirmed by Cramer’s coefficient of association ( $V = 0.299$ ;  $p < 0.001$ ), which signals a partial growth in the relationship between company size and career growth as a motivational factor for participating in further education in the examined years.

A partial analysis of the survey results was undertaken of whether career growth, as a motivational factor for participating in further education, changed between 2016 and 2021. Despite the fact that partial differences were recorded in relation to company size, in particular the recorded growth thereof in large companies (from 49.2% in 2016 to 56.6% in 2021 – see Figure 2), the analysis, on the basis of the calculated Chi-square value, revealed no statistically significant difference for any of the company categories (by size).



**Fig. 2.** The numbers of companies utilising the motive of career growth to support employee education.  
 Source: authors

***Financial remuneration as motivational factor***

Figure 3 shows the numbers of companies utilising the motive of financial remuneration to encourage employees to participate in further education. The 2016 results revealed no significant difference according to company size ( $\chi^2 = 1.726$ ;  $p = 0.631$ ). Micro companies reported that the motive of financial remuneration to encourage employees to participate in further education applied in 23.9% of cases, with small companies reporting that this applied in 27.8% of the cases, medium-sized companies in 22.7% of cases, and large companies in 22.1% of cases. The 2021 results revealed a difference according to company size ( $\chi^2 = 12.57$ ;  $p < 0.01$ ). While micro companies reported that the motive of financial remuneration to encourage employees to participate in further education applied in 20.0% of cases, small companies reported that this applied in 12.2% of cases, medium-sized companies in 23.9% of cases, and large companies in 29.5% of cases. The change between the examined years was statistically significant (Chi-square = 11.427;  $p < 0.001$ ) for small companies, where a drop from 27.8% to 12.2% was reported.

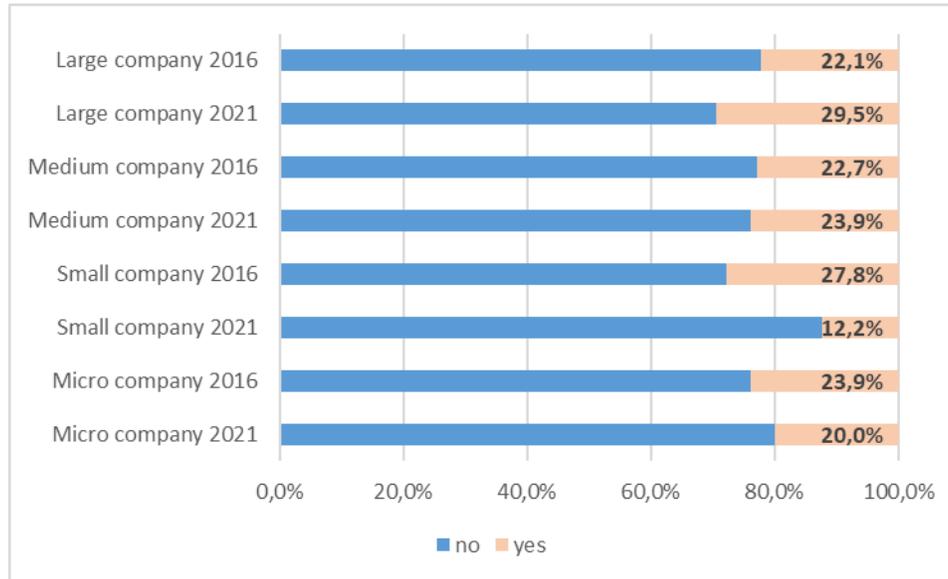


Fig. 3. The numbers of companies utilising the motive of financial remuneration to support employee education.

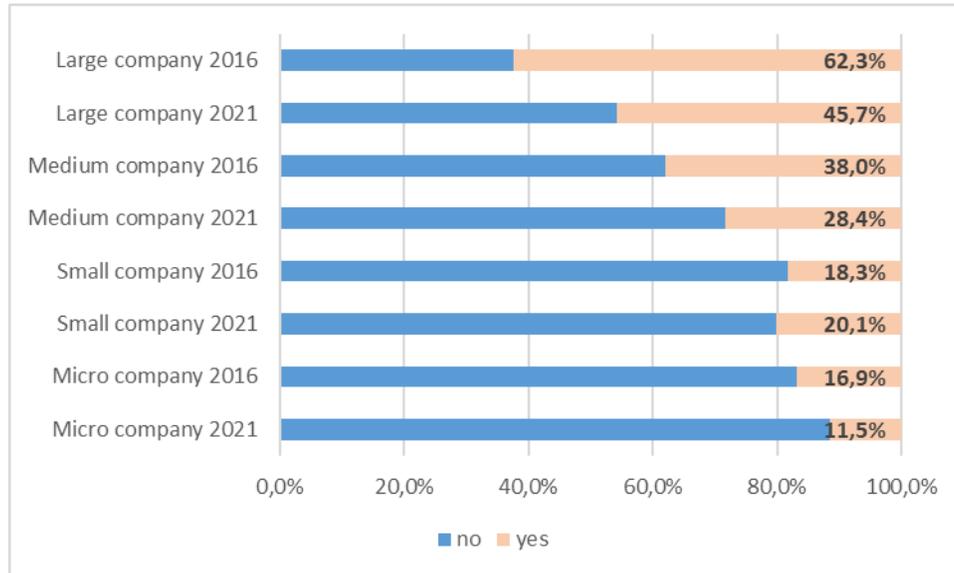
Source: authors

***Inclusion of education in regular evaluations as motivational factor***

The 2016 results show significant differences in the utilisation of the motive of inclusion of education in regular evaluations to encourage employees to participate in further education according to company size ( $\chi^2 = 84.36$ ;  $p < 0.001$ ). While micro companies reported that this applied in 16.9% of cases, small companies reported that this applied in 18.3% of cases, medium-sized companies in 38.0% of cases, and large companies in 62.3% of cases. Cramer’s coefficient of association reached the value of  $V=0.329$  ( $p < 0.001$ ).

Likewise, the 2021 results show a significant difference according to company size ( $\chi^2 = 42.80$ ;  $p < 0.001$ ). Figure 4 shows the frequencies with which companies utilise the aforementioned motive to support employee education. While micro companies reported that this applied in 11.5% of cases, small companies reported that this applied in 20.1% of cases, medium-sized companies in 28.4% of cases, and large companies in 45.7% of cases. Cramer’s coefficient of association slightly decreased in comparison to that for the previous data set ( $V = 0.291$ ;  $p < 0.001$ ).

A statistically significant change ( $\chi^2=6.916$ ;  $p<0.001$ ) was registered between the two examined years for large companies, with the value growing by 16.6%.



**Fig. 4.** The numbers of companies utilising the motive of inclusion of education in regular evaluations to support employee education.  
*Source:* authors

This article focuses on the development of trends in employee motivation in Czech companies in 2016 and 2021, in particular with regards to the roles of career growth, financial remuneration, and the inclusion of education in regular evaluations. The research includes a relatively large sample set of companies operating in the Czech Republic (N=1114), which provides a balanced sample for partial comparisons on the basis of company characteristics, in this case, company size. Kang (2007) found a close relationship between the perceivable benefits resulting from education and motivation and actual participation in such activities. However, his primary focus was on intrinsic motivation. In contrast, this study focuses on extrinsic motivation, i.e. the external incentives of companies. The companies reported that the main motivational factors for employees to participate in further education were career growth and the inclusion of education in regular evaluations. Of the three motivational factors analysed, financial remuneration was referred to the least, with the frequency thereof significantly differing according to company size, and significantly changing over time. The latter is evidenced by the significant drop in interest in financial remuneration as a motivational factor reported by small companies and the growth thereof noted by large companies.

The motivational factor career growth also significantly differed according to company size, and in both the examined years, with the associated trend even growing in 2021 ( $V=0.30$ ) compared to 2016 ( $V=0.25$ ). Despite the fact that the data show that the importance of career growth as a motivational factor grew in large companies between the examined years, a statistically significant change over time was not proven for any of the company size categories. Kakhovska, et al. (2018) characterise career growth as an important motivational factor, one that enables a balance to be achieved between the interests of the company and those of the employee. Major, et al. (2006) identified this trend early on, when further education was just starting to become an important part of an employee’s need for career growth. It is precisely in this motive that the highest interconnection exists between the extrinsic motivation of a company and the intrinsic motivation of an employee, whereby the company cultures of large companies enable the development of this individual motivation and the manifestation thereof, and in small companies, where career growth is limited and not wholly supported, signs of demotivation can appear.

The increase in 2021, in the identification of career growth in large companies as a motivational factor for employees to participate in further education is remarkable. Son & Kim (2019) corroborate this by confirming the

importance of the manager as a model for career development. Ellström & Ellström (2018) claim there is a strong need for training and development of first-line managers in order to improve their knowledge and skills in leadership and workplace organisation. Bhaskar, et al. (2021) state that continuous education has a positive impact on employee career growth and development.

The research at the heart of this article shows how motivational factors have changed over time. In 2021, financial remuneration as a means of supporting employee education proved to be statistically significant in small companies.

In 2021, the number of large companies that included education in regular evaluations fell. This is unfortunate and may take its toll in the future. As Depesova, et al. (2015) state, evaluation of the efficacy of employee education is an important part of the process of learning in professional practice.

We can assume that the situation around the Covid-19 global pandemic will have had an effect in companies and on employees with regards to the motivation to participate in further education (Liu et al., 2021; Al-Omouh et al., 2022). Riddell, et al. (2009), on the basis of the results of their research during crises, suggest that companies approach lifelong education with a certain degree of scepticism, and that at the end of the day they prioritise profitability over the individual development of employees, a philosophy that might reasonably be expected to apply to the time of the Covid-19 pandemic. On the contrary, Randall, et al. (2021) emphasises the key role that an organisation plays in the support of the permanent education of their employees, specifically in times of crises. Rapid organisational changes related to the pandemic and the switch to home office have brought new requirements, which have been reflected in employee education. The results of the study by Gołąb & Będzik (2018) indicate that there is a relationship between certain dimensions of well-being at work and motivation to undertake additional learning activities. Horáková & Maršíková (2021), in their probe into small and medium-sized Czech companies, identify support for knowledge management and knowledge sharing, although differences exist between the level of support for individual activities and the structure thereof. The requirement to acquire new skills as part of social-labour changes may have become more evident as a result of the transition from external motivation to the need for education as a part of changes in the workplace environment. As no suitable comparative data are available for the presented results, it is not possible to compare the results of this research. This research is designed to be the first part into this area. Further research is expected to focus on the V4 countries.

### **3. Conclusions**

The article deals with the extrinsic motivation of employees to participate in further education and trends within Czech companies between 2016 and 2021. It examines the relationships between individual motives for employees to participate in further education, namely career growth, financial remuneration, and the inclusion of education in regular evaluations, and company size. The inclusion of education in regular evaluations as a motivational factor differed according to company size, with large companies reporting the highest values, but with the association slightly decreasing between the examined years (from  $V=0.329$  in 2016 to  $V=0.291$  in 2021). The differences between the two years proved to be statistically significant in large companies, where the value decreased from 62.3% to 45.2% of companies that include education in regular evaluations.

A relationship to company size was also found for career growth as a motivational factor to participate in further education. The highest growth was recorded in large companies (from 49.4% in 2016 to 56.6% in 2021). However, only insignificant differences occurred over time.

The least important motivational factor was financial remuneration. In 2015, the frequency did not differ according to company size. The statistically significant difference found in 2021 was linked to a strong drop within small companies from 27.8% to 12.2%.

The research results suggest that large companies pay greater attention to motivating their employees to participate in further education than companies in other size categories. Furthermore, it follows from the results that regardless of size, companies prefer to utilise non-financial means to motivate their employees to participate in further education, which is in line with current trends. Based on the research results, the managements of micro, small, and medium-sized companies are recommended to focus more on motivating employees to participate in further education. This recommendation is in line with numerous studies on this issue, according to which, employees are looking for employers who support their professional as well as personal development and appreciate them. Employee motivation for education therefore generates a competitive advantage for a company in all areas of its activities.

## References

- Adam, A., & Rachman-Moore, D. (2004). The Methods Used to Implement an Ethical Code of Conduct and Employee Attitudes. *Journal of Business Ethics*, 54(3), 225-244. <https://doi.org/10.1007/s10551-004-1774-4>
- Ahmad, N., Shamsuddin A, Seman, N. A. A. (2019). Industry 4.0 implications on human capital: A review. *Journal for Studies in Management and Planning*, 4(3), 221-235.
- Almotairi, M., Alyami, M., & Song, Y.-T. (2019). Enhance employees' competences through customized learning. Proceedings of the 10th International Conference on E-Education, E-Business, E-Management and E-Learning - IC4E '19, 42-47. <https://doi.org/10.1145/3306500.3306521>
- Al-Omouh, K. S., Ribeiro-Navarrete, S., Lassala, C., & Skare, M. (2022). Networking and knowledge creation: Social capital and collaborative innovation in responding to the COVID-19 crisis. *Journal of Innovation & Knowledge*, 7(2), 100181. <https://doi.org/10.1016/j.jik.2022.100181>
- Ananchenkova, P. & Ponomareva, E. (2016). Distance learning technologies in corporate training: Experience by Russian companies, The 12th International Scientific Conference eLearning and Software for Education Bucharest, 292-295. <https://doi.org/10.12753/2066-026X-16-129>
- Appelbaum, S. H., Wenger, R., Pachon Buitrago, C., & Kaur, R. (2016). The effects of old-age stereotypes on organizational productivity (part One). *Industrial and Commercial Training*, 48(4), 181-188. <https://doi.org/10.1108/ict-02-2015-0015>
- Aragon, I. B., & Valle, R. S. (2013). Does training managers pay off? *The International Journal of Human Resource Management*, 24(8), 1671-1684. <https://doi.org/10.1080/09585192.2012.725064>
- Balková, M., Lejsková, P., & Ližbetinová, L. (2022). The values supporting the creativity of employees. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.805153>
- Bartlett, K. R. (2001). The relationship between training and organizational commitment: A study in the health care field. *Human Resource Development Quarterly*, 12(4), 335. <https://doi.org/10.1002/hrdq.1001>
- Bercu, A.M. (2015). Performance and promotion of firm's employees. An empirical research. International Conference on Euro and the European Banking System-Evolutions and Challenges, 602-609.
- Bernsteiner, R. Mirski, P.J. Zangerl, T., & Groth, A. (2013) Competency management as a basis for further education in the Workplace. INTED2013 Proceedings 7th International Technology, Education and Development Conference Valencia, Spain, 6085-6092.
- Bertolino, M., Truxillo, D. M., & Fraccaroli, F. (2011). Age as moderator of the relationship of proactive personality with training motivation, perceived career development from training, and training behavioral intentions. *Journal of Organizational Behavior*, 32(2), 248-263. <https://doi.org/10.1002/job.670>
- Bhaskar, P., Joshi, A., & Chopra, G. (2021). Career growth and development: The buzzword is continuing education. *International Journal of Knowledge and Learning*, 14(1), 39. <https://doi.org/10.1504/ijkl.2021.115031>

- Belas, J., Gavurova, B., Kubak, M., & Novotna, A. (2023). Risk management level determinants in Visegrad countries—sectoral analysis. *Technological and Economic Development of Economy*, 29(1), 307-325. <https://doi.org/10.3846/tede.2023.18415>
- Belas, J., Škare, M., Gavurova, B., Dvorsky, J., & Kotaskova, A. (2022). The impact of ethical and CSR factors on engineers' attitudes towards SMEs sustainability. *Journal of Business Research*, 149, 589-598. <https://doi.org/10.7441/joc.2022.02.02>
- Birdi, K., Clegg, C., Patterson, M., Robinson, A., Stride, C., Wall, T. D., & Wood, S. (2008). The impact of human resource and operational management practices on company productivity: A longitudinal study. *Personnel Psychology*, 61(3), 467-501. <https://doi.org/10.1111/j.1744-6570.2008.00136.x>
- Burke, L. A., & Hutchins, H. M. (2008). A study of best practices in training transfer and proposed model of transfer. *Human Resource Development Quarterly*, 19(2), 107-128. <https://doi.org/10.1002/hrdq.1230>
- Büsch, V., Bruschi, M., & Thieme, P. (2015). The role of continuing training motivation for work ability and the desire to work past retirement age. *European Journal for Research on the Education and Learning of Adults*, 6(1), 25-38. <https://doi.org/10.3384/rela.2000-7426.rela0150>
- Caha, Z., & Urban, J. (2020). Human Resource Management in SMEs in the Czech Republic – specifics and key requirements. *SHS Web of Conferences*, 73, 02001. <https://doi.org/10.1051/shsconf/20207302001>
- Caha, Z. (2017). Exploitation of External Financial Resources for Corporate Training Purposes in the Czech Republic. *Littera Scripta* 10(1), 10-21.
- Chen, S., Xu, Z., & Skare, M. (2022). The impact of COVID-19 on the service business industry: insights from a bibliometric review. *Total Quality Management & Business Excellence*, 1-35. <https://doi.org/10.1080/14783363.2022.2078188>
- Chiaburu, D. S., & Marinova, S. V. (2005). What predicts skill transfer? An exploratory study of goal orientation, training self-efficacy and organizational supports. *International Journal of Training and Development*, 9(2), 110-123. <https://doi.org/10.1111/j.1468-2419.2005.00225.x>
- Collier, W., Green, F., Kim, Y.-B., & Peirson, J. (2011). Education, training and economic performance: Evidence from establishment survival data. *Journal of Labor Research*, 32(4), 336-361. <https://doi.org/10.1007/s12122-011-9116-7>
- Colquitt, J. A., LePine, J. A., & Noe, R. A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology*, 85(5), 678-707. <https://doi.org/10.1037/0021-9010.85.5.678>
- Decker, J., Schulte, B., & Schumann, M. (2016). Supporting education and training in organizations through Mobile Micro Learning. INTED2016 Proceedings. <https://doi.org/10.21125/inted.2016.1777>
- Deloitte. (2018). Deloitte Millennial Survey: Millennials disappointed in business, unprepared for Industry 4.0. Available at <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/About-Deloitte/gx-2018-millennial-survey-report.pdf>.
- Denkowska, S., Fijorek, K., & Wegrzyn, G. (2020). Formal and non-formal education and training as an instrument fostering innovation and competitiveness in EU member countries. *Journal of Competitiveness*, 12(3), 82-98. <https://doi.org/10.7441/joc.2020.03.05>
- Depesova, J., Turekova, I., & Banesz, G. (2015). Lifelong learning in the professional practice. 2015 International Conference on Interactive Collaborative Learning (ICL). <https://doi.org/10.1109/icl.2015.7318145>
- Diamantidis, A. D., & Chatzoglou, P. (2019). Factors affecting employee performance: An empirical approach. *International Journal of Productivity and Performance Management*, 68(1), 171-193. <https://doi.org/10.1108/ijppm-01-2018-0012>
- Domaracká, L., Taušová, M., Čulková, K., Pavolová, H., Bakalár, T., Seňová, A., Shejbalo– Muchová, M., Teplická, K. and Kowal, B. (2020). Interdependence of mining industry and industrial sectors in Slovakia. *Acta Montanistica Slovaca*, 25(4), 494-503. <https://doi.org/10.46544/AMS.v25i4.05>
- European Commission, Directorate-General for Employment, Social Affairs and Inclusion. (2018). Promoting adult learning in the workplace: final report of the ET 2020 working group 2016–2018 on adult learning. <https://data.europa.eu/doi/10.2767/865359>

- Ellström, E., & Ellström, P.-E. (2018). Two modes of learning-oriented leadership: A study of first-line managers. *Journal of Workplace Learning*, 30(7), 545-561. <https://doi.org/10.1108/jwl-03-2018-0056>
- Ejdys, J., & Kozłowska, J. (2021). Acceptance of e-learning at university level during the COVID-19 pandemic situation-teachers' and students' perspective. *Polish Journal of Management Studies*, 23(2), 106-129. <https://doi.org/10.17512/pjms.2021.23.2.07>
- Fajčíková, A., & Urbancová, H. (2017). The role of organizations in lifelong learning and development. *Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis*, 65(2), 621-630. <https://doi.org/10.11118/actaun201765020621>
- Ferguson, K. L., & Reio, T. G. (2010). Human Resource Management Systems and firm performance. *Journal of Management Development*, 29(5), 471-494. <https://doi.org/10.1108/02621711011039231>
- Garavan, T. N. (1997). Training, development, education and learning: Different or the same? *Journal of European Industrial Training*, 21(2), 39-50. <https://doi.org/10.1108/03090599710161711>
- Gavurova, B., Schönfeld, J., Bilan, Y., & Dudáš, T. (2022a). Study of the differences in the perception of the use of the principles of corporate social responsibility in micro, small and medium-sized enterprises in the V4 countries. *Journal of Competitiveness*, 14(2), 23-40. <https://doi.org/10.7441/joc.2022.02.02>
- Gavurova, B., Kelemen, M., & Polishchuk, V. (2022b). Expert model of risk assessment for the selected components of smart city concept: From safe time to pandemics as COVID-19. *Socio-Economic Planning Sciences*, 82, 101253. <https://doi.org/10.1016/j.seps.2022.101253>
- Gołąb, S., & Będzik, B. (2018). Well-being as experienced in the context of an organisation and motivation to improve professional qualifications. *Economic Sciences for Agribusiness and Rural Economy*, 319-325. <https://doi.org/10.22630/esare.2018.2.43>
- Gregorc, C. (2015). Employee motivation for education (film, role-play). EDULEARN 2015: 7th International Conference on Education and New Learning Technologies, 2967-2971.
- Hitka, M., & Balážová, Ž. (2015). Comparison of motivation level of service sector employees in the regions of Slovakia and Austria. *Procedia Economics and Finance*, 23, 348-355. [https://doi.org/10.1016/s2212-5671\(15\)00393-7](https://doi.org/10.1016/s2212-5671(15)00393-7)
- Hitka, M., Balážová, Ž., Gražulis, V., & Lejsková, P. (2018). Determinants of employee motivation in Slovakia, Lithuania and the Czech Republic 10 years after joining the European Union. *Engineering Economics*, 29(5). <https://doi.org/10.5755/j01.ee.29.5.13953>
- Houben, E., De Cuyper, N., Kyndt, E., & Forrier, A. (2019). Learning to be employable or being employable to learn: The reciprocal relation between perceived employability and work-related learning. *Journal of Career Development*, 48(4), 443-458. <https://doi.org/10.1177/0894845319867431>
- Horáková, T., & Maršíková, K. (2021). Importance of knowledge management in COVID-19 pandemic: A case of small and medium-sized enterprises. In A. U. Ujwary-Gil & B. Godlewska-Dzioboń, Challenges in Economic Policy, Business and Management in the COVID-19 Era, 79-105. Institute of Economics, Polish Academy of Sciences.
- Israilidis, J., Siachou, E., & Kelly, S. (2020). Why organizations fail to share knowledge: An empirical investigation and opportunities for improvement. *Information Technology & People*, 34(5), 1513-1539. <https://doi.org/10.1108/itp-02-2019-0058>
- Kakhovska, O., Lositska, T., & Kolesnikova, K. (2018). Economic efficiency of investments into personnel development of enterprises. *Baltic Journal of Economic Studies*, 4(3), 115-122. <https://doi.org/10.30525/2256-0742/2018-4-3-115-122>
- Ključnikov, A., Civelek, M., Krajčík, V. and Ondrejmišková, I. (2020). Innovative Regional Development of the Structurally Disadvantaged Industrial Region by the Means of the Local Currency. *Acta Montanistica Slovaca*, 25 (2), 224-235. <https://doi.org/10.46544/AMS.v25i2.9>
- Kontoghiorghes, C. (2001). Factors affecting training effectiveness in the context of the introduction of new technology—a US case study. *International Journal of Training and Development*, 5(4), 248-260. <https://doi.org/10.1111/1468-2419.00137>
- Kuba, K., & Milichovský F. (2019). Industry 4.0 and its impact on employees' age. *Littera Scripta*, 12(1), 77-88.

Krajčík, V. (2022). Digitalization of SMEs and their perceptions regarding public interventions and supports of digitalization: Evidence from mining and iron industries. *Acta Montanistica Slovaca*, 27 (1), 100-116 <https://doi.org/10.46544/AMS.v27i1.08>

Lim, D. H., & Morris, M. L. (2006). Influence of trainee characteristics, instructional satisfaction, and organizational climate on perceived learning and Training transfer. *Human Resource Development Quarterly*, 17(1), 85-115. <https://doi.org/10.1002/hrdq.1162>

Linhartová, L., & Urbancová, H. (2011). Employee turnover and maintaining knowledge continuity in large and small organisations. *Central European Review of Economic Issues*, 14(4), 265-274. <https://doi.org/10.7327/cerei.2011.12.03>

Liu, N., Xu, Z., & Skare, M. (2021). The research on COVID-19 and economy from 2019 to 2020: analysis from the perspective of bibliometrics. *Oeconomia Copernicana*, 12(2), 217-268. <https://doi.org/10.24136/oc.2021.009>

Ližbetinová, L., Hitka, M., Li, C., & Caha, Z. (2017). Motivation of employees of Transport and logistics companies in the Czech Republic and in a selected region of the PRC. *MATEC Web of Conferences*, 134, 00032. <https://doi.org/10.1051/mateconf/201713400032>

Mahmoud, A. B., Fuxman, L., Mohr, I., Reisel, W. D., & Grigoriou, N. (2020). “We aren't your reincarnation!” workplace motivation across X, y and Z generations. *International Journal of Manpower*, 42(1), 193-209. <https://doi.org/10.1108/ijm-09-2019-0448>

Major, D. A., Turner, J. E., & Fletcher, T. D. (2006). Linking proactive personality and the big five to motivation to learn and development activity. *Journal of Applied Psychology*, 91(4), 927-935. <https://doi.org/10.1037/0021-9010.91.4.927>

Martin, H. J. (2010). Improving training impact through effective follow-up: Techniques and their application. *Journal of Management Development*, 29(6), 520-534. <https://doi.org/10.1108/02621711011046495>

Matoskova, J., Mikeska, M., Polcakova, M., Sobotkova, E., Jurasek, M., & Banarova, M. (2013). Knowledge Sharing as a Competitive Advantage of SMEs. In 22nd International-Business-Information-Management-Association Conference on Creating Global Competitive Economies: 2020 Vision Planning and Implementation, 856-869.

Mc Loughlin, C., & Jennings, M. (2018). Life-long learning – motivation and participation in continuing professional development: The case of adult education tutors. In 12th International Technology, Education and Development Conference, Valencia, Spain. <https://doi.org/10.21125/inted.2018.1493>

MetLife (2013). The MetLife Study of Gen X: The MTV Generation Moves into Mid-Life. MetLife Mature Market Institute. Available at <https://documentacion.fundacionmapfre.org/documentacion/publico/en/bib/156488.do?queryId=28431&position=11&>

Milic, D.C.; Pavic, D. & Mandic, B. (2020). Training methods in municipal enterprises, *Ekonomski Vjesnik*, 33(1), 71-82.

Miri, D. H., & Macke, J. (2021). Gamification, motivation, and engagement at work: A qualitative multiple case study. *European Business Review (ahead of print)*. <https://doi.org/10.1108/eb-04-2020-0106>

Mirski P., Bernsteier R., Zangerl T., & Groth A. (2013). Competency management as a basic for further education in the workplace. Paper presented at 7th annual International Conference on Education and New Learning Technologies, Barcelona, Spain.

Moideenkutty, U., Murthy, Y. S. R., & Al-Lamky, A. (2016). Localization HRM practices and financial performance: Evidence from the Sultanate of Oman. *Review of International Business and Strategy*, 26(3), 431-442. <https://doi.org/10.1108/ribs-12-2014-0123>

Ng, I., & Dastmalchian, A. (2011). Perceived training benefits and training bundles: A Canadian study. *The International Journal of Human Resource Management*, 22(4), 829-842. <https://doi.org/10.1080/09585192.2011.555126>

Pasaribu, F., Muzakir, Pratama, K., Yusrita, & Yuliaty, T. (2022). Impact of the university creative management on the students enterprising performance. *Polish Journal of Management Studies*, 25(2), 234-246. <https://doi.org/10.17512/pjms.2022.25.2.15>

Puhakka, I. J., Nokelainen, P., & Pylväs, L. (2021). Learning or leaving? individual and environmental factors related to job satisfaction and turnover intention. *Vocations and Learning*, 14(3), 481-510. <https://doi.org/10.1007/s12186-021-09275-3>

Randall, J. G., Brooks, R. R., & Heck, M. J. (2021). Formal and informal learning as deterrents of turnover intentions: Evidence from frontline workers during a crisis. *International Journal of Training and Development*, 25(4). <https://doi.org/10.1111/ijtd.12254>

Rauch, A., & Hatak, I. (2016). A meta-analysis of different HR-enhancing practices and performance of small and medium sized firms. *Journal of Business Venturing*, 31(5), 485-504. <https://doi.org/10.1016/j.jbusvent.2016.05.005>

Riddell, S., Ahlgren, L., & Weedon, E. (2009). Equity and lifelong learning: Lessons from workplace learning in Scottish smes. *International Journal of Lifelong Education*, 28(6), 777-95. <https://doi.org/10.1080/02601370903293252>

Roca-Puig, V., Bou-Llusar, J. C., Beltrán-Martín, I., & García-Juan, B. (2018). The virtuous circle of Human Resource Investments: A precrisis and postcrisis analysis. *Human Resource Management Journal*, 29(2), 181-198. <https://doi.org/10.1111/1748-8583.12213>

Rowden, R. W., & Conine, C. T. (2005). The impact of workplace learning on job satisfaction in small US commercial banks. *Journal of Workplace Learning*, 17(4), 215-230. <https://doi.org/10.1108/13665620510597176>

Siminovich, C., & Provost, G. (2020). Modernize learning with AI, XR and microlearning. Presentation on Global Congress on Process Safety, 17-21.

Skare, M., & Riberio Soriano, D. (2022). Explaining COVID-19 shock wave mechanism in the European service industry using convergence clubs analysis. *Service Business*, 16, 283-307. <https://doi.org/10.1007/s11628-021-00471-8>

Snieska, V., Navickas, V. Grencikova, A., Safrankova, J.M, & Sikyr, M. (2020). Fundamental Human Resource Management Practices Aimed at Dealing with New Challenges in the Labour Market. *Transformations in Business & Economics*, Vol. 19, No 2 (50), pp.38-51

Son, S. J., & Kim, D.-Y. (2019). Organizational career growth and career commitment: Moderated mediation model of work engagement and role modeling. *The International Journal of Human Resource Management*, 32(20), 4287-4310. <https://doi.org/10.1080/09585192.2019.1657165>

Stadnicka, D., Litwin, P., & Antonelli, D. (2019). Human factor in industry of the Future: Knowledge Acquisition and motivation. *FME Transactions*, 47(4), 823-830. <https://doi.org/10.5937/fmet1904823s>

Szostek, D., Balcerzak, A., P., & Rogalska, E. (2020). The relationship between personality, organizational and interpersonal counterproductive work challenges in industry 4.0. *Acta Montanistica Slovaca*, 25 (4), 577-592. <https://doi.org/10.46544/AMS.v25i4.11>

Štefko, R., Bačík, R. Fedorko, R., Gavurová, B., Horváth, J., & Propper, M. (2017). Gender Differences in the Case of Work Satisfaction and Motivation, *Polish Journal of Management Studies*, 16(1), 215-225. <https://doi.org/10.17512/pjms.2017.16.1.18>

Tarábková, L. (2014). Model of motivating linked-up with education. *Entrepreneurship and Sustainability Issues*, 2(1), 12-18. [https://doi.org/10.9770/jesi.2014.2.1\(2\)](https://doi.org/10.9770/jesi.2014.2.1(2))

Tharenou, P. (2001). The relationship of training motivation to participation in training and development. *Journal of Occupational and Organizational Psychology*, 74(5), 599-621. <https://doi.org/10.1348/096317901167541>

Urbancová, H., Vrabcová, P., Hudáková, M., & Petrů, G. J. (2021). Effective training evaluation: The role of factors influencing the evaluation of effectiveness of employee training and development. *Sustainability*, 13(5), 2721. <https://doi.org/10.3390/su13052721>

Vaganova, O. I., Rudenko, I. V., Bekirov, S. N., Abbasova, L. I., & Kutepov, M. M. (2020). Modern Technologies of Adult Education. *Revista Amazonia Investiga*, 9(28), 57-64. <https://doi.org/10.34069/ai/2020.28.04.7>

Vanhournout, G., Noyens, D., Gijbels, D., & Van den Bossche, P. (2014). The relationship between workplace climate, motivation and learning approaches for knowledge workers. *Vocations and Learning*, 7(2), 191-214. <https://doi.org/10.1007/s12186-014-9112-1>

Verswijvel, K., Vanhournout, G., Gijbels, D., & Bossche, P. (2016). The Relation between Motivation to Participate, Goals, and Learning Preferences: A Mixed-Method Study of Participants in Formal Professional Development Activities. *Pedagogische Studien* 93(1), 38-59.

Xu, F., Ma, L., Liunata, L., Najaf, I. and Streimikiene, D. (2020). Does Social Responsibility Increase Corporate Value of China's Coal Enterprises? The Mediating Effect of Capital Enrichment Based on the Generalized Moment Estimation. *Acta Montanistica Slovaca*, 25 (3), 274-288. <https://doi.org/10.46544/AMS.v25i3.2>

Wang, X., Qin, Y., Xu, Z., & Škare, M. (2022). A look at the focus shift in innovation literature due to Covid-19 pandemic. *Journal of Business Research*, 145, 1-20. <https://doi.org/10.1016/j.jbusres.2022.02.067>

Zhang, G., & Chen, C. (2021). A study on the relationship between learning motivation and learning effectiveness of personnel based on Innovation Capability. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.772904>

Zientara, P. (2009). Employment of older workers in Polish SMEs: Employer attitudes and perceptions, employee motivations and expectations. *Human Resource Development International*, 12(2), 135-153. <https://doi.org/10.1080/13678860902764068>

**Funding:** This paper was supported by the project IVSUPS003 Current Trends in Human Resource Management, Czech Republic

**Data Availability Statement:** More data may be obtained from the authors on a reasonable request.

**Author Contributions:** Conceptualization: *Klementová, Caha, Mrhálek*; methodology: *Klementová, Caha, Mrhálek*; data analysis: *Klementová, Caha, Mrhálek*; writing—original draft preparation: *Klementová, Caha, Mrhálek*; writing; review and editing: *Klementová, Caha, Mrhálek*; visualization: *Klementová, Caha, Mrhálek*. All authors have read and agreed to the published version of the manuscript.

**Iva KLEMENTOVÁ**, Assistant at the Department of Human Resources Management, Faculty of Corporate Strategy, Institute of Technology and Business in České Budějovice. Fields of scientific interests: human resource management, personnel management, CSR

**ORCID ID:** <https://orcid.org/0000-0002-4585-2712>

**Zdeněk CAHA**, Associate Professor at the Department of Human Resources Management, Faculty of Corporate Strategy, Institute of Technology and Business in České Budějovice. Fields of scientific interests: human resource management, personnel management, CSR.

**ORCID ID:** <https://orcid.org/0000-0003-2363-034X>

**Tomáš Mrhálek**, Assistant at the Department of Human Resources Management, Faculty of Corporate Strategy, Institute of Technology and Business in České Budějovice. Fields of scientific interests: human resource management, personnel management, psychology

**ORCID ID:** <https://orcid.org/0000-0003-3872-930X>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center  
This work is licensed under the Creative Commons Attribution International License (CC BY).  
<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

FAIRTRADE PRODUCTS IN RETAIL CHAINS: CASE STUDY IN THE CZECH REPUBLIC\*

Alena Srbová <sup>1</sup>, Nikola Sagapova <sup>2</sup>

<sup>1,2</sup> Department of Tourism and Marketing, Faculty of Corporate Strategy, Institute of Technology and Business  
Okružní 517/10, 370 01 České Budějovice, Czech Republic

E-mails:<sup>1</sup> [31774@mail.vstecb.cz](mailto:31774@mail.vstecb.cz); <sup>2</sup> [sagapova@mail.vstecb.cz](mailto:sagapova@mail.vstecb.cz)

Received 28 January 2023; accepted 7 May 2023; published 30 June 2023

**Abstract.** The main objective of the article was to find out what the situation is with Fairtrade products on the Czech and Slovak markets in relation to consumed primary raw materials and their Fairtrade premium, and also the supply of these products in retail chains operating in the Czech Republic (including products that are marked with their private labels). To meet the first part of the objective, secondary data taken from the Fairtrade Czech Republic and Slovakia annual reports involving the 2017 – 2021 period were used. These reports showed that the consumption of cocoa beans and coffee beans in the production of Fairtrade products was on an upward trend in the years under review. The opposite was true for cane sugar, which was also reflected in the evolution of the Fairtrade premium for this commodity. To meet the second part of the objective, a qualitative mystery shopping method was used. On the basis of this method it was found that Kaufland has the highest number of Fairtrade products among the retail chains operating in the Czech Republic, followed by Penny, while Albert supplies only one product. Another important fact was that most of the Fairtrade products provided by the retail units surveyed were sold under their private labels and yet not from well-known manufacturers. It is the increase in the number of Fairtrade products offered under private labels, based on negotiations with the producers of these products, which would ultimately lead to an increase in Fair trade premiums for growers' cooperatives.

**Keywords:** fairtrade products; primary raw materials; retail chains; private labels; Fairtrade in the Czech Republic and Slovakia

**Reference** to this paper should be made as follows: Srbová, A., Sagapova, N. 2023. Fairtrade products in retail chains: Case study in the Czech Republic. *Entrepreneurship and Sustainability Issues*, 10(4), 105-117. [http://doi.org/10.9770/jesi.2023.10.4\(7\)](http://doi.org/10.9770/jesi.2023.10.4(7))

**JEL Classifications:** L81, M31

## 1. Introduction

Fair trade is considered to be one of the concepts that promote sustainable development and social change through ethical consumption based on support of the producers in developing countries, and thus improving their livelihoods (Ribeiro-Duthie et al., 2021). Sustainable development as a concept focuses not only at the social, economic, and environmental aspects, but applies the ethical principle as well (Čech, 2019; Belas et al., 2022a,b). Fair trade represents an alternative market system which tries to correct the historically unfair (and unethical) trade conditions

---

\* This research was funded by the Institute of Technology and Business in České Budějovice, grant number IVSUPS2305.

between geopolitical global North and South (Jaffee et al., 2004) to ensure good working conditions and just incomes for the producers and workers at the tail of the value chain (Ruiz, 2022). In this regard, fair trade provides better payments to the producers than global free trade (Wang and Chen, 2019). The system is based on consumers who are willing to pay higher prices for imported goods from developing countries (Witkowski, 2005) produced in line with sustainable development goals (D'Souza et al., 2020) to support the social, economic and environmental development and decent living for the producers (Witkowschi, 2005). The growth of fair trade and its visibility and recognition can be directly connected to Fairtrade organization, its label and its marketing activities (Wright and Heaton, 2006). Nowadays, Fairtrade is a well-known organization with a well-established label (Durevall, 2020). Fairtrade uses several specific mechanisms to improve the livelihoods of producers in developing countries, such as price floor, Fairtrade premium, access to credits and their stability, institutional structure, but also safe working conditions and environmental protection (Dragusanu et al., 2014). Fairtrade certification may increase job satisfaction by all the benefits related to the system, including both the extrinsic and intrinsic rewards for workers and empowering them (Krumbiegel et al., 2018). The certification is gaining momentum as it is becoming important for many crops produced in developing world, and as it significantly increases aggregate living standards of the households participating in the Fairtrade system (Knöbelsdorfer et al., 2021). The certification body of the Fairtrade is FloCERT (Balzarova et al., 2022), which works as an independent organization conducting certification audits (Abbott, et al., 2017). The controlling task is very relevant nowadays, when a lot of companies tend to report their corporate social responsibility, which has generally a positive effect on corporate value of enterprises, yet the practices cannot be proven, and thus lack credibility (Hąbek et al., 2019; Xu et al., 2020). Nowadays, the Fairtrade certified products can be found on shelves of the most famous retailers in many countries of the developed world (Ruggeri et al., 2021). In this study, the authors shall examine retailing of Fairtrade products and its recent development in the Czech and Slovak Republic, both in terms of the commodities as well as the supply of Fairtrade products displayed on shelves of established retail chains operating in the Czech Republic, where an in-store analysis was conducted.

## **2. Theoretical background**

While the retail sales of Fairtrade products increased in most countries, it is Europe that is recognized as the largest market for Fairtrade certified products. The old continent represents almost 80% of retail sales in the global market (Lernoud and Willer, 2018). Large multinational companies, including retailers, are often blamed for taking financial and competitive advantages of this system. On the one hand, retailers need to respond to the trend to meet the demand for Fairtrade products (Hellwig et al., 2020). On the other hand, the introduction of the products on supermarket shelves affects the demand and interest in them. Some retailers have even developed own product lines (Nicholls, 2002; Olearova et al., 2022). However, for a successful inclusion to the shelves, retailers need to differentiate the features of Fairtrade goods from the conventional ones (Bhavsar et al., 2021). The ethical dimension of such differentiation reduces the pressure on the price competitiveness of even homogeneous products, and the higher retail prices caused by the higher incomes for producers in developing world are generally classified as having a higher value (Kuzmenko et al. 2023; Gavurova et al. 2022). The higher price and value perceived by consumers is also connected with a feeling of buying a kind of a premium product (Baake et al., 2018). Interestingly, the willingness to pay for such products partly depends on the retailer's perceived level of respect towards the producer rights and the trust in the retailer's social responsibility (Hellwig et al., 2020). Such social responsibility as well as the retailer's positive reputation are important factors in attracting consumers (Wang et al, 2022; Pan et al., 2022; Qin et al., 2022; Martiskova et al., 2022). Therefore, socially responsible retailers need to be transparent to their customers and build positive relationships with society (Zeng et al., 2021; Streimikiene et al., 2021; Deliana & Rum, 2017). In the case of Fairtrade products, one part of the trust to buy these products is the trust in the Fairtrade itself, which is then followed by the trust in the retailer. Based on a survey among Italian customers of retail chains, it was found that retailers with a good social reputation gain more trust when selling Fairtrade products, even under their own private labels (Castaldo et al., 2009). Furthermore, there are two important milestones for retailers in terms of Fairtrade products introduction. The first one is to convert existing brands to Fairtrade, the second one is

to convert own label products to Fairtrade. It is claimed that the reason for doing so is not only the previously mentioned pressure on the demand side presented by the ethically conscious consumers, but also the competitors' behaviour. Once the competitors start to introduce Fairtrade products, the others, including supermarkets, have to behave likewise if they want to stay competitive on the market. Moreover, based on evidence from the industry reports, the introduction of Fairtrade products into supermarkets attracts more people than just the ones ethically-driven to make the purchase (Yamoah, 2019).

In addition, market growth can be directly linked to the shift from fair trade goods starting as a niche market to the boost related to the Fairtrade labelling and finally the mainstreaming of the products in supermarkets. The drastic change is connected with the year 2005 when WalMart, Nestlé and Tesco were granted the Fairtrade license on some of their products. This led to a higher extent of introducing Fairtrade products by other retailers, including Carrefour or Ahold Group, with some of them doing so under their own labels (Doherty et al., 2013). In the UK, many retailers demonstrated their position towards Fairtrade by various claims, such as “leading retailer of Fairtrade”, “first supermarket to sell Fairtrade” etc. Surprisingly, the first retailer operating supermarkets in the UK that converted its entire label product category to Fairtrade was Co-op. It did so with all own brand chocolates in 2002, and all own brand coffee in 2004 (Smith, 2010). The collaboration with retailers, especially the supermarket chains, is thus an important strategy to increase the availability of Fairtrade products in the market (Nylund et al., 2021). In the Czech Republic, there are several strong players in retail. In the sector of supermarket (and hypermarket) chains, the TOP 7 retailers in terms of sales include Lidl, Kaufland, Albert ČR, Penny Market, Tesco Stores, Billa, and Coop Group (Divinová, 2022). Lidl is the leading discount chain in the Czech market recognized for its efforts in corporate economic, social and environmental responsibility, including the support of producers from developing countries through the Fairtrade system. Kaufland is the hypermarket retail chain that is also concerned with social responsibility. Kaufland offers Fairtrade products, including products under own private brand bearing the label of Fairtrade Cocoa Program (Šalamoun, 2020). As for the Fairtrade coffee, the widest range can be found in Lidl, Kaufland and Globus. As for the Fairtrade chocolate, the widest selection of products is provided by Lidl, but Tesco offers such chocolate as well. In Albert, customers can find Fairtrade flowers (Wočadlová, 2021). Apart from the previously mentioned information, there is an overall lack of scholar attention regarding the Fairtrade in the Czech retail sector. By presenting this study, the authors strive to fulfil this knowledge gap.

### **3. Research objective and methodology**

The main objective of the article is to find out what the situation is with Fairtrade products on the Czech and Slovak markets, in relation to the primary raw commodities consumed and their Fairtrade premium, as well as the supply of these products in retail chains operating in the Czech Republic (including products which are marked with their private labels).

In the context of the above objective, the following research questions were established:

1. Was there an increasing trend in the consumption of primary raw materials related to Fairtrade production in the Czech Republic and Slovakia between the years 2017 and 2021?
2. How did the Fairtrade premium for primary raw materials in the Czech Republic and Slovakia develop in the 2017 – 2021 period?
3. Do retail chains operating in the Czech Republic sell mainly Fairtrade products from producers rather than Fairtrade products labelled with their private labels?

To answer the first and second research questions, secondary data contained in the annual reports of the Fairtrade Agency Czech Republic and Slovakia from the 2017 – 2021 period were used. Specifically, they were related to the quantity of primary raw materials used to produce Fairtrade products for the Czech and Slovak markets in each year.

Based on the above stated, the first step made by the authors was to identify which types of primary raw materials were repeatedly used in Fairtrade production in each year under review, and then to compare quantities of these raw materials with each other for individual years. In addition, the Fairtrade premiums for the primary raw materials selected were also compared. It should be noted that the Fairtrade premium is one that the Fairtrade producer cooperatives received on each of the primary raw materials examined through sales of Fairtrade products on the Czech and Slovak markets (Fairtrade Czech Republic and Slovakia, 2019a).

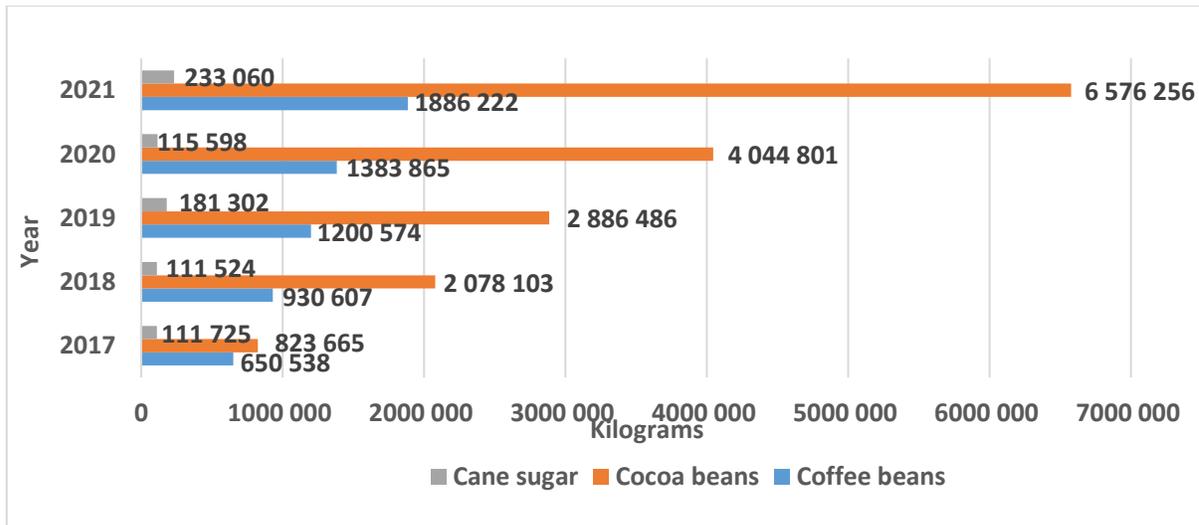
To answer the third research question, primary data obtained through a qualitative data collection method, namely mystery shopping, were used. The essence of mystery shopping was to find out which products made from primary raw materials listed in the annual reports of Fairtrade Czech Republic and Slovakia in 2017-2021 are part of the commercial assortment of selected retail units of major retail chains operating in the Czech Republic. Mystery shopping was scheduled for mid-January 2023 and took place in 8 retail units of major retail chains operating in the South Bohemia Region. The authors assumed that the supply of Fairtrade products is the same in relation to all retail units of a given type - supermarkets and hypermarkets - of the selected retail chains nationwide. The research itself also focused on products bearing the private labels of the retail chains surveyed, which were identified on the websites of the retail chains prior to the research.

Retail units of the following retail chains were included in the research: Globus, Lidl, Kaufland, Penny, Billa, Terno, Albert and Tesco.

#### **4. Result and discussion**

As regards the research purposes and to answer the first research question, Fairtrade Czech Republic and Slovakia's annual reports involving the 2017 – 2021 period showed that cocoa beans, coffee beans and cane sugar are the primary raw materials from which Fairtrade products are produced, recurring in each of the years under review (Fairtrade Czech Republic and Slovakia, 2019a; Fairtrade Czech Republic and Slovakia, 2019b; Fairtrade Czech Republic and Slovakia, 2020; Fairtrade Czech Republic and Slovakia, 2021; Fairtrade Czech Republic and Slovakia, 2022). These findings are in line with the globally most traded Fairtrade products mentioned above, as well as bananas (Ruggeri and Corsi, 2021).

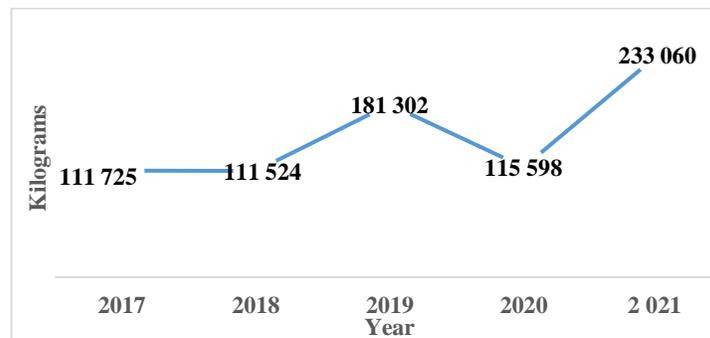
Subsequently, the consumption of these raw materials was compared as follows (see Figure 1).



**Figure 1.** Development of the consumption of primary raw materials in Fairtrade production in the Czech Republic and Slovakia in 2017-2021

Source: Fairtrade the Czech Republic and Slovakia, 2019a; Fairtrade the Czech Republic and Slovakia, 2019b; Fairtrade the Czech Republic and Slovakia, 2020; Fairtrade the Czech Republic and Slovakia, 2021; Fairtrade the Czech Republic and Slovakia, 2022

Figure 1 shows that the aforementioned consumption increased year on year for coffee beans and cocoa beans. The opposite is true for cane sugar. To illustrate this more clearly, Figure 2 below shows that the trend in the consumption of cane sugar in Fairtrade production was flat in the first two years and then increased by more than 60% in the third year compared to the second year. In contrast, there is a decrease in 2020 of about 35% compared to the previous year, and in 2021, there is an increase in consumption of once as much compared to 2020. In comparison to the global Fairtrade sales volumes by products between the years 2018 and 2020, only the coffee sales were increasing each year, while both cocoa and cane sugar sales were decreasing each year. As for cane sugar, the decrease is more significant than in case of cocoa (Fairtrade International, 2022a).



**Figure 2.** Development of cane sugar consumption in Fairtrade production in the Czech Republic and Slovakia in 2017-2021

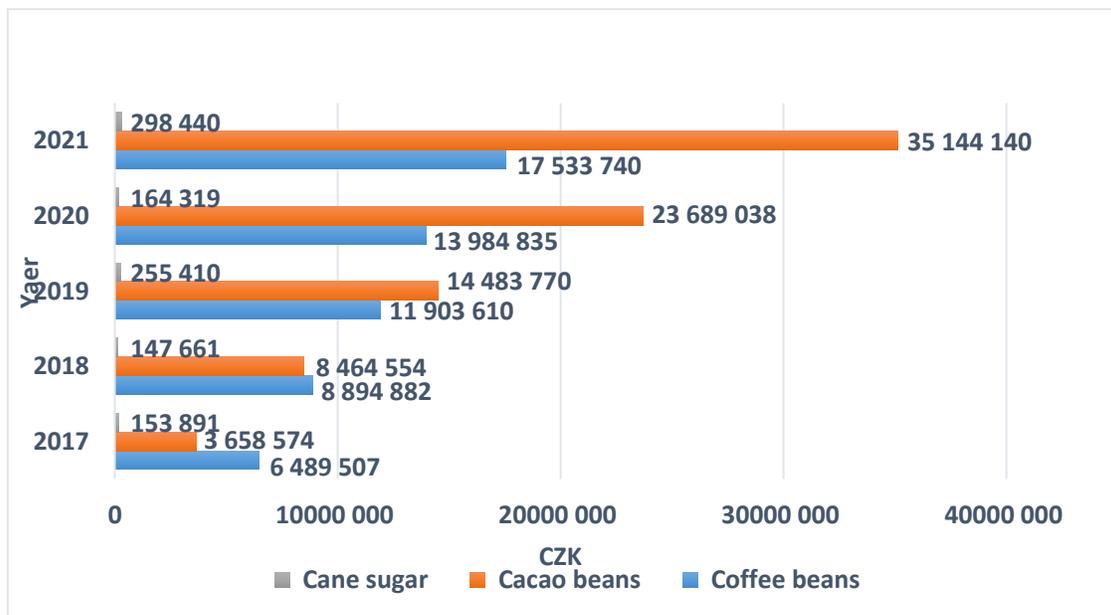
Source: Fairtrade the Czech Republic and Slovakia, 2019a; Fairtrade the Czech Republic and Slovakia, 2019b; Fairtrade the Czech Republic and Slovakia, 2020; Fairtrade the Czech Republic and Slovakia, 2021; Fairtrade the Czech Republic and Slovakia, 2022

On the basis of the above, the first research question can be answered as follows: Only the consumption of cocoa beans and coffee beans in Fairtrade production in the Czech Republic and Slovakia in 2017-2021 recorded an increasing trend, while cane sugar did not.

In relation to answering the second research question, information taken from Fairtrade Czech Republic and Slovakia's annual reports for the 2017 – 2021 period (Fairtrade Czech Republic and Slovakia, 2019a; Fairtrade Czech Republic and Slovakia, 2019b; Fairtrade Czech Republic and Slovakia, 2020; Fairtrade Czech Republic and Slovakia, 2021; Fairtrade Czech Republic and Slovakia, 2022) was again used.

As mentioned above, the primary raw materials, from which Fairtrade products are produced and which recur in each of the years under review, are cocoa beans, coffee beans and cane sugar. It is for these raw materials that the Fairtrade premium was monitored.

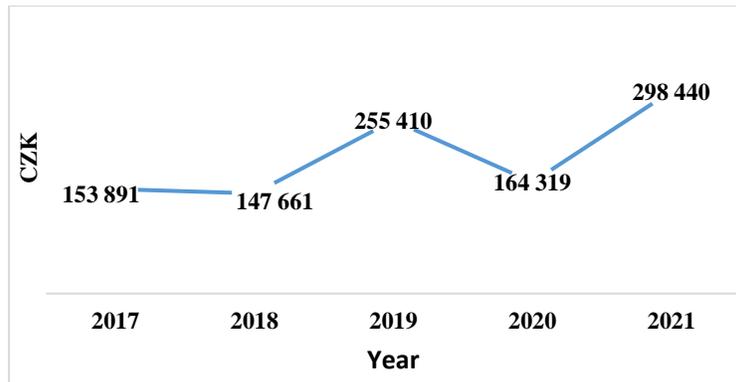
Furthermore, Figure 3 below indicates that in 2017-2021, the Fairtrade premium for cocoa beans was not always higher than for coffee beans. The difference can be seen in 2018 (less than 5%).



**Figure 3.** Development of the Fairtrade premium for primary raw materials in the Czech Republic and Slovakia in 2017-2021

*Source:* Fairtrade the Czech Republic and Slovakia, 2019a; Fairtrade the Czech Republic and Slovakia, 2019b; Fairtrade the Czech Republic and Slovakia, 2020; Fairtrade the Czech Republic and Slovakia, 2021; Fairtrade the Czech Republic and Slovakia, 2022

Next, Figure 4 below shows that the Fairtrade premium development for cane sugar did not always follow an upward trend, as would be expected after answering the first research question where there is a link between consumption and the Fairtrade premium.



**Figure 4.** Development of the Fairtrade premium for cane sugar in the Czech Republic and Slovakia in 2017-2021

*Source:* Fairtrade the Czech Republic and Slovakia, 2019a; Fairtrade the Czech Republic and Slovakia, 2019b; Fairtrade the Czech Republic and Slovakia, 2020; Fairtrade the Czech Republic and Slovakia, 2021; Fairtrade the Czech Republic and Slovakia, 2022

Regarding the second research question, the total Fairtrade premium for cocoa beans was not always higher than for coffee beans, and the Fairtrade premium for cane sugar was not always on an upward trend between 2017 and 2021 in the Czech Republic and Slovakia. The globally most important Fairtrade premium products based on certified volume are coffee, bananas and cocoa (Loconto et al., 2019). The Fairtrade premium is set as a percentage of the commercial price, or as a total price per unit depending on a particular product, its specific type, and sometimes also the agricultural method (conventional or organic), or place of origin. For example, the premium for conventionally produced raw sugar or direct consumption is 60 USD/MT, while the premium for organic raw centrifugal cane sugar for direct consumption is 80 USD/MT, whereas the by-products of cane sugar in both agricultural methods make up 15% of the market price. The Fairtrade premium for cocoa beans, both conventional and organic, is 240 USD/MT. For coffee, the premium is 0.2 USD/pound regardless of the agricultural method. The minimum price is set differently for various Fairtrade products. It can be a fixed amount, or the commercial price (implying there is no Fairtrade minimum), as well as a plus minimum organic differential for some organic products (Fairtrade International, 2022b). The minimum gives the producers the ability to rely on the prices and also plan ahead, while the premium is intended for various socio-economic projects and payments, which gives them the opportunity to develop the livelihoods in the community, and also justifies the higher prices of Fairtrade goods (Krumbiegel et al., 2018).

When considering the third research question, results from mystery shopping were used. It is important to note that the primary raw materials and products examined were those that appeared in all Fairtrade Czech Republic and Slovakia annual reports from the 2017 – 2021 period:

- coffee beans (coffee),
- cocoa beans (instant drinks, chocolates, biscuits, muesli, chocolate baking ingredients),
- fruit in the form of juices,
- bananas,
- cut flowers,
- cane sugar,
- tea leaves (teas).

In addition, cotton (being the primary raw material as well) was not monitored in this research due to the fact that products made from this raw material are mainly sold in specialty clothing stores rather than in the selected retail units surveyed.

Table 1 comprises a summary of products with the Fairtrade label on their packaging that were displayed in the retail units surveyed.

In order to provide greater clarity, Fairtrade products produced under each retailer's private label are shown in italics in Table 1. The numbers put in brackets indicate the number of types of these products. As can be seen from Table 1, Kaufland supplies the highest number of Fairtrade products, followed by Penny, while Albert sells only one product, namely coffee beans.

The most common products included cocoa bean products, mainly chocolate and biscuits, with muesli also being displayed.

On the other hand, the following products were completely absent in the retail chains surveyed: fruit in the form of juices and tea leaves (teas). In the case of bananas, they were only stocked in Kaufland, while cane sugar was offered only by Tesco. In both Kaufland and Lidl consumers could buy cut flowers. In addition, the Fairtrade logo was displayed on designated shelves in Lidl for quicker customer orientation for Fairtrade products.

Another important fact is that most of the Fairtrade products provided by the five retail units surveyed are sold under their private labels. These are Globus, Lidl, Kaufland, Penny and Billa. Two of the four retail chains mentioned offer Fairtrade products under three of their private labels, namely Penny (Penny, Crip Crop, My BIO) and Billa (Billa, Billa Premium and Billa Genusswelt), two have Fairtrade products under two private labels in their portfolio, namely Lidl (J.D. Gross and Tastino) and Kaufland (K-Classic and K-Favourites), while Globus supplies one product under one of its private labels. It would also be worth noting that, for example, the retail unit of the retail chain Tesco sold products under its private label with the Rainforest Alliance label, a social standard to ensure that farms protect the health and well-being of workers and surrounding communities (Rainforest Alliance, 2023).

**Table 1.** Overview and numbers of Fairtrade labelled products sold in the retail units surveyed

		Globus	Lidl	Kaufland	Penny	Billa	Terno	Albert	Tesco
	Coffee beans (coffee)	Tchibo - Beans (2) (small and large pack) Capsules (1)  <i>Globus Coffee beans (1)</i>		Tchibo-beans (2)		Tchibo-beans (1) Capsules (1)	Tchibo-beans (3) (small and large pack)	Tchibo-beans (3)	Tchibo-beans (2)
Cocoa beans	Instant drinks	Manner Cocoa drink (1)		<i>K-Classic Choco drink (1)</i>	Choco'la Chocodrink (1)				
	Chocolates	Halloren Bonbonniere (1)	<i>J. D. Gross Chocolates (2)</i> <i>Bonbonnieres (2)</i>	<i>K-Classic Chocolate spread (2)</i> <i>Chocolate (7)</i>  <i>K-Favourites Chocolate (6)</i> <i>Bonbonnieres (7)</i>	Choco'la Bonbonnieres (5) Chocolate Bonbons (1) Chocolate (6)  Manner Chocobonbons (1)  <i>Penny Chocolates (2)</i>	<i>Billa Premium Bonbonnieres (1)</i>  <i>Billa Bonbonnieres (1)</i>  <i>Billa Genusswelt Bonbonnieres (2)</i>  Manner Chocobonbons (1)	Maître Truffout Bonbonnieres (4)		
	Cookies	Manner cuts (3)	<i>Tastino</i>	<i>K-Classic</i>	<i>Penny (6)</i> <i>My BIO (1)</i>	Manner cuts (4)	Manner cuts (4)		Manner cuts (4)

	Kinkratz Gingerbread (1)	<i>Gingerbreads (1)</i>	<i>Rice cakes (1)</i> <i>Various types of cookies (8)</i>		<i>Billa (4)</i>			
	LambertZ Gingerbreads (1)							
	Müsli		<i>K-Classic (2)</i> <i>K-Favourites (2)</i>	<i>Crip Crop (6)</i>				
	Chocolate baking ingredients		<i>K-Classic (3)</i>					
Fruit in the form of juices								
Bananas			With BIO					
Cut flowers		Roses	Bouquet of Roses					
Cane sugar								Agrana Sugar (5g)
Tea leaves (tea)								

*Source: own processing*

Moreover, mystery shopping also revealed that Fairtrade products from manufacturers (Tchibo, Halloren, Kinkratz, LambertZ, Manner, Choco’la, Maître Truffout, Agrana) were less represented in the retail units studied.

Based on the above, it is possible to answer the third research question as follows: Retail chains operating in the Czech Republic mainly sell Fairtrade products labelled with their own private labels.

## **Conclusions**

*The purpose of Fairtrade is to provide growers, workers and artisans from the Global South (countries in Africa, Asia and Latin America) with the opportunity to earn a living from their own labour under decent conditions (Fairtrade Czech Republic and Slovakia, 2023). This is also related to the Fairtrade premium mentioned above and a view of how stakeholders from the Global South could receive more funding from the consumption of primary raw materials used for Fairtrade production.*

The results of the mystery shopping research showed that retail chains operating in the Czech Republic mainly sell Fairtrade products labelled with their own private labels. A suggestion to increase the consumption of primary raw materials could be a negotiation between retail chains and companies that produce Fairtrade products for these retail chains to use primary raw materials from Fairtrade producers for a greater variety of products.

These Fairtrade products would then be distributed to the retail units of these retail chains, which would also tailor their marketing communications. This would include, for example, sales promotion in the form of tastings, consumer competitions, sampling, point of sales and, above all, merchandising on the sales floor. Appropriate advertising should also be an essential part of this. These marketing communication tools should lead to an increase in the purchase of Fairtrade products, which would in turn lead to an increase in the purchase of primary raw materials for the production of these products. Ultimately, this would lead to an increase in the Fairtrade premium. The above research did not compare the prices of either Fairtrade or non-Fairtrade products, so further research could focus on comparing the prices of Fairtrade products sold under the private labels of retail chains with the prices of Fairtrade products of manufacturers, as well as the prices of products that do not carry the Fairtrade label.

## References

- Abbott, K.W., Levi-faur, D., & Snidal, D. (2017). Theorizing Regulatory Intermediaries: The RIT Model. *The ANNALS of the American Academy of Political and Social Science*, 670(1), 14-35. <https://doi.org/10.1177/0002716216688272>
- Baake, P., Friedrichsen, J., & Naegele, H. (2018). Soziale Nachhaltigkeitssiegel: Versprechen und Realität am Beispiel von Fairtrade-Kaffee. *DIW Wochenbericht*, 85(48), 1031-1037. <https://econpapers.repec.org/article/diwdiwwob/85-48-1.htm>  
[http://www.diw.de/documents/publikationen/73/diw\\_01.c.608366.de/18-48-1.pdf](http://www.diw.de/documents/publikationen/73/diw_01.c.608366.de/18-48-1.pdf)
- Balzarova, M., Dyer, C., & Falta, M. (2022). Perceptions of blockchain readiness for fairtrade programmes. *Technological Forecasting and Social Change*, 185, 122086. <https://doi.org/10.1016/j.techfore.2022.122086>
- Belas, J., Škare, M., Gavurova, B., Dvorsky, J., & Kotaskova, A. (2022a). The impact of ethical and CSR factors on engineers' attitudes towards SMEs sustainability. *Journal of Business Research*, 149, 589-598. <https://doi.org/10.7441/joc.2022.02.02>
- Belas, J., Gavurova, B., Novotna, L., & Smrčka, L. (2022b). Examination of differences in using marketing tools in the management of SMEs in the Visegrad Group countries. *Amfiteatru Economic*, 24(60), 447-463. <https://doi.org/10.24818/ea/2022/60/447>
- Bhavsar, A., Diallo, C., & Ülkü, M. A. (2021). Towards sustainable development: Optimal pricing and sales strategies for retailing fair trade products. *Journal of Cleaner Production*, 286, 124990. <https://doi.org/10.1016/j.jclepro.2020.124990>
- Castaldo, S., Perrini, F., Misani, N., & Tencati, A. (2009). The Missing Link Between Corporate Social Responsibility and Consumer Trust: The Case of Fair Trade Products. *Journal of Business Ethics*, 84(1), 1-15. <https://doi.org/10.1007/s10551-008-9669-4>
- Čech, J. (2019). Ekonomický rast a znehodnocovanie životného prostredia [Economic growth and environmental degradation]. *Acta Montanistica Slovaca*, 12(3), 194-204. Retrieved January 4, 2023, from <https://actamont.tuke.sk/pdf/2007/n3/4cech.pdf>
- Deliana, Y., & Rum, I. A. (2017). Understanding consumer loyalty using neural network. *Polish Journal of Management Studies*, 16(2), 51-61. <https://doi.org/10.17512/pjms.2017.16.2.05>
- Divinová, A. (2022). Největší řetězce v Česku. Žebříček podle tržeb a prodejen [The largest chains in the Czech Republic. Ranking by sales and stores]. Retrieved January 4, 2023, from <https://www.penize.cz/nakupy/432822-nejvetsi-retezce-v-cesku-zebricek-podle-trzeb-a-prodejen>
- Doherty, B., Davies, I.A., & Tranchell, S. (2013). Where now for fairtrade? *Business History*, 55(2), 161-189. <http://dx.doi.org/10.1080/00076791.2012.692083>
- Dragusanu, R., Giovannucci, D., & Nunn, N. (2014). The Economics of Fair Trade. *Journal of Economic Perspectives*, 28(3), 217-236. <http://dx.doi.org/10.1257/jep.28.3.217>
- D'Souza, C., Apaolaza, V., Hartmann, P., & Gilmore, A. (2020). Fairtrade nexus between just-world beliefs and normative antecedents. *Marketing Intelligence & Planning*, 38(7), 991-1005. <https://doi.org/10.1108/MIP-04-2020-0170>
- Durevall, D. (2020). Fairtrade and Market Efficiency: Fairtrade-Labeled Coffee in the Swedish Coffee Market. *Economies*, 8(2), 30. <https://doi.org/10.3390/economies8020030>
- Fairtrade the Czech Republic and Slovakia. (2019a). *Výroční zpráva 2017 Fairtrade Česko a Slovensko*, z. s. [Annual Report 2017 Fairtrade the Czech Republic and Slovakia]. Retrieved October 11, 2022, from [https://fairtrade.cz/wp-content/uploads/2019/01/web\\_Fairtrade\\_CZ-SK\\_VZ-2018.pdf](https://fairtrade.cz/wp-content/uploads/2019/01/web_Fairtrade_CZ-SK_VZ-2018.pdf)
- Fairtrade the Czech Republic and Slovakia. (2019b). *Výroční zpráva 2018 Fairtrade Česko a Slovensko*, z. s. [Annual Report 2018 Fairtrade the Czech Republic and Slovakia]. Retrieved October 11, 2022, from [https://fairtrade.cz/wp-content/uploads/2019/08/VYROCNI\\_ZPRAVA\\_2018\\_CZ.pdf](https://fairtrade.cz/wp-content/uploads/2019/08/VYROCNI_ZPRAVA_2018_CZ.pdf)
- Fairtrade the Czech Republic and Slovakia. (2020). *Výroční zpráva za rok 2019 Fairtrade Česko a Slovensko*, z. s. [Annual Report 2019 Fairtrade the Czech Republic and Slovakia]. Retrieved October 11, 2022, from [https://fairtrade.cz/wp-content/uploads/2020/08/VZ-Fairtrade-za-2019-CZ\\_final-1.pdf](https://fairtrade.cz/wp-content/uploads/2020/08/VZ-Fairtrade-za-2019-CZ_final-1.pdf)

- Fairtrade the Czech Republic and Slovakia. (2021). *Výroční zpráva 2020 Fairtrade Česko a Slovensko, z. s.* [Annual Report 2020 Fairtrade the Czech Republic and Slovakia]. Retrieved October 11, 2022, from [https://fairtrade.cz/wp-content/uploads/2021/08/VYROCNI\\_ZPRAVA\\_2020\\_CZ\\_ONLINE.pdf](https://fairtrade.cz/wp-content/uploads/2021/08/VYROCNI_ZPRAVA_2020_CZ_ONLINE.pdf)
- Fairtrade the Czech Republic and Slovakia. (2022). *Výroční zpráva 2021 Fairtrade Česko a Slovensko, z. s.* [Annual Report 2021 Fairtrade the Czech Republic and Slovakia]. Retrieved October 11, 2022, from [https://fairtrade.cz/wp-content/uploads/2022/09/VYROCNI\\_ZPRAVA\\_CZ\\_2021\\_ONLINE.pdf](https://fairtrade.cz/wp-content/uploads/2022/09/VYROCNI_ZPRAVA_CZ_2021_ONLINE.pdf)
- Fairtrade the Czech Republic and Slovakia. (2023). *Co je Fairtrade?* [What is Fairtrade?]. Retrieved January 20, 2023, from <https://fairtrade.cz/fairtrade/co-je-fairtrade/>
- Fairtrade International (2022a). *Monitoring the scope and benefits of Fairtrade*. Retrieved January 24, 2023, from <https://files.fairtrade.net/publications/2022-Fairtrade-monitoring-report-13th-edition.pdf>
- Fairtrade International (2022). *Fairtrade minimum price and Fairtrade premium table*. Retrieved January 24, 2023, from <https://files.fairtrade.net/Fairtrade-Minimum-Price-and-Premium-Table-EN-PUBLIC.pdf>
- Gavurova, B., Schönfeld, J., Bilan, Y., & Dudáš, T. (2022). Study of the differences in the perception of the use of the principles of corporate social responsibility in micro, small and medium-sized enterprises in the V4 countries. *Journal of Competitiveness*, 14(2), 23-40. <https://doi.org/10.7441/joc.2022.02.02>
- Hábek, P., Biały, W., & Livenskaya, G. (2019). Stakeholder engagement in corporate social responsibility reporting. The case of mining companies. *Acta Montanistica Slovaca*, 24(1), 25-34. Retrieved January 4, 2023, from <https://actamont.tuke.sk/pdf/2019/n1/3habek.pdf>
- Hellwig, R., Atasoy, A. T., & Madlener, R. (2020). The Impact of Social Preferences and Infor on the Willingness to Pay for Fairtrade Products. *FCN Working Paper*, 6. <http://dx.doi.org/10.2139/ssrn.3686521>
- Jaffee, D., Kloppenburg, J. R. Jr., & Monroy, M. B. (2004). Bringing the “Moral Charge” Home: Fair Trade within the North and within the South. *Rural Sociology*, 69(2), 169-196. <https://doi.org/10.1526/003601104323087561>
- Knöbldorfer, I., Sellare, J., & Qaima, M. (2021). Effects of Fairtrade on farm household food security and living standards: Insights from Côte d’Ivoire. *Global Food Security*, 29, 100535. <https://doi.org/10.1016/j.gfs.2021.100535>
- Krumbiegel, K., Maertens, M., & Wollni, M. (2018). The Role of Fairtrade Certification for Wages and Job Satisfaction of Plantation Workers. *World Development*, 102, 195-212. <https://doi.org/10.1016/j.worlddev.2017.09.020>
- Kuzmenko, O., Bilan, Y., Bondarenko, E., Gavurova, B., & Yarovenko, H. (2023). Dynamic stability of the financial monitoring system: Intellectual analysis. *PloS one*, 18(1), e0276533. <https://doi.org/10.1371/journal.pone.0276533>
- Lernoud, J., & Willer, H. (2018). Organic and Fairtrade Markets at a Glance. In P. Parvathi, U. Grote & Waibel, H. (Eds.), *Fair Trade and Organic Agriculture: A Winning Combination?* (pp. 8-14). Boston: CABI International. DOI: [10.1079/9781786393050.0000](https://doi.org/10.1079/9781786393050.0000)
- Loconto, A., Silva-Castañeda, L., Arnold, N., & Jimenez, A. (2019). *Participatory analysis of the use an impact of the Fairtrade premium*. Retrieved January 24, 2023, from [https://files.fairtrade.net/publications/2019\\_LISIS\\_UseImpactFairtradePremium.pdf](https://files.fairtrade.net/publications/2019_LISIS_UseImpactFairtradePremium.pdf)
- Martiskova, P., Waldhauserova, T., & Skibinski, A. (2022). Corporate social responsibility activities as a way of creating value for consumers. *Polish Journal of Management Studies*, 26(1), 189-201. <https://doi.org/10.17512/pjms.2022.26.1.12>
- Nicholls, A. J. (2002). Strategic options in fair trade retailing. *International Journal of Retail & Distribution Management*, 30(1), 6-17. <https://doi.org/10.1108/09590550210415220>
- Nylund, P. A., Brem, A., & Agarwal, N. (2021). Innovation ecosystems for meeting sustainable development goals: The evolving roles of multinational enterprises. *Journal of Cleaner Production*, 281, 125329. <https://doi.org/10.1016/j.jclepro.2020.125329>
- Olearova, M., Gavurova, B., & Bacik, R. (2022). Consumer shopping motive identification: study of webrooming vs. showrooming. *Marketing i menedžment inovacij*, 2, 231-243. <https://doi.org/10.21272/mmi.2022.2-21>
- Pan, L., Xu, Z. & Skare, M. (2022). Sustainable business model innovation literature: a bibliometrics analysis. *Review of Managerial Science* <https://doi.org/10.1007/s11846-022-00548-2>

- Qin, Y., Xu, Z., Wang, X., & Škare, M. (2022). Green energy adoption and its determinants: A bibliometric analysis. *Renewable and Sustainable Energy Reviews*, 153, 111780. <https://doi.org/10.1016/j.rser.2021.111780>
- Rainforest Alliance. (2023). *How Rainforest Alliance Certification Benefits Your Farm*. Amsterdam: Amsterdam Office. Retrieved January 20, 2023, from [https://www-rainforest--alliance-org.translate.goog/business/certification/how-rainforest-alliance-certification-benefits-your-farm/?x\\_tr\\_sl=en&x\\_tr\\_tl=cs&x\\_tr\\_hl=cs&x\\_tr\\_pto=sc](https://www-rainforest--alliance-org.translate.goog/business/certification/how-rainforest-alliance-certification-benefits-your-farm/?x_tr_sl=en&x_tr_tl=cs&x_tr_hl=cs&x_tr_pto=sc)
- Ribeiro-Duthie, A., Gale, F., & Murphy-Gregory, H. (2021). Fair trade and staple foods: A systematic review. *Journal of Cleaner Production*, 279, 123586. <https://doi.org/10.1016/j.jclepro.2020.123586>
- Ruggeri, G., & Corsi, S. (2021). An Exploratory Analysis of the FAIRTRADE Certified Producer Organisations. *World*, 2(4), 442-455. <https://doi.org/10.3390/world2040028>
- Ruggeri, G., Corsi, S., & Nayga, R. M. (2021). Eliciting willingness to pay for fairtrade products with information. *Food Quality and Preference*, 87, 104066. <https://doi.org/10.1016/j.foodqual.2020.104066>
- Ruiz, L. Z. (2022). Fair Trade in an unfair market: economic competitiveness and workers' rights in Costa Rica's banana industry. *Ethnography*, 0, <https://doi.org/10.1177/1466138122109860>
- Smith, S. (2010). For Love or Money? Fairtrade Business Models in the UK Supermarket Sector. *Journal of Business Ethics*, 92, 257-266. <https://doi.org/10.1007/s10551-010-0582-2>
- Streimikiene, D., Lasickaitė, K., Skare, M., Kyriakopoulos, G., Dapkus, R., Duc, P.A. (2021). The impact of Corporate Social Responsibility on Corporate Image: Evidence of budget airlines in Europe. *Corporate Social Responsibility and Environmental Management*, 28, 925-935. <https://doi.org/10.1002/csr.2099>
- Šalamoun, J. (2020). Characteristics of companies involved in the Fairtrade platform. *Economic Working Papers*, 4(3). Retrieved January 4, 2023, from <http://repec.ef.jcu.cz/index.php/ewp/article/view/478>
- Wang, E., S.-T., & Chen, Y.-C. (2019). Effects of perceived justice of fair trade organizations on consumers' purchase intention toward fair trade products. *Journal of Retailing and Consumer Services*, 50, 66-72. <https://doi.org/10.1016/j.jretconser.2019.05.004>
- Wang, X., Xu, Z., Qin, Y., & Skare, M. (2022). Innovation, the knowledge economy, and green growth: Is knowledge-intensive growth really environmentally friendly? *Energy Economics*, 115, 106331. <https://doi.org/10.1016/j.eneco.2022.106331>
- Witkowski, T. H. (2005). Fair Trade Marketing: An Alternative System for Globalization and Development. *Journal of Marketing Theory and Practice*, 13(4), 22-33. <https://doi.org/10.1080/10696679.2005.11658556>
- Wočadlova, J. (2021). *Certifikace Fairtrade a její vliv na nákupní chování vybraného segmentu zákazníků* [Fairtrade certification and its influence of customers buying behaviour of a selected segment] [Diploma thesis]. Plzeň: Západočeská univerzita v Plzni. Retrieved January 4, 2023, from [https://dspace5.zcu.cz/bitstream/11025/47451/1/BP\\_Julie\\_Wocadlova\\_2021.pdf](https://dspace5.zcu.cz/bitstream/11025/47451/1/BP_Julie_Wocadlova_2021.pdf)
- Wright, L. T., & Heaton, S. (2006). Fair Trade marketing: and exploration through qualitative research. *Journal of Strategic Marketing*, 14(4), 411-426. <https://doi.org/10.1080/09652540600948019>
- Xu, F., Ma, L., Liunata, L., Najaf, I., & Streimikiene, D. (2020). Does Social Responsibility Increase Corporate Value of China's Coal Enterprises? The Mediating Effect of Capital Enrichment Based on the Generalized Moment Estimation. *Acta Montanistica Slovaca*, 25(3), 274-288. <https://doi.org/10.46544/AMS.v25i3.2>
- Yamoah, F. A. (2019). Fairtrade UK in Retrospect: From the Niche Genesis to the Revelatory Mainstreaming Marketing Strategy Era (Late 1950s - Late 2000s). *International Review of Management and Marketing*, 9(4), 110-120. Retrieved January 4, 2023, from <https://www.proquest.com/scholarly-journals/fairtrade-uk-retrospect-niche-genesis-revelatory/docview/2288757702/se-2>
- Zeng, J., Škare, M., & Lafont, J. (2021). The co-integration identification of green innovation efficiency in Yangtze River Delta region. *Journal of Business Research*, 134, 252-262. <https://doi.org/10.1016/j.jbusres.2021.04.023>

**Funding:** This article is one of the partial outputs of the currently solved research project IVSUPS2305. This research was funded by the Institute of Technology and Business in České Budějovice, grant number IVSUPS2305.

**Author Contributions:** Conceptualization: *Nikola Sagapova*; methodology: *Alena Srbova, Nikola Sagapova*; data analysis: *Alena Srbova*, writing—original draft preparation: *Alena Srbova, Nikola Sagapova*; writing; review and editing: *Alena Srbova, Nikola Sagapova*; visualization: *Alena Srbova, Nikola Sagapova*. All authors have read and agreed to the published version of the manuscript.

**Alena SRBOVA** is a lecturer at the Department of Tourism and Marketing, Institute of Technology and Business in České Budějovice. Research interests: retail chains, retail marketing, private labels, consumer, consumer protection, consumer behaviour.

**ORCID ID:** <https://orcid.org/0000-0002-7657-5463>

**Nikola SAGAPOVA** is a Ph.D. candidate at the University of South Bohemia, and a lecturer at the Department of Tourism and Marketing (Institute of Technology and Business in České Budějovice) as well as at the Department of Regional Management and Law (University of South Bohemia). She is an economist and biologist focusing on linking economics, marketing, trade, tourism, and regional management with sustainable development. She is actively involved in biodiversity conservation and is a member of international organizations WWF, IALE, and ISEE.

**ORCID ID:** <https://orcid.org/0000-0003-1628-7758>

---

Copyright © 2023 by author(s) and VSI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





**Publisher**

<http://jssidoi.org/esc/home>



## INNOVATION OF THE PRODUCTION PROCESS OF ENGINEERING COMPANIES IN RELATION TO BUSINESS PORTFOLIO\*

Milan Talíř<sup>1\*</sup>, Jarmila Straková<sup>2</sup>

<sup>1</sup> Brno University of Technology Faculty, Institute of Management, Kolejní 2906/4, Brno, 612 00, Czech Republic)

<sup>2</sup> Institute of Technology and Business in Ceske Budejovice, Okružní 517, 370 01 České Budějovice

E-mails:<sup>1\*</sup> [252620@vutbr.cz](mailto:252620@vutbr.cz) (Corresponding author); <sup>2</sup> [4090@mail.vstecb.cz](mailto:4090@mail.vstecb.cz)

Received 18 January 2023; accepted 8 May 2023; published 30 June 2023

**Abstract.** The paper is aimed at the innovation process in the context of the business portfolio of micro-enterprises. This type of companies is typical of and prevalent in the southern region of the Czech Republic, and the presented conclusions have general validity. A newly developed method of assessing the innovative technological potential of enterprises called "Business technology assessment system" (BTAS), with the contribution of "Criteria analysis of systems". The research answers the question, what economic efficiency can innovations in the production process bring to SMEs dealing with custom manufacturing in the engineering sector. Technological backwardness including corporate infrastructure was proven. Companies compensate for this shortcoming by an increased focus on satisfying customer needs and a high degree of flexibility and innovation in production. From the point of view of production processes, there is a high degree of interconnectedness between individual operations and sub-processes. The business portfolio of most of these companies is disproportionately broad, and this is reflected in the negative findings in terms of the disproportionate number of methods and technologies that these companies possess, but do not fully utilize. Such behaviour of the companies can be explained by the absence of active creation and updating of business strategy. The economic evaluation of the innovative process (BTAS) proved that the very implementation of innovations did not lead to a major increase in the profit margin. The situation was different when evaluating the benefits of the digitization process, which brought an increase in sales and corporate margins. A completely new finding has been demonstrated, i.e., if a company has unused equipment which brings opportunity costs as well, it is possible to create space for innovation by removing it, and at the same time the sale of equipment can be a significant financial contributor to innovation.

**Keywords:** strategic management; innovation, industry; production process; BTAS.

**Reference** to this paper should be made as follows: Talíř, M., Straková, J. 2023. Innovation of the production process of engineering companies in relation to business portfolio. *Entrepreneurship and Sustainability Issues*, 10(4), 118-134. [http://doi.org/10.9770/jesi.2023.10.4\(8\)](http://doi.org/10.9770/jesi.2023.10.4(8))

**JEL Classifications:** M11, M21, O14

**Additional disciplines:** information and communication, informatics. construction engineering

\* This paper has been prepared as a part of internal research competition at the department of management for 2022 entitled: "A new approach in the generation of corporate (business) strategy based on the parameterization of business processes". PID: IVSUPS004.

## 1. Introduction

Companies are constantly interacting with the environment in which they operate. They are exposed to stimuli that require their immediate reactions. One way to respond to these stimuli is innovation. The area in which companies can improve is specific to each business with respect to its size, focus and capacity capabilities. It is possible to improve products (products, services), processes (e.g. production process by changing production technology), logistics (material flow) or areas in the organization and management of the company (choice of strategy, change of organizational structure, choice of information tool such as internal software - flow of information, soft skills of managers, etc.). Although nowadays companies are allowed to offer a range of accompanying services, the most important things for customers in the engineering industry still remain quality, price and time of implementation. This triple imperative creates constant competitive pressure and represents an opportunity for better prepared competitors. Growing competition forces companies to constantly innovate and thus respond to dynamic changes taking place especially in the external business environment. Some companies face this pressure without problems, others, less financially strong and competitive ones, may succumb to this increasing pressure. For companies to be competitive and achieve exceptional performance, it is essential to have a "good" strategy and a tailored value chain. The issue of the innovation potential of small and medium-sized engineering enterprises (SMEs) will be dealt with, with a focus on the production process, its innovation, and in connection with the business portfolio of these companies. In order to achieve the set goal, research questions were formulated. They aim to determine the economic efficiency associated with the innovation of the production process and to find what economic benefit is generated from the introduction of digitization into the production process. Following the research questions, the study captures a view of the business environment and aspects related to the innovations of both the production process and the business portfolio through the prism of the company. Therefore, the aim of the paper will be to identify and evaluate the innovation potential of small and medium-sized engineering enterprises with a focus on the production process with regard to their business portfolio. Based on the aim of this study, the following research questions were formulated:

RQ1: What economic efficiency can innovations in the production process bring to SMEs dealing with custom manufacturing in the engineering sector.

RQ2: What economic benefit does the introduction of digitization into the production process generate in SMEs dealing with custom manufacturing in the engineering sector.

## 2. Theoretical background

With the beginning of the 21st century, issues of efficiency, stability and growth are coming to the fore in the corporate sphere, including SMEs. There are a lot of financial techniques and indicators that address this issue in this setting (Horák et al., 2020). Growing supply is a key element of today's market, which implies that supply frequently surpasses demand in many areas. As a result, firms confront intense competition in their daily operations (Kollmann and Dobrovič, 2022; Soltes & Gavurova, 2015). This trend is reflected in the works of both domestic and foreign authors (Heekyung, 2015; Civelek et. al. 2020; Krajcik, 2021). One of the main tools to fulfil the above-mentioned goals is to ensure permanent and effective innovation of business processes (Krugman, Obstfeld and Melitz, 2015; Heekyung, 2015). In general, the innovation process can be anchored in the business environment in two levels. The first can be characterized as an operation-process area, the second is a management and organizational area. Despite extensive research on innovation performance relationships, previous studies have focused mainly on technological innovation, leaving the effects of organizational innovation relatively unexplored (Azar a Ciabuschi, 2017; Al-Omouh et al., 2022; Skare and Porada Rochon, 2022). It is always necessary to look at innovations not only from the point of view of what they essentially relate

to, but it is also important to perceive the links to the overall business system (Sternad et al., 2019; Owalla et al., 2021). According to Ghezzi et al. (2020) innovation begins with the discovery of problems and the search for innovation opportunities through the acquisition and classification of knowledge. The authors state that based on this knowledge, companies subsequently determine the direction, goal and approach to innovation. In the context of unpredictable changes (e.g., the Covid-19 pandemic), not only customer behaviour changes (see Sagapova and Dušek, 2021; Dušek and Sagapova, 2022; Konečný, Kostiuik and Ruschak, 2022; Pollák et al., 2022; Pollák et al., 2021; Xiao et al., 2022; Wang et al., 2022; Skare and Riberio Soriano, 2022), but as Ashrafi et al. (2019) also state, only such companies that are innovative and at the same time strategically oriented and managed have increased resistance to crisis phenomena and are looking for new ways to achieve permanent economic prosperity. The introduction of a mechanism for regular evaluation of the company's position will make it possible to identify potential problems in business activity already in the initial stages, which will allow the companies to develop and implement a set of innovative measures to solve problems and to neutralize them (Tyukhtenko et al., 2021; Phadernrod, Crowder and Wills, 2019). As reported by Wu et al. (2022), the company's human resources play an irreplaceable role in the innovation process, and the application of the principles of socially responsible behaviour is increasingly relevant. For industrial production companies, especially SMEs, the business portfolio and distribution channels are an essential pro-growth factor. Foroudi et al., (2022) claim that corporate strategy and the area of innovation processes form the development base of an enterprise and positively influence the process of corporate margin and building the corporate image, including the corporate brand. Weber and Müßig (2022) state that the company's business strategy, the basis of which is the business portfolio, is a determining factor for both the quantity and quality of information from the perspective of risk factors. Henry et al., (2020) present the concept of a company's absorptive capacity as the ability to recognize the value of new external information, to adopt it and use it for business purposes, including changing the business portfolio. Companies with an innovation-oriented strategy report more about their risk factors than companies with a defensive efficiency-oriented strategy (Putro et al., 2021; Soltes & Gavurova, 2014; Gavurova et al. 2016). Weber and Müßig (2022) mention that business strategy influences coverage of major risk topics and creates a framework for innovation activities.

Effective innovations require taking into account the shared values of participants in innovation processes, whereby values are understood as subjective ideas about what is desirable (Breuer and Luedeke-Freund, 2017). To improve the quality and efficiency of business processes with a focus on production, Zuhaira and Ahmad (2021) recommend distinguishing the production process itself from the process of seeking changes and from the process of very change of the production process (Ližbětinová et al., 2017). Continuous process improvement begins with a description of its current state. This is followed by determination of monitored metrics, monitoring of process operation, measurement of process operation. The final point is the design and implementation of an improvement, which is then again a source for new improvements (Sjodin et al., 2020; Kljucnikov, et. al., 2021). In the case of business model innovations, Bocken, Nancy and Geradts (2020) and Podshivalova and Almrshed (2021) mention that business model innovations are extremely important, yet very difficult to achieve. Anshari and Almunawar (2021) hypothesize that there is a positive relationship between company digital ecosystem readiness and SME adoption of open innovations. The fourth industrial revolution refers to innovation and transformation of production processes (Domanižová, Janíčková and Milichovský, 2021). Veile et al. (2019) state that in order to innovate in the sense of the gradual implementation of Industry 4.0 elements, it is necessary for the organizational structure to be characterized by a flat hierarchy and decentralized decision-making, and agility needs to be supported as well. At the same time, the corporate culture should be characterized by flexibility, openness, a willingness to learn as well as entrepreneurial spirit and attitudes. Frank et al. (2019) mention a growing trend in the innovation process of servitization. In today's era of high competition, manufacturing companies are increasingly offering important services as part of their processes that support customer satisfaction with the product itself or the result of the previous service. Servitization includes, for example, training, maintenance, overhaul or customer support. Frank et al. (2019) note that the very change of production organization towards the use of servitization is a challenge. Sjodin et al. (2020) state that in response to customer

demands for ever better products and services, and in response to preventing the customers from leaving for the competition, companies continuously work to improve their processes using mutual harmony. Knowing the processes and documenting the changes is essential for their improvement (Sjodin et al., 2020; Korshunov, Kabanov and Cehlar, 2020).

The very activation of innovation processes in companies largely depends on the ability of the companies to develop their intellectual potential (Kasych et al., 2021; Komang et al., 2022; Belas et al. 2023). The authors state that, paradoxically, this intellectual capital is not sufficiently appreciated by companies. Hwang and Kim (2021) find that the introduction of new Industry 4.0 technologies increases the productivity of small and medium-sized enterprises. The authors report that adoption of these technologies increases the efficiency of the manufacturing process by more than 26 % on average compared to companies that do not implement these technologies. At the same time, the authors see digital transformation as a unique opportunity to increase the productivity of small and medium-sized enterprises. However, Ferdous and Ikeda (2022) also found that, based on structural modelling of the innovation process, it can be concluded that the size of the company raises the probability of its involvement in new-to-the-market innovations. In relation to employees, Suto and Takehara (2022) state that non-monetary rewards act independently and synergistically with monetary rewards to enhance employee motivation to innovate, thereby increasing the company value. Companies that apply these principles will continue to be considered legitimate if they are perceived as socially embedded not only externally but also internally (Wu et al., 2022). A pro-growth-oriented company assumes the intersection of horizontal and vertical integration. While the vertical leads to real modernization and innovation of business processes, horizontal integration has the task of ensuring the connection of the company with educational and research institutions, which is the essence of an effective innovation process. When trying to find an answer to the question of how a company can anchor the ideas of continuous innovation among the basic company components, it is possible to use the CIPF model, the author of which is professor Milan Zelený. Zelený states that CIPF has 4 necessary and fully sufficient components: C (customer), I (innovation), P (process), F (finance), (Zelený, 2021). A number of authors, including the authors of this paper, recommend starting to connect the value chain horizontally in order to implement the elements of Industry 4.0. To optimize processes across the entire value chain, it is necessary to ensure the exchange of data from customers to suppliers and vice versa (Veile et al., 2019). In the context of digitization, Anshari and Almunawar (2021) and Kraj (2022) mention that SMEs should be protected to ensure their survival. Müller, Buliga and Voigt (2021) as well as Nagy, Zábajník and Valaskova (2022) mention that many benefits of Industry 4.0 will become available to small and medium-sized enterprises only if they not only use Industry 4.0 technologies, but also innovate their business models or business portfolio based on the opportunities brought by these innovative technologies. Fernandez-Vidal et al. (2022) and Sommer et. al (2022) state that companies in their transformation primarily choose combinations of small transformational innovation strategies to achieve their large transformational goals.

### **3. Research objective and methodology**

*Descriptive analysis* – this method aims to identify the determinants of innovation potential of enterprises through observation, measuring, and interviews. There will be determined the essence of the problem and its limitations. The focus will be on analysing the causes and motivation of a company to innovate or not to innovate its processes. Furthermore, the production process and the related processes will be analysed with regard to the business portfolio of a model company. There will also be performed an analysis of the determinants influencing the innovation of a production process and business strategy of the company.

*Criteria analysis of systems* – extraction of data from the production process. It is a qualitative evaluation of data according to predetermined criteria. The evaluation will be carried out by assigning values -1, 0 and 1 to a given item being evaluated based on whether it meets (1) or does not meet (-1) a given criterion, or whether the information cannot be confirmed or verified (0). In the case of a zero or negative value, the given item will be

penalized in fact. Another criterion of the analysis is the significance of a given parameter for a given purpose in the form of weight coefficient. Weight coefficient can be assigned the values ranging from 0.1 to 1. For a clear evaluation, the result of the analysis will be also graphically represented.

*Business technology assessment system* – it is an assessment system created by the authors. A trial version is in MS Excel (see Table 1). The assessment is focused on the proportional use of technology in a company in relation to its full use, and its possible attractiveness for a customer. The practical application of this method consists in determining the degree of the company’s ability to use this technology, or its possible use in future. The values assigned can range from 0.1 to 1, where 0.1 corresponds to the minimum use of technology. Value 1 then refers to the maximum possible use of technology which a given company is able to ensure. The attractiveness of the technology then reflects the customer’s demand for the use of the given technology. The possible values range from 1 to 10 where 10 corresponds to the maximum demand for the given technology.

**Table 1.** General (methodical) application of the business technology assessment system (BTAS)

Machine	Current status			Estimated future status			Rating	Intensity and direction of change
	Usage	Attractivity	Proposal	Usage	Attractivity	Proposal		
A	0,6	6	⊕	0,9	8	⊕	⊕	Without change
B	0,4	6	+	0,5	9	+	+	Without change
C	0,6	3	?	0,6	3	?	?	Without change
D	0,1	2	⊗	0,2	1	⊗	⊗	Without change
E	0,1	1	⊗	0,6	2	?	⊗	Positive change
F	0,2	3	⊗	0,5	6	+	⊗	Strongly positive change
G	0,2	3	⊗	0,9	6	⊕	⊗	Extremely positive change
Legend of recommendation								
Cancel	Consider cancelling	Expand	Main activity	Change				
⊗	?	+	⊕	⊗				

Source: Authors

To obtain relevant results, the values were symmetrically divided into two parts. There can thus be four alternative outputs: 1. To stop using the given technology (*usage < 0.55, attractiveness < 5.5*); 2. Consider future elimination or increase interest of Tu customers to use the technology (*usage > 0.55, attractiveness < 5.5*); 3. To develop the technology, strive for its increased usage, i.e., to increase machine hourly rate, work with the active demand for a given service – focus on technology (*usage < 0.55, attractiveness >= 5.5*); 4. To maintain and work with the technology within the main activity of the company (rate growth) – focus on technology (*usage > 0.55, attractiveness > 5.5*).

**Table 2.** Intervals of values for making recommendations in a given area

Cancel	Usage < 0,55 ⇔ Attractivity < 5,5
Consider cancelling	Usage > 0,55 ⇔ Attractivity < 5,5
Expand	Usage < 0,55 ⇔ Attractivity > 5,5
Main activity	Usage > 0,55 ⇔ Attractivity > 5,5
Change	In case of difference in recommendations

Source: Authors

The concurrence of current recommendations with the future ones enables to formulate the resulting evaluation. If there is a difference, *change* is recommended, which can be evaluated as follows: *extremely negative, strongly negative, negative, positive, strongly positive, extremely positive*. It shall be also noted that even negative evaluation of a given technology may open new innovative opportunities for the company.

*Economic analysis* – economic analysis will be used for the financial evaluation of the innovations implemented. For its evaluation, the average payback period will be used, as stated by Kislingerová (2007). Average payback period indicates the time in which the investment should be paid off considering average cash flows arising from the implementation of the investment.

$$t = \frac{C_0}{\varnothing CF}$$

where: C0 is the capital invested

∅ CF is the average flow of funds arising from investment for its planned economic life

By inverting average payback period in percentage, it is possible to obtain average percentage return. The value indicates the average annual percentage return on the amount invested.

$$\varnothing r = \frac{\varnothing CF}{C_n}$$

A simplified form of payback period not including the discount coefficient will be used because the discount coefficient is always difficult to determine precisely for a small engineering company. Moreover, the economic analysis shall include a process to evaluate the change in margin and volume of sales. This evaluation will be carried out by means of the ratio and percentage increase in given parameters in relation to their individual initial values.

#### 4. Results and Discussion

##### *Specifics and uniqueness of the transformation process*

Prior to the actual analysis of relationship between the company’s business portfolio and the innovation process, the specifics and uniqueness of the corporate transformation process were identified. Part of the company’s success is its specific approach to customers and a well-functioning order creation process (see Table 3) where customer awareness and acceptance of future technological process is decisive for the production process and pricing.

Table 3. Diagram of order creation process in a company

 Requirement	1. Customer requirement	<input checked="" type="checkbox"/> Can be accommodated <input checked="" type="checkbox"/> Can't be accommodated	 Invoicing
	2. Difficulty assessment	<input checked="" type="checkbox"/> Can be accommodated <input checked="" type="checkbox"/> Can't be accommodated	
	3. Notify customer	<input checked="" type="checkbox"/> Offer accepted <input checked="" type="checkbox"/> Offer rejected	
	4. Receive the product	X	
	5. Model diagnosis	<input checked="" type="checkbox"/> Can be realized <input checked="" type="checkbox"/> Can't be realizet = end	
	6. Notify customer (price etc.)	<input checked="" type="checkbox"/> Proceed <input checked="" type="checkbox"/> Annulment = end	
	7. Manufacturing process	X	
	8. Product completion	X	
	9. Product delivery	X	
	Satisfaction of requirement	10. Invoicing	

Source: Authors

The standard production process takes place at point 7 or point 5. Given that it is a unique micro-enterprise, a high degree of interdependence of individual operations and subprocesses have been identified. This means that individual elements, such as logistics, control, or construction design (if carried out directly at the workplace) are inseparable parts of the production process.

***Risks of transformation process as a framework of innovation process***

In the context of the production processes, risks could be identified that affect this process. The most significant business risk is considered to be associated with the improper communication of information. Within the solution processes, the management of the company was proposed to replace manual information recording with digital software. Part of the innovations in the model micro-enterprise was thus the implementation of software for order management and extraction of data from the production process. Within the analysis of software suitable for the company, an initial list of systems was compiled. The mapping of possible software solutions was preceded by determining 15 parameters that further specified the suitability of the systems for their possible implementation in the model company. The observed parameters were recording orders, recording employee work on orders, recording of employee attendance, recording material consumption in orders, possibility of data export and import (this is particularly suitable for stock and non-stock items), invoicing options, price setting of different hourly rates of employees and/or machines, basic financial tools for evaluation of cost and profitability of orders, the possibility to rent or purchase a licence (a permanent licence), whether support is provided and whether it is free, possibility to obtain hardware from the system supplier, and the possibility to connect to other systems through API. Based on these parameters, the data were graphically processed (see Graph 1) to be able to clearly assess the suitability of a specific proposed solution. The evaluation was based on assigning values -1, 0 and 1 to given software according to whether a given parameter meets (1), does not meet (-1) the set criteria or whether the information on the software function is not available (0). This implies that even negative values are important for the evaluation. The evaluation also included the weight coefficient (0.1 - 1), which determines the significance of individual observed criteria for the selected model company. Here, 1 indicates the highest weight, while 0.1 the lowest one. In the case of the most observed parameter such as recording orders, employee attendance, material consumption, and possibility of data export and import, the assigned weight of these functions was 1. When comparing the software, the latest commercial version with add-ons was considered, except for the eMistr system, where add-ons go beyond the monitored areas.

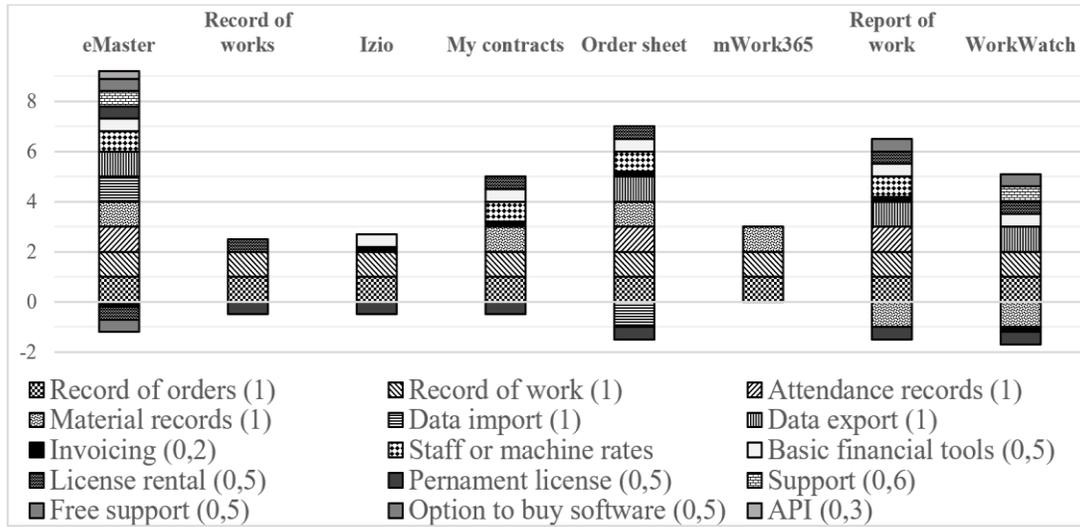


Figure 1. Results of comparative criteria analysis

Source: Authors (assessed on the basis of publicly available information)

As seen from the above graph, all systems can perform the function of work recording. The only system that meets all 6 weight criteria is eMistr. The second most suitable system was “Zakázkovník”, which, unlike eMistr, does not have the function of data import, which represents its biggest advantage for its application in the model company. For implementation, the eMistr system was thus selected, as it enables nearly 100% transition of an industrial company from manual data management to the digital form, and thus reduces the necessary administration.

**Solution for harmonization of business portfolio with business technologies**

As mentioned above, the company is characterized by a wide range of production technologies and the corresponding business portfolio. This brings along a risk of their full use, and it can thus be very complicated to determine the benefits of individual technologies for the given company. Table 4 below shows the input values, output recommendations, and resulting evaluation on a representative sample of technologies in the model company.

**Table 4.** Technology evaluation system in the model company (representative sample)

Rate [Kč/h]	Current status			Estimated future status			Rating	Change
	Usage	Attractivity	Proposal	Usage	Attractivity	Proposal		
550	<b>Machining – Horizontal boring mill 1</b>							
	0,7	8	⊕	0,7	8	⊕	⊕	
550	<b>Machining – Spindle lathe 2</b>							
	0,7	8	⊕	0,7	8	⊕	⊕	
550	<b>Welding + heating – Automatic welding machine Castolin</b>							
	0,3	8	+	0,6	8	⊕	⊗	Positive change
550	<b>Other – Truck lift</b>							
	0,2	2	⊗	0,1	2	⊗	⊗	
<b>Legend of recommendation</b>								
Cancel		Consider cancelling		Expand		Main activity		Change
⊗		?		+		⊕		⊗

Source: Authors

The table shows which technologies were recommended to be phased out from the business portfolio (Other – Truck lift).

**Economic evaluation of innovations in technology**

Economic evaluation of the innovation proposal for changes was carried out in relation to the technology evaluation system proposed by researchers for the implementation of digitization in the model company. Table 5 shows the balance of costs of innovation and income from the sales of discarded machines and stock

**Table 5.** Balance of costs of innovation and income from the sale of discarded machinery and stock

Item	Price [CZK]
Costs of implementation of technology changes (purchase of machinery and software)	517 550
Sale of stock not related to the new business portfolio	-20 000
Sale of equipment not related to the new business portfolio	-183 500
<b>Total costs [CZK]</b>	<b>314 050</b>

Source: Authors

The assessment of return on investment was performed using the average payback period (t) where the difference between the annual amount of labour cost savings at the same volume of production and annual fixed costs was used as the cash flow of investment repayment (CF):

$$t = \frac{C_0}{\varnothing CF} = \frac{314\ 050}{81\ 328 - 15\ 000} = 4.73 \text{ [years]}$$

Where: 81 328 CZK is the sum of the constant annual cost savings arising from implemented innovations.

15 000 CZK are annual fixed costs associated with innovation (costs of machinery and equipment maintenance)

The average percentage return that indicates the percentage return in the model company resulting from the innovation implemented is determined as follows:

$$\varnothing r = \frac{\varnothing CF}{C_0} = \frac{81\ 328 - 15\ 000}{314\ 050} = 0.2112 \Rightarrow 21.12 \text{ [%]}$$

Further calculation considered 230 effective days on which the employees actually work. Four employees in production work a total of 7 360 hours for an 8-hour working day. In the model company, the innovations can save about 413 hours per year. These are hours of inefficient time when the company pays the workers their wage and at the same time charges this time to its customers. The following calculations are based on the proportional increase in sales, which is generated from the time savings in the execution of orders. The calculation below represents the conversion of sales per employee at the point of higher time efficiency. By analogy, it can be said that thanks to a more efficient production process, the employees now need less time to achieve the same sales.

$$\text{Share of sales per employee and hour} = \frac{7\,908\,532}{(7\,360 - 413)} = 1\,138 \text{ [CZK /hour]}$$

where: 7360 – annual hours worked by all employees

413 – time saved thanks to innovations

The calculation below determines higher sales generated thanks to a more efficient production process with all other factors being equal.

$$\text{Sales at more efficient production process} = 1\,138 \cdot 7\,360 = 8\,375\,680 \text{ [CZK]}$$

The increase in labour efficiency in the production process increases sales by 467 147 CZK, which accounts for 5.91 %. The above calculation applies to total sales regardless of whether it is only sales for labour or for products or goods. Depending on the way the company operates, it can be assumed that the increase in the volume of sales of own products, services and goods grows linearly with the volume of hours worked. The calculation of margin was based on the size of changes brought by the innovation in the monitored period. Let's say that the average annual cost of innovation is 77 810 CZK and the saving resulting from innovation is 81 328 CZK. The annual difference is 3 518 CZK. When dividing this difference by the aforementioned volume of hours worked (7 360), the cost saving is nearly 0.48 CZK for every hour worked. In the calculations, the model company works with average hourly costs of 392 CZK. The company thus achieved the following average margins:

$$\text{Current margin} = 550 - 392 = 158 \text{ [CZK]}$$

$$\text{New margin} = 550 - (392 - 0.48) = 158.48 \text{ [CZK]}$$

The percentage increase in margin resulting from the innovations implemented are calculated as follows:

$$\text{Increased margin} = \frac{158.48 - 158}{158} = 0.003 \Rightarrow 0.3 \text{ [%]}$$

As can be seen above, the implementation of innovations did not result in a substantial increase in the case of business margin.

### ***Economic evaluation of innovations in the area of digitization***

The evaluation of the benefits of digitization was based on the assumption of benefits resulting from the introduction of this new form of recording, evaluation and reporting. The actual value invested in digitization after deducting the revenues from the sale of equipment is 190 467 CZK. For the purposes of the basic evaluation of return, the calculation of average payback period was selected. In this case, CF was the difference between the annual cost savings from the implementation of the software and annual costs associated with its operation:

$$t = \frac{C_0}{\varnothing \text{ CF}} = \frac{190\,467}{27\,830 - 9\,000} = 10.12 \text{ [years]}$$

where: 27 830 CZK is the constant annual cost saving resulting from the implementation of the software

9 000 CZK expresses the fixed costs associated with the software use

The average percentage of return resulting from the implementation of the software for the management of orders is as follows:

$$\varnothing r = \frac{\varnothing CF}{C_n} = \frac{27\,830 - 9\,000}{190\,467} = 0.0989 \Rightarrow 9.89 \text{ [%]}$$

The use of the software enables saving 107 hours per year. The current sales generated by 4 employees are again 7 908 532 CZK. The increase in sales resulting from the savings generated by the implementation of the software was determined based on the conversion of sales per employee at the point of higher time efficiency. The calculation is presented below:

$$\text{Share of sales per employee and hour} = \frac{7\,908\,532}{(7360 - 107)} = 1\,090 \text{ [CZK/hour]}$$

Sales generated during the more efficient production process are as follows:

$$\begin{aligned} \text{Sales generated with higher efficiency of the production process} &= 1\,090 \cdot 7360 \\ &= 8\,022\,400 \text{ [CZK]} \end{aligned}$$

In this case, digitization enables an increase in sales of goods, services and products by 1.44 %. In absolute value, it is 113 868 CZK.

The calculation of the margin was again based on the savings that the given innovation brings in the monitored period.

$$\text{Savings} = \text{benefits} - \text{costs} = 27\,830 - 47\,093 = -19\,263 \text{ [CZK]}$$

The above calculation was based on the assumption that the implementation of the software will generate savings. However, this has not been confirmed for the model company. When dividing the above result by 7 360, the resulting share is -2,62 CZK/hour. A higher hourly cost thus brings a lower margin for the company:

$$\text{New margin} = 550 - (392 + 2.62) = 155.38 \text{ [CZK]}$$

where: 392 is the current hourly cost in the model company

In percentage terms, digitization generates the following increase in margin:

$$\text{Increased margin} = \frac{155.38 - 158}{158} = -0.0166 \Rightarrow -1.66 \text{ [%]}$$

where: 158 is the current margin

It follows from the above outputs that if a company has equipment that is not used and does not bring opportunity costs, its removal can create space for innovations. Moreover, selling the equipment can bring significant funds for further innovations. Although the benefits of innovations are not reflected in a significant increase in margin, the resulting effect of the innovations can have much more significant effect in the technical, time, and organizational aspects of the operation and the related increase in total sales. At the same time, it has been confirmed that mere innovations do not significantly increase the margin, and companies can thus proceed to increasing the hourly rate charged to customers, if it is possible from the perspective of price sensitivity of customers. This statement is of general validity, especially for SMEs.

The presented technology assessment system was created for the area of companies where there are no data or overview of using individual technologies. By setting the range of values and thresholds between individual recommendations, it is possible to achieve different sensitivity of the evaluation. Furthermore, it shall be stated that the created system of business technology assessment does not necessarily bring the desired benefit to larger digitized companies. Therefore, the authors propose further research on the system of technology assessment in order to create a more sophisticated software environment, that, as the authors believe, should be implemented in a suitable commercially available ERP system. Small and medium-sized enterprises, except high-tech companies, typically have many inefficiencies in their production processes, which are usually caused by accompanying administrative processes. SMEs usually respond to this burden with low activity in data recording. Such companies usually have a very low number of administrative staff, if any. In such a case, the introduction of the

software can very positively influence the performance of the whole company. Based on the results presented in this paper, several conclusions can be drawn and it is possible to answer the research questions. The first research question was formulated as follows: What economic efficiency can innovations in the production process bring to SMEs dealing with custom manufacturing in the engineering sector? Following this research question, it can be stated that innovations in the production process can significantly rationalize and streamline the whole process from the organizational and technical point of view. However, in the case of small and medium-sized enterprises, even a relatively significant reorganization of the processes may have only a small effect on the margin. In the model company under review, the confirmed increase in margin was 0.3 %. Nevertheless, the innovations implemented in the company resulted in the desired effect, i.e., a more logical system of operation was implemented and the production capacity of the company was achieved, which will result in a year-on-year increase in sales of almost 6 %. The horizon of the average payback period of the investment in this case was 4.73 years.

The second research question was focused specifically on the area of digitization: What economic benefit does the introduction of digitization into the production process generate in SMEs dealing with custom manufacturing in the engineering sector? The response concerning the digitization benefits for SMEs provides partially contradictory results. As for the effects on the operation of the company, digitization was definitely beneficial. On the other hand, the economic benefits of digitization may not be reflected positively in all parameters. This is partly due to the primary traceability of all effects the digitization has for the company. However, the difficulty of predicting the future growth in the volume of data used also plays a role. In the model company, digitization has led to increased labour efficiency, but due to the cost of the solution, this has not led to an increase in margin but even to its reduction by 1.66 %. Nevertheless, higher labour efficiency has resulted in a year-on-year increase in sales by 1.44 %. The payback period of the investment is 10,12 years. Some of the negative effects were due to the fact that the model company is currently not able to fully use the digitization potential. It is mainly the size limitation of the model company. Furthermore, it was possible to present the reduction of financial burden of innovation by selling rather than just scrapping the equipment of the enterprise. The paper has several limitations that limit the validity of its generally applicable results. The first limitation is that the paper uses the model of a profitable company, which may not always be fully met in practice. In the results, the paper presents conclusions from a case study focused on streamlining the production process and the change in the concept of business strategy following the selected micro-enterprise oriented to service and production. The model company is unique in the structure of its business portfolio; therefore, some of the assumptions associated with the business environment is limited only to this or similar companies. Another limitation is that the paper uses a very limited quantity of information due to the lack of systematic collection of operational data by the model company. This condition was anticipated because many small and medium-sized enterprises report these shortcomings when analyzing their processes.

## **Conclusions**

The selected engineering micro-enterprise, i.e., a company with a maximum of 25 employees, is a typical representative of engineering companies in the South Bohemian region. It can be stated that the presented conclusions have general validity for this size category and sector. In terms of their specifics, characteristics, trends, and sustainability, the following factors and parameters can be specified. The fundamental production feature of these companies is an average, often obsolete technological equipment, including the corporate infrastructure. This clearly negative parameter is compensated by increased focus on satisfying customer needs and high degree of flexibility and innovations in production. For this, the pragmatic knowledge and skills of the majority of managers in these companies are necessary. In terms of production processes, there is a high degree of interdependence between individual operations and subprocesses. This means that logistics, control, or construction and design activities are inseparable parts of the production process. The area of business risks is also very specific, for example the flow and communication of relevant information. This has recently been

addressed by the advancement of digitization in this category of companies. The result of the qualitative testing of the selected parameters of the transformation process was the finding that the most functional and effective system is eMistr, which enables the transition of the company to digital data management.

The business portfolio was also subjected to the research. It has been confirmed that too broad a business portfolio and too many processes and technologies in a company bring a risk of not being fully used and it can thus be very difficult to determine the benefits of individual technologies for a given company. The data collection showed that SMEs, or micro-enterprises dealing with production and services in engineering tend to purchase technologies that are not related to their business portfolio and are thus not actively used by the companies. This can be explained by the absence of active creation and updating of business strategies. Innovation process takes place even in this size category of companies. Economic evaluation of the innovative process shows that the mere implementation of innovations has not resulted in a significant increase in margin. This was not the case for the evaluation of benefits of the digitization process, which has resulted in an increase in sales and business margin. A completely new finding is that if a company has equipment that is not used and which incurs opportunity costs, its removal may create space for innovations and its selling can represent additional funds that can be used for innovations. Although the benefit of innovations is not reflected in a significant increase in margin, the resulting effect can be much more pronounced in the technical, time, and organizational aspect of the operation. Some of the above new findings can be considered essential in terms of the sustainability of this category of companies, but they are continuously addressed by the managers. The relevance of these findings is gaining momentum in relation to the increasing existential risk of engineering companies in general. At the time of conducting this research and preparation of this paper, which has a character of a generalized case study, the authors did not know how relevant the information found will be and how the increasing ecocritical situations will threaten the very existence of this size category in the engineering sector.

## References

- Al-Omouh, K. S., Ribeiro-Navarrete, S., Lassala, C., & Skare, M. (2022). Networking and knowledge creation: Social capital and collaborative innovation in responding to the COVID-19 crisis. *Journal of Innovation & Knowledge*, 7(2), 100181. <https://doi.org/10.1016/j.jik.2022.100181>
- Anshari, M., & Almunawar, M.N. (2021). Adopting open innovation for SMEs and industrial revolution 4.0. *Journal of Science and Technology Policy Management*, 13(2), 405-427. <https://doi.org/10.1108/JSTPM-03-2020-0061>
- Ashrafi, A., Ravasan, A.Z., Trkman, P., & Afshari, S. (2019). The role of business analytics capabilities in bolstering firms' agility and performance. *Int. J. Inf. Manag.*, 47, 1-15. <https://doi.org/10.1016/j.ijinfomgt.2018.12.005>
- Azar, G., & Ciabuschi, F. (2017). Organizational innovation, technological innovation, and export performance: The effects of innovation radicalness and extensiveness. *International Business Review*, 26(2), 324-336, <https://doi.org/10.1016/j.ibusrev.2016.09.002>
- Belas, J., Gavurova, B., Kubak, M., & Novotna, A. (2023). Risk management level determinants in Visegrad countries—sectoral analysis. *Technological and Economic Development of Economy*, 29(1), 307-325. <https://doi.org/10.3846/tede.2023.18415>
- Bocken, N. M. P., & Geradts, T. H. J. (2020). Barriers and drivers to sustainable business model innovation: Organization design and dynamic capabilities. *Long Range Planning*, 53(4), ISSN 0024-6301, <https://doi.org/10.1016/j.lrp.2019.101950>
- Breuer, H., & Luedeke-Freund, F. (2017). Values-based Network and BusinessModel Inovation, *International Journal of Innovation Management*, 21(3). <https://doi.org/10.1142/S1363919617500281>
- Civelek, M. et. al. (2020). The Usage of Technology-Enabled Marketing Tools by SMEs and Their Bankruptcy Concerns: Evidence from Visegrad Countries. *Acta Montanistica Slovaca*, 25(3), 263-273. <https://doi.org/10.46544/AMS.v25i3.01>
- Domanižová, P., Janičková, N., & Milichovský, F. (2021). Specification of product value as a key part of Canvas business model in the context of industry 4.0. *Littera Scripta*, 14(1), 1-10. [https://doi.org/10.36708/Littera\\_Scripta2021/1/1](https://doi.org/10.36708/Littera_Scripta2021/1/1)

- Dušek, R., & Sagapova, N. (2022). Instagram Use among Czech Young Generation during COVID-19 Lockdown Period with Restricted Travel and Services. *Journal of Tourism and Services*, 13(24), 150-63. <https://doi.org/10.29036/jots.v13i24.350>
- Ferdous, S., & Ikeda, M. (2018). Value creation and competitive advantages for the Shrimp industries in Bangladesh. *Journal of Agribusiness in Developing and Emerging Economies*, 8(3), 518-536. <https://doi.org/10.1108/JADEE-04-2017-0048>
- Fernandez-Vidal, J. et al. (2022). Digitalization and corporate transformation: The case of European oil & gas firms. *Technological Forecasting and Social Change, Elsevier*, 174(C). <https://doi.org/10.1016/j.techfore.2021.121293>
- Foroudi, P., Foroudi, M., Palazzo M., & Nguyen, B. (2022). Fly me to the moon: from corporate branding orientation to retailer preference and business performance. *International Journal of Contemporary Hospitality Management*. 34(1), 78-112. <https://doi.org/10.1108/IJCHM-12-2020-1424>
- Frank, A.G. et al. (2019), Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change*, 141, 341-351. <https://doi.org/10.1016/j.techfore.2019.01.014>
- Gavurova, B., Vagasova, T., & Kovac, V. (2016). Competitiveness Assessment of Slovak Republic Regions. Ed. Krajcicek, J., Nesleha, J., Urbanovsky, K. *European Financial System 2016: Proceedings of the 13th International Scientific Conference*, 175 p. Brno, Czech Republic.
- Ghezzi, A., & Cavallo, A. (2020). Agile Business Model Innovation in Digital Entrepreneurship: Lean Startup Approaches. *Journal of Business Research*, 110, 519-537. <https://doi.org/10.1016/j.jbusres.2018.06.013>
- Heekyung, K., (2015). An Empirical Study on Effect of Technology Innovation of Small and Medium Business on Business Performance: The Mediation Effect of Partnership. *Journal of CEO and Management Studies*. 18(3), 21-36.
- Henry, M.A., Bauwens, T., Hekkert, M., & Kirchherr, J. (2020). A typology of circular start-ups: An Analysis of 128 circular business models. *Journal of Cleaner Production*, 245, 118528. <https://doi.org/10.1016/j.jclepro.2019.118528>
- Horák, J., Šuleř, P., Kollmann, J. & Mareček, J. (2020). Credit Absorption Capacity of Businesses in the Construction Sector of the Czech Republic—Analysis Based on the Difference in Values of EVA Entity and EVA Equity. *Sustainability*, 12(21). <https://doi.org/10.3390/su12219078>
- Hwang, WS. & Kim, HS. (2021). Does the adoption of emerging technologies improve technical efficiency? Evidence from Korean manufacturing SMEs. *Small Business Economics*, 69, 627-643. <https://doi.org/10.1007/s11187-021-00554-w>
- Kasych, A. et al. (2021). The impact of intellectual capital on innovation activity of companies. *Soc Romana Pentru Asigurarea Calitatii*, 22(182), 3-11. (<https://www.webofscience.com/wos/woscc/full-record/WOS:000651404500001>)
- Kislingerová, E. et al. (2007). *Manažerské finance. 2., přepřac. a rozš. vyd. Praha: C.H. Beck, Beckova edice ekonomie*. ISBN 9788071799030.
- Kljucnikov, A. et al. (2021). The Differences in the Usage of Social Media between SMEs operating in the Iron and Mining Industries. *Acta Montanistica Slovaca*, 26(2), 185-194. <https://doi.org/10.46544/AMS.v26i2.01>
- Kollmann, J. & Dobrovič, J. (2022). Key factors of organizational and management structures in the formaton of competitive strategy. *Journal of International Studies*, 15(3). <https://doi.org/10.14254/2071-8330.2022/15-3/9>
- Komang, S. M., Indrianawati, U., Sri, W. A., & Tanti, H. (2022). Identification of the relationship among perceived firm innovativeness, trust and customer loyalty. *Polish Journal of Management Studies*, 26(1), 125-139. <https://doi.org/10.17512/pjms.2022.26.1.08>
- Konečný, M., Kostiuk, Y., & Ruschak, M. (2022). Online reputation of business entities from the field of supply chain: an empirical study on the Czech market. *IDIMT 2022 - Digitalization of Society, Business and Management in a Pandemic: 30th Interdisciplinary Information Management Talks*, 251-256. <https://doi.org/10.35011/IDIMT-2022-251>
- Korshunov, G., Kabanov, E. & Cehlar, M. (2020). Occupational Risk Management in a Mining Enterprise with the Aid of an Improved Matrix Method for Risk Assessment. *Acta Montanistica Slovaca*, 25(3), 289-301. <https://doi.org/10.46544/AMS.v25i3.3>

- Kraj, V. (2022). Digitalization of SMEs and their perceptions regarding public interventions and supports of digitalization: Evidence from mining and iron industries. *Acta Montanistica Slovaca*, 27(1), 100-116. <https://doi.org/10.46544/AMS.v27i1.08>
- Krajcik, V. (2021). The readiness of Small and Medium-sized Enterprises (SMEs) for the digitalization of industry: Evidence from the Czech Republic. *Acta Montanistica Slovaca*, 26(4), 761-772. <https://doi.org/10.46544/AMS.v26i4.13>
- Krugman, P.R., Obstfeld, M. & Melitz, M.J. (2015). *International Economics: Theory and Policy*, Harlow: Pearson Education Limited. ISBN-13: 978-01-334-2364-8
- Ližbetinová, L., Hitka, M., Chenguang, Li., & Caha, Z. (2017). Motivation of employees of transport and logistics companies in the Czech Republic and in a Selected Region of the PRC. *MATEC Web of Conferences*, Volume 134, 18th International Scientific Conference, LOGI 2017. České Budějovice: EDP Sciences. ISSN 2261-236X. <https://doi.org/10.1051/mateconf/201713400032>
- Müller, J. M., Buliga, O. & Voigt, K. I. (2021). The role of absorptive capacity and innovation strategy in the design of industry 4.0 business Models - A comparison between SMEs and large enterprises. *European Management Journal*, 39(3), 333-343. <https://doi.org/10.1016/j.emj.2020.01.002>
- Nagy, M., Zábajník, S., & Valaskova, K. (2022). Chasing up the value-added by implementing newest trends of Industry 4.0 – Evidence from Slovak automotive industry. *Littera Scripta*, 15(1), 142-158. [https://doi.org/10.36708/Littera\\_Scripta2022/1/10](https://doi.org/10.36708/Littera_Scripta2022/1/10)
- Owalla, B. et al. (2021). Mapping SME productivity research: a systematic review of empirical evidence and future research agenda. *Small Business Economics*, 58(3), 1258-1307. <https://doi.org/10.1007/s11187-021-00450-3>
- Podshivalova M.V. & Almrshed S.K.Kh. (2021). Managing the innovation potential of small high-tech enterprises. *Upravenets – The Manager*, 12(4), 16-27. <https://doi.org/10.29141/2218-5003-2021-12-4-2>.
- Phadermrod, B., Crowder, R. M. & Wills, G. B. (2019). Importance-Performance Analysis based SWOT analysis. *International Journal of Information Management*, 44, 194-203. <https://doi.org/10.1016/j.ijinfomgt.2016.03.009>
- Pollák, F., Dorčák, P., Markovič, P., Világi, R. & Konečný, M. (2021). Analysis of selected characteristics of e-consumer behavior of Slovaks during the first wave of the Covid-19 pandemic. *IDIMT 2021 - Pandemics: Impacts, Strategies and Responses*, 29th Interdisciplinary Information Management Talks, 299–306. <https://doi.org/10.18690/978-961-286-442-2.53>
- Pollák, F., Markovič, P., Vavrek, R. & Konečný, M. (2022). Return to the New Normal: Empirical Analysis of Changes in E-Consumer Behavior during the COVID-19 Pandemic. *Behavioral Sciences*, 12(3), 85 <https://doi.org/10.3390/bs12030085>
- Putro, S. W., Kusumawardhani, A., & Raharjo, S. T. (2021). The role of organizational innovations in improving local government performance. *Polish Journal of Management Studies*, 23(2), 437-448. <https://doi.org/10.17512/pjms.2021.23.2.26>
- Sagapova, N., & Dušek, R., (2021). The Effect of the First Wave of the Covid-19 Global Pandemic on Summer Holiday Plans In 2020 - Case Study from the Czech Republic. *AD ALTA: Journal of Interdisciplinary Research*. 11(1), 271-277. ISSN 1804-7890. (<https://www.webofscience.com/wos/woscc/full-record/WOS:000674964900044>)
- Sjodin, D. et al. (2020). Value Creation and Value Capture Alignment in Business Model Innovation: A Process View on Outcome-Based Business Models. *Journal of Product Innovation Management*, 37(2), 158-183. <https://doi.org/10.1111/jpim.12516>
- Skare, M., & Riberio Soriano, D. (2022). Explaining COVID-19 shock wave mechanism in the European service industry using convergence clubs analysis. *Service Business*, 16, 283-307 (2022). <https://doi.org/10.1007/s11628-021-00471-8>
- Skare, M., & Porada-Rochon, M. (2022). The role of innovation in sustainable growth: A dynamic panel study on micro and macro levels 1990–2019. *Technological Forecasting and Social Change*, 175, 121337. <https://doi.org/10.1016/j.techfore.2021.121337>
- Soltes, V., & Gavurova, B. (2015). Modification of Performance Measurement System in the Intentions of Globalization Trends. *Polish Journal of Management Studies*, 11(2), 160-170.
- Sommer, M. et al. (2020). Improvement of Factory Planning by Automated Generation of a Digital Twin. *Transdisciplinary Engineering for Complex Socio-technical Systems – Real-life Applications, Advances in Transdisciplinary Engineering*, 12, 453-462. <https://doi.org/10.3233/ATDE200105>

- Sternad, D., Krenn, M. & Schmid, S. (2019), Business excellence for SMEs: motives, obstacles, and size-related adaptations. *Total Quality Management & Business Excellence*, 30(1-2), 151-168, <https://doi.org/10.1080/14783363.2017.1300054>
- Suto, M. & Takehara, H. (2022). Employee-oriented corporate social responsibility, innovation, and firm value. *Corporate Social Responsibility and Environmental Management*, 1-14. <https://doi.org/10.1002/csr.2232>
- Šoltés, V., & Gavurová, B. (2014). Innovation Policy as the Main Accelerator of Increasing the Competitiveness of Small and Medium-sized Enterprises in Slovakia. *Emerging Markets Queries in Finance and Business (EMQ 2013)*, *Procedia Economics and Finance*, 15, 1478-1485. [https://doi.org/10.1016/s2212-5671\(14\)00614-5](https://doi.org/10.1016/s2212-5671(14)00614-5)
- Tyukhtenko N. et al., (2021). Innovative Approaches to Enterprise Competitiveness Assessment. *Marketing and Management of Innovations*, 1, 278-289, <https://doi.org/10.21272/mmi.2021.1-21>
- Veile, J. et al., (2019). Lessons learned from Industry 4.0 implementation in the German manufacturing industry. *Journal of Manufacturing Technology Management*, 31(5), 977-997, <https://doi.org/10.1108/JMTM-08-2018-0270f>
- Xiao, A., Qin, Y., Xu, Z., & Škare, M. (2022). Emerging research trends of total quality management in the COVID-19 pandemic: a dynamic evolution analysis. *Economic Research-Ekonomska Istraživanja*, 1-29. <https://doi.org/10.1080/1331677X.2022.2140305>
- Wang, X., Qin, Y., Xu, Z., & Škare, M. (2022). A look at the focus shift in innovation literature due to Covid-19 pandemic. *Journal of Business Research*, 145, 1-20. <https://doi.org/10.1016/j.jbusres.2022.02.067>
- Weber, V. & Müßig, A., (2022). The Effect of Business Strategy on Risk Disclosure. *Accounting in Europe*. <https://doi.org/10.1080/17449480.2021.2018473>
- Wu, B. et al., (2022). Substantial response or impression management? Compliance strategies for sustainable development responsibility in family firms. *Technological Forecasting and Social Change*, Elsevier. 174(C). <https://doi.org/10.1016/j.techfore.2021.121214>
- Zelený, M., (2021). Entering the age of accelerated change: In search of equilibrium. *Human Systems Management*. 40(1), 3-14, <https://doi.org/10.3233/HSM-209002>
- Zuhaira B. & Ahmad N. (2021). Business process modeling, implementation, analysis, and management: the case of business process management tools. *Business Process Management Journal*, 27(1), 145-183, <https://doi.org/10.1108/BPMJ-06-2018-0168>

**Funding:** This paper has been prepared as a part of internal research competition at the department of management for 2022 entitled: “A new approach in the generation of corporate (business) strategy based on the parameterization of business processes“. PID: IVSUPS004.

**Author Contributions:** Conceptualization: *Talíř, Straková*; methodology: *Talíř*; data analysis: *Talíř*, writing—original draft preparation: *Talíř*, writing; review and editing: *Talíř, Straková*; visualization: *Talíř*. All authors have read and agreed to the published version of the manuscript.

**Milan TALÍŘ** is doctoral student at the Institute of Management, University of Technology Faculty in Brno, Kolejní 2906/4, 612 00, Brno (Czech Republic). Research interests: Strategic Management and business strategy.

ORCID ID: <https://orcid.org/0000-0002-6510-1297>

**Jarmila STRAKOVÁ**, is the Associate Professor on the department of Corporate strategy, Institute of Technology and business in České Budějovice, Okružní 517/10, 37001 České Budějovice (Czech Republic). Research interests: Strategic and value management.

ORCID ID: <https://orcid.org/0000-0002-3048-3467>

---

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





**Publisher**

<http://jssidoi.org/esc/home>



---

## PROJECT MANAGEMENT IN THE RENEWABLE ENERGY SOURCES INDUSTRY IN POLAND - IDENTIFICATION OF CONDITIONS AND BARRIERS

**Michał Igielski**

*Gdynia Maritime University, 81-87 Morska St., 81-225 Gdynia, Poland*

*E-mail: [m.igielski@wznj.umg.edu.pl](mailto:m.igielski@wznj.umg.edu.pl)*

*Received 11 February 2023; accepted 8 May 2023; published 30 June 2023*

**Abstract.** The article aims to identify the conditions accompanying the project management process in the renewable energy sources (RES) industry. The author will also try to reveal the key barriers and problems associated with this process in the surveyed business entities. In addition to the analysis of the literature, the author chose as another research method a survey in the form of a structured interview with project managers and their employees - the survey was conducted in 2021 in 44 purposively selected enterprises of the SME sector, which are based in Poland and implement this type of project (a total of 254 people took part in the survey). After analysing the literature on the subject and the survey results, keeping in mind its pilot nature, the author listed ten determinants that impact the management of RES projects. According to the author, they significantly affect the project's result and generate the main problems and dysfunctions that project teams encounter.

**Keywords:** project; project management; project management considerations; renewable energy sources

**Reference** to this paper should be made as follows: Igielski, M. 2023. Project management in the renewable energy sources industry in Poland - identification of conditions and barriers. *Entrepreneurship and Sustainability Issues*, 10(4), 135-151. [http://doi.org/10.9770/jesi.2023.10.4\(9\)](http://doi.org/10.9770/jesi.2023.10.4(9))

**JEL Classifications:** M10, M12, Q42

### 1. Introduction

Renewable energy sources (RES) are nowadays the main alternative to fossil fuels and, at the same time, are seen as an essential contributor to halting dangerous climate change on the planet. Their use in national energy balances is not only a manifestation of the implementation of guidelines resulting from agreements at the global level. Still, it is also a common sense and economically conditioned action (Młynarski, 2019).

Renewable energy sources, mainly those based on natural forces, have exceptional potential for meeting the population's growing electricity needs. They are not depleting; their use does not burden the environment - to such a significant degree - as fossil fuels do; they allow decentralised energy production and, therefore, close to the

consumer (which does not require the transmission of energy over long distances), they enable efficient development of rural areas with limited access to the electricity grid (Tomaszewski, 2020).

Organisations that choose to implement these alternative energy sources are moving toward project-based management, emphasising personnel and excellent communication between the various segments of the operation. A project is defined as the totality of activities that allow the organisation of work in a way that leads to the achievement of the set goal. Many factors help or hinder the achievement of this goal. Efficient management coupled with effective communication is the basis for successful project management, i.e., achieving all set goals.

Regardless of which view of the project we choose and which model we use, the most significant attention is paid to teamwork and good internal and external communication. The organisation of projects and project teams is becoming a compulsion for forward-looking companies. On the other hand, due to the increasing globalisation of business, the short life cycle of RES products, increasing competition and high integration in the outcome of customers, management through project implementation in the RES industry is becoming not only a factor in the success of the company, but even part of the strategy for building competitive advantage.

Hence, the subject of this article is to analyse the management of projects that use renewable energy sources in Poland, with a particular focus on the conditions of this process and its dysfunctions.

## **2. Theoretical background**

An important direction in management science is the concept of Project Management, which has been popularised worldwide since the 1960s. However, it was only in the 1990s that this new management concept, which has been applied to run unique businesses, gained many supporters in Europe. This happened due to contacts with developed companies that used and are applying project management in practice and due to global organisations' popularisation of this subject.

Project management is not limited to special, spectacular, high-profile ventures but is an approach with an expanded structure of applications. Examples of this expanded project management use include research or training projects.

In defining the concept of project management, a system formula can be used, which in this case is defined by the distinguishing features:

- objectives and scope of the project;
- planning;
- organisation of project teams;
- effectiveness of the project;
- project implementation technique;
- control of the course of the design process and implementation work.

In most cases, organisations (enterprises, offices or associations) are organised (structured) so that it is possible to carry out their typical routine activities effectively. These structures usually result from the functions performed by the organisation or the products offered.

Project management is, therefore, an extremely complex issue. For ease of reference, we can distinguish the types of activities included in project management, which the author has presented in Table 1.

**Table 1.** Description of the types of tasks included in project management.

Operational activities (primary)	Managerial activities (management)	Supporting activities (auxiliary)
<p>Include the translation of the inputs possessed into the realisation of the project objective - the reference is the implementation of the project based on the satisfaction of specific needs and/or the solution of a particular problem (the European Commission emphasises the problem approach).</p> <p>A distinction is made between operational activities, consisting of preparing a description of the subject of the project (e.g., project documentation, technical documentation) and administrative activities, consisting of the material implementation of the subject of the project.</p>	<p>They focus on harmonising operational and support activities</p>	<p>Include goal setting, planning, organising, motivating, coordinating and controlling.</p>

*Source:* own study based on Bradley (2012) and Quinn (2017).

With the above overview, we can observe the rank and importance of project management. Thanks to this, we will always have access to the most critical information, which will help us more easily make decisions and pursue predefined goals. The info mentioned includes data on the progress of the initial plan (Jones, 2017).

To sum up, the diverse subject of project management includes three main problem areas (Martini, 2015):

- functional project management (project cycle management);
- institutional project management (project manager and project team);
- personal project management (qualifications and range of skills, distribution of competencies).

In turn, the term project can be used to describe a project implemented within a specific organisation which is new, unusual, and different from routine activities - that the organisation has never encountered before. The statement that a project is carried out within an organisation does not mean that people from outside or other organisations cannot participate. The situation in which a single organisation implements a project is the primary situation considered in this work. Multiple organisations can also carry out projects on a partnership basis, by individuals, or even a single person (Pawlak, 2017). The very concept of the word project comes from the Latin theorem *proiectus*, meaning to advance/progress forward/forward. According to the author, it can be translated as finding and presenting a way to solve a task/problem to be implemented in the future.

Conversely, there is usually a consensus on interpreting this concept in the literature. However, the very popular and frequently cited opinion of American authors can raise (and raises for the author of this article) fundamental doubts. In Table 2, the author has compared what he considers to be basic definitions of the term in conjunction with its main elements.

**Table 2.** Description of the types of tasks included in project management

No.	Distinguishing features	Definition
1.	goals and scope of the project	According to the Project Management Institute, a project is an undertaking of a temporary nature, the purpose of which is to create a unique product (produce a product or provide a service). "Temporariness" is understood here as a closed period in which a specific project sentence will be implemented. "Uniqueness" is the distinctive position of the designed product belonging to a given class (group) of assortment.
2.	objectives and scope of the project, planning	J. D. Frame (2011) believes that a project is oriented toward some goal, involves the coordinated undertaking of related activities over time (it has a beginning and an end) and is characterised by uniqueness.
3.	objectives and scope of the project, planning, effectiveness of the project, control of the course of the design process, implementation work	In German Project Management, project characteristics include goal orientation, one-time nature, complexity, interdisciplinarity, organisational separation, and significance (Witzel, 2013).
4.	objectives and scope of the project, planning, effectiveness of the project, controlling the course of the process	R.K. Wysocki (2015) defines a project as a sequence of unique, complex and interrelated tasks with a common goal intended to be completed within a specified period, without exceeding a set deadline, under established requirements.
5.	objectives and scope of the project, planning, organisation of project teams, effectiveness of the project, project implementation technique, process control	H. Kerzner (2005) defines the concept of a project as a project concerning which objectives, required resources, deadlines for execution, costs, and level of quality have been given. In addition, he stresses that projects, in general should be distinguished by their uniqueness.

*Source:* own study

The author believes that exposing uniqueness (uniqueness) in the definitions of a project, and on the other hand, treating it as an individual (one-time) task, is a fundamental limitation of the scope and type of projects that, in practice, are attributed to the term project.

In addition to the fact that a project is, as a rule, a new and unusual undertaking, it also has distinctive characteristics, such as:

- A specific goal can be achieved in its implementation, and a clearly defined result can be obtained. Such a result may be, for example, a new product, device, or organisational form. This result is also referred to as the system that is built under the project.
- It has a specific start and end date and specific phases - so it is a time-limited project.
- During its implementation, various resources are used: human, financial, materials, equipment, premises, information, etc. These resources are generally limited.
- A project is often separated organizationally from other activities carried out within an organisation.
- It has a specific organisational structure.
- The project involves many people and/or organisational units.
- It is often an extensive and complex undertaking.
- The tasks carried out as part of the project should be characterised by a high degree of innovation.
- The project implementation is usually associated with uncertainty from the point of view of the material solution of the problem (the shape of the system that will be created under the project) and risk. In general, this uncertainty decreases successively as the work progresses.
- The nature of the project changes from one phase to the next, and lines of demarcation between phases can be identified. There are many projects in business practice characterised by wide variation. However, it is possible to

group them systematically and based on an established methodology according to characteristic features (Table 3).

**Table 3.** Division of projects by subject criterion

No.	Type of project	Description
1.	research projects	Are represented by scientific, experimental and development work in all fields of knowledge. Examples of projects include research on technical topics: - product value analysis, - reliability theory, - development of measurement apparatus, - quality control. There are particular problems in human resource management, for example, evaluation of the formation of human relations in the organisation, the use of working time, and analysis of the physical and mental workload of personnel.
2.	technical projects	Very often, they are a development of research projects. They present design solutions for products and manufacturing technologies - for example, projects for the modernisation and equipment of industrial plants, investment projects, and projects for production automation and management computerisation.
3.	manufacturing projects	Are integrated technical and organisational solutions. Their field is operational systems, for example: - organisation and operation of the production process, - a system of supply, transportation, traffic protection, - monitoring organisation, - production controlling model, - organisation of workstations, - logistics systems.
4.	management systems projects	They are divided into economic and organisational: 1. Economic system projects are developed at various levels of economic management, primarily in terms of development strategy. They refer not only to economic and financial issues, but their scope also includes solutions for strategic and marketing management systems, production management, personnel management, price management, and cost management. 2. Organisational systems projects mainly concern the company's organisational structure, task management, distribution and economic cooperation. In addition, this group includes virtual and network organisation management system projects, quality management and information management also belong here. Concerning the company, management system projects can be considered in a broad and narrow sense: - in a broad sense, these projects synthesise development concepts of market ventures (product-market formula), organisational solutions, technical and production projects and others. - in the narrow sense, management system projects relate, for example, to the diversification of the profile and assortment of production, changes in the organisation of the manufacturing process, and new work systems - the scope of projects refers only to sectional solutions.

*Source:* own study based on M. Pawlak (2011), K. Frączkiewicz (2021) and R. Marek (2010).

In summary, based on the information cited above, which shapes the definitions of project and project management that occur in the literature, we can conclude that virtually all of them contain common features, such as:

- purpose;
- time;
- budget/finance;
- planning/design;

- organising;  
project team/people/employees.

They differ only in the authors' approach regarding the rank and importance of the above issues in terms of project management in practice.

When discussing projects involving the renewable energy industry, the starting point is to determine what the industry is based on and what it involves.

The slowly depleting stock of conventional fuels and the growing need to increase the intensity of environmental protection efforts are two of the main driving forces behind the introduction on an increasing scale of modern technologies that use natural energy resources.

In the literature, we can find many definitions of renewable energy sources, which boil down to the same. Therefore, for this article, let's assume that renewable energy sources include all energy sources whose use for the production of heat energy and electricity is not associated with their long-term scarcity - their resources are easily renewable. Renewable energy sources are mainly water energy, wind energy, solar energy, geothermal energy, as well as biomass (Table 4). Natural processes produce electricity and heat, and the entire process does not contribute to the emission of environmentally harmful substances. RES are, therefore, clean energy, safe and friendly to the planet (Mirowski, 2016). This is in line with the definition in the Energy Law of 2006, which defines renewable energy sources as sources that use the following in the conversion process: wind energy, solar radiation, geothermal energy, waves, currents and tides, river fall, energy derived from biomass and landfill biogas.

**Table 4.** Types of renewable energy sources

No.	Source	Description
1.	Water energy	This source is most often used in hydropower plants to produce electricity. For this purpose, water turbines are required, which, when moving, create mechanical energy that goes to hydro generators. There, in turn, it is converted into electricity.
2.	Solar energy	Solar energy has become one of the most undistributed renewable sources, thanks to photovoltaics. Photovoltaic panels mounted on the roof of a building or the ground capture solar radiation and transform it into electricity directed to electrical outlets in homes, businesses, farms or other structures of choice. Solar energy can also be used for heating purposes. This requires solar collectors, which heat water in tanks through a heating medium and heat exchanger. This solution prepares domestic hot water and supports central heating operations.
3.	Wind energy	Renewable energy sources can also use wind energy in the conversion process. To generate electricity, special wind turbines are set in motion by the wind, generating mechanical energy. For electricity to be produced it must first go to the device, which is a generator
4.	Biomass - biodegradable matter	Renewable energy sources can also be talked about in the case of biomass. Biomass is all kinds of matter, such as products and waste from agricultural or forestry production, which is biodegradable. It can be used to create solid, gaseous and liquid fuels. It is most often used to produce heat energy when biomass is burned. The heat generated can, in turn, be used to produce electricity.
5.	Geothermal energy	Geothermal energy is energy from inside the earth. It can be used both to produce electricity and to produce thermal energy, including for heating purposes. To obtain it, it is necessary to drill wells. A technology that uses heat energy from the ground is ground source heat pumps, which can be used to provide heating for a building and to heat domestic hot water.

Source: own study based on Hymon (2022) <https://hymon.pl/co-to-jest-oze-jakie-sa-rodzaje-zrodel-energii-odnawialnej/>

In turn, the division of renewable energy sources can be made according to the type of usable energy produced from them - some sources we can convert to usable energy only in the form of thermal energy (for example, low and medium-temperature geothermal waters), and other sources in the form of electricity (for example, hydroelectric, wind turbines). The latter is abbreviated as RES-E (Renewable Energy Sources-Electricity). Below in Table 5 are those renewable sources from which we can obtain electricity, according to the classification of the European Commission's Directorate-General for Energy and Transport and the International Energy Agency - IEA.

**Table 5.** Types of renewable energy sources

Sorts of RES - E	Directorate	IEA
Biogas of agricultural origin Landfill gas Fermentation gas from wastewater	Biogas	Bioenergy (including waste energy)
Bioenergy (including waste energy) Forest products (wood) Forest production waste (bark, lumber waste, etc.) Agricultural products (energy crops) Waste from agricultural production (including substances of plant and animal substances, e.g., straw)	Solid biomass	
Biodegradable waste (municipal and industrial)	Biological waste	
Electricity from geothermal	Electricity from geothermal	
Small hydropower plants (<10 MW) Large hydropower plants (>10 MW)	Small Hydropower Large Hydropower	Hydropower
Photovoltaics	Photovoltaics	
Electricity from solar collectors	Electricity from solar collectors	
Tidal energy Tidal wave energy	Tidal and wave energy	
Onshore wind energy	Wind Energy Onshore	
Offshore wind energy	Wind Energy Offshore	

*Source:* own study based on Mirowski, 2016.

Renewable energy resources are practically unlimited, but as we can see, their potential is dispersed, and their use of them requires higher capital expenditures. That is why today, the investment costs of generating eco-energy are even higher than that of obtaining and processing fossil fuels. The reason is the still globally controlled top-down prices of energy carriers. The cost-effectiveness of applying technical solutions that use renewable resource energies can be justified when the prices of all energy carriers are liberalised and eco-fuels are fully charged for environmental degradation (Zimny, 2014).

However, one of the main priorities of energy development in the coming years is the development of renewable energy sources. Rational use of energy from renewable sources (water energy, wind energy, solar radiation, earth energy, i.e. geothermal energy and biomass) is one of the essential components of sustainable development with measurable environmental and power effects. The increase in the share of renewable energy sources in the fuel and energy balance of the world contributes to improving the efficiency of use and saving energy resources, improving the environment by reducing emissions of pollutants into the atmosphere and water, and reducing the amount of waste generated. Therefore, supporting the development of these sources is becoming an increasingly severe challenge for all countries of the world and Europe in particular, as reflected in many EU programs (Borgosz-Koczwara & Herlender, 2018).

In summary, the use of renewable energy sources, due to their advantages, not only those related to environmental protection, has become a fundamental priority for EU action in the field of energy. We should stop looking at the implementation of RES projects only through the prism of fighting global warming or levelling CO<sub>2</sub> production. This is also an opportunity for the development of local environments, where by using resources that have been available for many years, new jobs are created, social ties are strengthened, and, after all, what is also very important - ultimately, the cost of living is reduced.

In addition, the increase in the exploitation of renewable energy allows greater independence from the supply of imported energy, enables more robust diversification of supply sources, and contributes to the creation of distributed energy, which will be based on locally available raw materials. This will increase energy security and reduce transmission losses due to the possibility of locating close to the consumer. And this, after all, influences the formation of the country's energy balance, which translates into increased electricity security (Ignarska, 2013).

Issues related to RES projects implementation are widely discussed in the contemporary scientific literature (e.g. Yuksel, 2018; Rodin & Moser, 2021; Maestre et al., 2021; Othman & Khallaf, 2022; Vasquez-Ordonez et al., 2022; Mancerova & Tuyet, 2022). The impact of project management conditions and stemming barriers still need sufficient attention (Boonstra, & Reezigt, 2023; Calderon-Tellez et al., 2023; Soderberg, & Liff, 2023; Shava & Vyas-Doorgapersad 2023). This research intends to fill in this gap by investigating a Polish case.

### **3. Research Methodology and data**

The research involved people managing a Renewable Energy Sources (RES) project - project managers and project team members from public institutions, associations and enterprises. This choice was dictated by the fact that external as well as internal factors influence the management of this type of project, and therefore the author took into account:

- the institution in which they work, that is, its legal form, organisational structure and size;
- individual variables, that is, education, age, gender;
- career variables, that is, their position, work experience, length of service, and knowledge of their work.

In turn, the choice related to the analysed group of organisations was based on the author's observations over the past three years and his personal experience implementing and managing RES projects. In addition, it is also due to legal regulations.

The entire research process was carried out based on the fact that RES project management can be conditioned by (e.g. Aghdaie et al., 2020):

- the organisational structure of the entity in question;
- nature of the organisation;
- the size of the organisation;
- the number of members of the project team;
- their knowledge and experience, and the manner and type of employment for the project position.

The research does not consider micro-enterprises, i.e. institutions employing up to 9 people, usually established only to implement a given project. Their entire staff are project employees only, and organisations that only implement their first project - they have yet to implement any others before and therefore have no experience and reference points.

Due to this fact, the sample size for the study was assumed to be 118 organisations operating in Poland which are implementing at least one RES-related project and have also implemented at least one such project before. In the end, the author induced only 44 organisations to participate in the study, despite making contact and sending a request to 218. Unfortunately, the research sample did not reflect the assumed characteristics of the entire group for the country. Therefore, the presented research results cannot be a total set for Poland - they provide a basis for expanding the research process in the future, and for the time being, can only be treated as a pilot study.

Organisations and project teams that participated in the survey:

- 9 public institutions;
- 23 enterprises;
- 12 associations;

A total of:

- 52 project teams - in 8 organisations, there were two teams;
- 44 project team managers (in organisations that had two projects, one person managed two projects);
- 210 employees of the teams.

Given the research problem of identifying conditions and barriers (problems or dysfunctions) of RES project management, the author chose a survey questionnaire as the primary research tool - he took into account, of course, the distinguished two groups of respondents and prepared two separate questionnaires for each of them. The different content of the questions in the two questionnaires was included.

- the different roles that representatives of the selected groups have in the implementation of the project;
- different participation in the decision-making process;
- different problems in daily work;
- very often highly different knowledge, experience and skills.

Of course, both questionnaires asked questions to indicate the conditions affecting daily work, identify the barriers present during project implementation, or place their project in the organisation where it is implemented. In the survey questionnaires, the author included different types of questions:

- closed alternative;
  - closed filtering ones;
  - closed ones that use a nominal and ordinal scale;
  - determining the rank of importance of the topics under consideration;
  - semi-open in the form of conjunction;
  - so-called "control" tests, which allow checking the sincerity of the respondent's answers;
  - "Stein's Self-Portrait" test - used to identify the needs of respondents and examine the level of expectations;
- questions to identify dehumanising factors - used to identify communication issues or roles in the overall management process.

When analysing the results of the study, taking into account individual variables, in the group of managers and employees of project teams, the following characteristics could be noted:

- the predominance of women over men - 58.4% to 41.6%;
- the largest group was between 31 and 50 years of age - 61.4%;
- the majority of the group had a university degree - 83.4%;
- as many as 76.3% of the respondents were new employees hired for the project;
- 23.7% had previously worked for the organisation in positions not related to the implementation of RES projects;
- only 35.4% of respondents had experience in implementing similar projects;
- only 18.7% of respondents had acquired knowledge of RES project implementation (courses, training, postgraduate studies, first or second-degree studies).

Significantly, the above structure was not influenced by the place of employment of respondents from both the group of managers and the group of project team workers, which means that the structure of project employment is not influenced by the type of organisation in which the project is implemented.

#### **4. Results**

In the first stage of the research, the following determinants of RES project management were identified (alphabetically):

1. Project team members (their selection to the team).
2. Resources and tools available during project implementation.
3. The person of the project manager.
4. Project planning.
5. Distribution of roles and relevant competencies - proper involvement.
6. Flow of information.
7. Strategic management of the project.
8. Strategic management of the organisation.
9. Organisation structure.
10. Cooperation with institutions responsible for the implementation of RES in Poland.

The importance and relevance of the above-identified determinants for each group of respondents are presented in percentage terms in Figure 1 below - it shows which determinants are the most specified and most important for different groups of people involved in the implementation of RES projects.

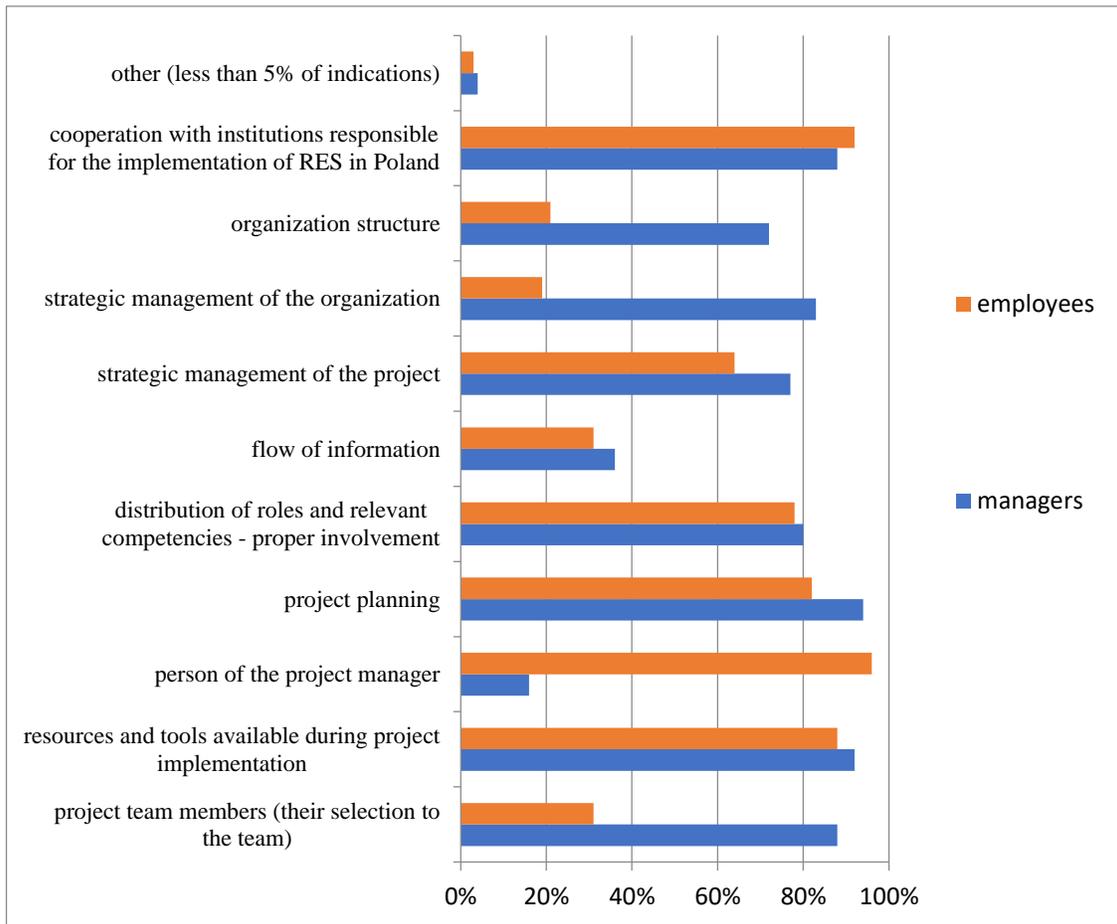


Figure 1. Weight of identified determinants for two groups of respondents

Source: own study

However, we can see discrepancies when emphasising the importance of specific determinants mentioned by the two groups of respondents. If, in the case of the issue of conditions related to the project manager and people in the project team, the discrepancy is justified and is due to the place occupied in the structure of the project, then in the case of conditions related to the organisation (one's workplace), it is surprising to see so few voices of project employees. In the author's opinion, this is a result of the low level of knowledge of basic concepts of organisation and management held by this group of respondents and the fact that they do not realise the strength of the influence of these factors on the project they are implementing. In other cases, on the other hand, the opinions are already much more similar, which means a high impact of the mentioned conditions on the work of all those directly involved in project management. Confirmation of this opinion can be seen in the very high percentage of answers given, exceeding 80% in almost all cases. In addition, all complications accompanying the performance of project tasks have their source precisely within the organisation and do not contrary to appearances and widely accepted opinions, arise from the external environment. In addition, in making the above analysis, it is imperative to note that most people cannot determine whether a given condition is external or internal. This confirms the author's opinion as to their knowledge of management processes.

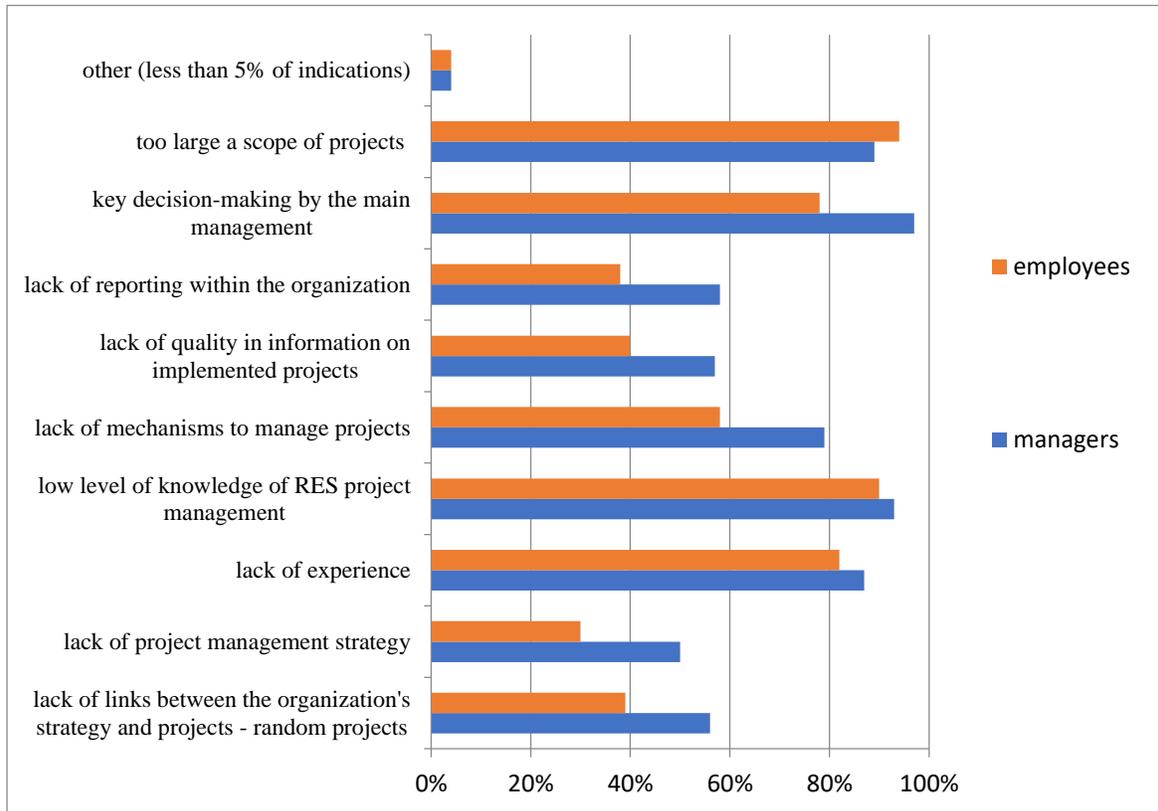
The determinants described and listed in this way were also accompanied by the dysfunctions indicated by the respondents specific to each determinant - the second stage of the research (Table 4).

**Table 4.** Dysfunctions associated with each conditionality

No	Conditioning	Dysfunctions
1	Project team members (their selection to the team)	<ul style="list-style-type: none"> <li>- poor selection of employees for the project team</li> <li>- lack of training for project team staff</li> <li>- very high staff turnover</li> <li>- filling one person in two positions in two projects - including project managers</li> </ul>
2	Resources and tools available during project implementation	<ul style="list-style-type: none"> <li>- lack of methods and tools for project management</li> <li>- lack of mechanisms for monitoring the resources held</li> <li>- projects implemented are not consistent with the organisation's profile and strategy</li> <li>- too many projects implemented at once</li> <li>- the inadequacy of adopted project cost estimates (budgets) to the intended results</li> </ul>
3	The person of the project manager	<ul style="list-style-type: none"> <li>- filling one person in two positions in two projects</li> <li>- lack of competence</li> <li>- lack of experience</li> </ul>
4	Project planning	<ul style="list-style-type: none"> <li>- extended project schedules (leaving too large time buffers)</li> <li>- erroneous resource planning</li> <li>- long waiting time for management decisions (even more than six months)</li> <li>- results in changing project realities.</li> </ul>
5	Distribution of roles and relevant competencies - proper involvement	<ul style="list-style-type: none"> <li>- lack of definition of roles and responsibilities for units or individuals outside the project</li> <li>- lack of ongoing participation of top management in project management</li> <li>- low morale of project staff - need for more support from boards of directors.</li> </ul>
6	Flow of information	<ul style="list-style-type: none"> <li>- lack of information on the status of the project</li> <li>- lack of information flow channel with other departments of the organisation involved in project activities</li> <li>- lack of cooperation and information transfer between project teams working simultaneously</li> <li>- lack of databases left after the end of the project - often replacement of personnel - no lessons learned</li> </ul>
7	Strategic management of the project	<ul style="list-style-type: none"> <li>- poorly prepared projects</li> <li>- projects implemented are not linked to each other</li> <li>- lack of coordination of overall activities undertaken in all projects</li> <li>- duplication of project activities performed</li> <li>- rivalry between project teams simultaneously implementing projects.</li> </ul>
8	Strategic management of the organisation	<ul style="list-style-type: none"> <li>- treating projects secondarily</li> <li>- lack of experience in project implementation</li> <li>- insufficient resources</li> <li>- lack of integration of the project team into the organisation</li> </ul>
9	Organisation structure	<ul style="list-style-type: none"> <li>- lack of project structure - prevalence of functional structures</li> <li>- misalignment of the organisation with the ongoing projects</li> <li>- inability to link the work of all units in an organisation to project activities</li> </ul>
10	Cooperation with institutions responsible for the implementation of RES in Poland	<ul style="list-style-type: none"> <li>- lack of information flow channels</li> <li>- low level of knowledge in the staff employed there</li> <li>- lack of standards in project management developed by these institutions</li> <li>- an influx of conflicting information on project implementation</li> <li>- lack of unified laws and standards for all areas of operations</li> <li>- high frequency of changes to existing laws and standards.</li> </ul>

Source: own study.

In summing up the above data, it is necessary to add that the respondents mapped all the dysfunctions occurring to individual conditions. Hence, there may be doubts about the validity of such an association. However, based on the answers given in this way, which are simply the result of the difficulties constantly encountered in work, they significantly impact the management of the RES project. In addition, for this work and a better understanding of such sensitive issues, the author decided to cite the main problems (Figure 2) that arise in the daily work of the respondents. According to the work's author, only a concrete example taken from practice can illustrate a given situation most optimally.



**Figure 2.** Problems occurring during the management of a RES project

*Source: own study.*

In summary, it can be noted that the results of the author's research presented above are as identical as possible to the project management considerations contained in the world literature and lead to efforts to improve the following areas:

- adapting the organisational structure to the implementation of RES projects;
- managing the organisation through project management;
- optimisation of the information flow process during project management;
- external and internal flow (information management);
- managing the competencies and skills of project team members,
- “bottleneck management”;
- project planning;
- proper selection of roles, competencies and responsibilities in the organisation during project management;
- optimisation of procedures and tools of institutions responsible for implementing RES systems in the country.

## **5. Discussion**

In the 21st century, companies, to gain a sustainable competitive advantage, must respond quickly to the intense and unprecedented environmental changes. They are to be helped by project management, which, as the article's author wrote, is an extensive, multifaceted and interdisciplinary issue.

In the scientific literature, we can find many definitions of project and project management, and we can note an inevitable evolution of views that emphasise their different aspects. However, even though the concept of RES project management (the very concept of their general implementation is more than 60 years old) is not so new - many attempts to apply it to traditional entities have failed to meet the expectations of their boards or even the market itself. The reasons for failure that occur are due, as indicated by the conditions discussed earlier, which, according to the author, can be divided into four leading and basic categories:

1. Psychological.
2. Organisational.
3. Market-based.
4. Cultural.

To sum up, it doesn't matter whether we are talking about determinants or their dysfunctions; everything revolves around practically the same main aspects which are:

- lack of tools and resources;
- the wrong people in the wrong positions, performing the wrong tasks;
- a virtually non-existent flow of information;
- an ill-defined or overlooked area of project planning;
- strategic project management approach;
- the negative impact of the project company on its management;
- shallow cooperation with institutions responsible for renewable energy sources in Poland - practically none.

But it was coming back to project management in the RES industry, which today is responsible for giving the right prompts in the development process, stimulating knowledge transfer and diffusion. At the same time, it is supposed to support organisational learning and, consequently, lead to the development of dynamic capabilities. After all, nowadays, it is not only the bundle of resources that counts in building competitive advantage but also capabilities. Consequently, mechanisms by which organisations can develop these capabilities and reconfigure resources are essential. This confirms that dynamic capabilities, built on knowledge and linked to an entrepreneurial orientation, lie at the heart of generating new products, processes or services.

The rapid development of the green energy sector in the coming years seems inevitable, especially for European Union member states. It is, therefore, worth considering what consequences it will carry. Undoubtedly, the consequences for the state budget are essential. One can forecast an increase in budget revenues from VAT, due to the increased number of investments related to developing the green technology market. In addition, increased state budget revenues may result from developing enterprises and subsequent employment growth. A decrease in budget revenues is also likely inevitable due to reduced excise tax revenues and less exploitation of fossil fuels. The development of the RES sector will positively impact the labour market. This is especially true for industries involved in producing equipment for renewable energy and the construction industry due to increased demand for construction services related to the construction of new generating units and the modernisation of existing ones. Employment growth can also be forecast in banking due to the development of programs to finance green energy investments. Human capital will shift from traditional sectors to highly innovative ones, consequently contributing to developing a knowledge-based economy (Ignarska, 2013).

The importance of the topics discussed above is undoubtedly due to the drive to build an information society and a knowledge-based economy. This is a priority activity for any country that intends to compete effectively in international markets in the future. For Poland, the vision of continuing the current economic assumptions based on a very cheap labour force is becoming more and more elusive, as increased emigration, as well as demographic changes, have caused the significant labour surpluses that have existed in the labour market so far are rapidly beginning to turn into shortages that are difficult to level. The changing relationship between supply and demand in the labour force segment in such a situation inevitably means an increase in production costs. The only way out of the "crisis" in such an economic situation is to break the barrier of cheap labour resources, which at the same time leads to the path of sustainable development, by transforming the structures of the economy to be less sensitive to fluctuations in the number of labour costs. One should strive to modernise the economy, which includes a much more significant component of technical progress - to a knowledge-based economy.

In conclusion, despite the many obstacles investors in the renewable energy sector may face, there is a basis for seeing a brighter future for the industry, especially in the long term. A mix of market consolidation and optimism may characterise the target year of 2030. The RES sector should emerge as a critical component of the long-term development of global economies.

## **Conclusions**

The practice of project management in the RES industry in Polish conditions boils down only to managing individual projects, the managers of which are only responsible for adhering to the budget, schedule, reporting and final results planned to be achieved. This results from the need for existing links between the organisation's strategy and the implementation of RES projects and between the project management strategy and the adopted corporate management strategy. And yet the selection and management of the project itself, already at the planning stage, should be done following the planned strategy of the enterprise and in the form of a typical activity.

This means that the management of RES projects in the surveyed enterprises is carried out, bypassing the concept of project management, which, due to its characteristics, is ideally suited as a tool for project teams. Unfortunately, with a guarantee of applying this concept, it is possible to develop a standardisation of the project management process in the organisation, that is, to guarantee reproducible quality.

In turn, the selection of project team members, including the manager, also raises concerns - it should be done through the prism of their competence in close connection with the determination of the appropriate involvement, that is, roles and place in the structure of the company. The lack of such standards often leads to a situation in which the project team leader cannot efficiently manage more projects without prioritising individual projects and properly allocating strategic resources. This raises the question of how project teams can perform different tasks at different hierarchical levels in the organisational structure of the surveyed companies.

Besides, in the author's opinion, all enterprise employees should participate in the project / feel like they are participants. This will cause the disappearance of barriers to cooperation between them and the project team. This also applies to the top management, who must do more than participate in the project in emergencies.

Ultimately, it seems very important to cooperate with public institutions managing renewable energy sources in each country, which will result in uniform procedures.

In summary, considering the above conclusions of the survey, it is worth extending it to a larger group of companies that implement RES projects - this will undoubtedly reduce the very high convergence of opinions provided and expand the practical directions of change. This will allow us to thoroughly verify the assumptions

about the universality of the above conclusions and observations and to put into practice standards that will be helpful in the future.

## References

- Aghdaie, M.H., Hashemkhani Zolfani, S., Cavallaro, F., Varzandeh, M.H.M., Derakhti, A., & Pamucar, D. (2020). Decision Making on Exigent Issues in Organisations: a Case Study on R&D Projects. *Transformations in Business & Economics*, Vol. 19, No 2 (50), pp.114-137.
- Boonstra, A., & Reezigt, C (2023). A Complexity Framework for Project Management Strategies. *Project Management Journal*. <http://doi.org/10.1177/87569728221142229> Early Access JAN 2023
- Borgosz-Koczwara, M. & Herlender, K. (2018). Bezpieczeństwo energetyczne a rozwój odnawialnych źródeł energii (Power security and renewable energy sources). *Energetyka*, 3, 194-197. <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-article-BPS1-0031-0041>
- Bradley, K. (2012). *Podstawy metodyki Prince 2 (Basics of Prince 2 methodology)*. Warszawa (Polska): Centrum Rozwiązań Menadżerskich CRM.
- Calderon-Tellez, J.A., Bell, G., Herrera, M. M., & Sato, C. (2023). Project management and system dynamics modelling: Time to connect with innovation and sustainability. *Systems Research and Behavioral Science*, Early Access JAN 2023 <http://doi.org/10.1002/sres.2926>
- Energy Law 2006 - Ustawa z dnia 10 kwietnia 1997 r. (Dz.U. z 1997 r. nr 54, poz. 348) z późniejszymi zmianami (stan na dzień 23 czerwca 2006). <https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=wdu19970540348>
- Frączkiewicz, K. (2012). *Zarządzanie projektami informatycznymi. (IT project management)* Wrocław (Polska): Oficyna Wydawnicza Politechniki Wrocławskiej.
- Frame, J.D. (2011). *Zarządzanie projektami w organizacjach (Project management in organizations)*. Warszawa (Polska): WIG.
- Hymon (2022) <https://hymon.pl/co-to-jest-oze-jakie-sa-rodzaje-zrodel-energii-odnawialnej/>
- Ignarska, M. (2013). Odnawialne źródła energii w Polsce (Renewable energy sources in Poland), *Poliarchia*, 1, 57-72. <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-438f04e3-644b-41ec-8887-7ca92807982c>
- Jones, R. (2017). *Zarządzanie projektami. Sztuka przetrwania (Project Management. The art of survival)*. Warszawa (Polska): MT Biznes.
- Kerzner, H. (2005). *Zarządzanie projektami (Project management)*. Gliwice (Polska). Helion.
- Maestre, V.M., Ortiz, A., & Ortiz, I. (2021). Challenges and prospects of renewable hydrogen-based strategies for full decarbonisation of stationary power applications. *Renewable & Sustainable Energy Reviews*, 152, Article Number 111628 <http://doi.org/10.1016/j.rser.2021.111628>
- Mancerova, T.F., & Tuyet, N.A. (2022). Structure and Organization of Regional Renewable Energy Cluster in Vietnam. *Science & Technique*, 21(1), 82-88 <http://doi.org/10.21122/2227-1031-2022-21-1-82-88>
- Marek, R. (2010). *Zarządzanie projektem logistycznym. Wybrane zagadnienia (Logistics Project Management. Selected issues)*. Gdynia (Polska): Akademia Morska w Gdyni.
- Martini, E. (2015). *Dotacja i co dalej? (The grant and what comes next)*. Warszawa (Polska): Twigger.
- Mirowski, T. (2016). Odnawialne źródła energii do wytwarzania energii elektrycznej (Renewable energy sources for electricity generation), *Polityka energetyczna*, 9, 597-610. <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-article-BPB2-0029-0029>
- Młynarski, T. (2019). Unia Europejska w procesie transformacji energetycznej (The European Union in the process of energy transition). *Krakowskie Studia Międzynarodowe*, 16(1), 1-44. <https://repozytorium.ka.edu.pl/handle/11315/27080>

Othman, K., & Khallaf, R. (2022). Identification of the Barriers and Key Success Factors for Renewable Energy Public-Private Partnership Projects: A Continental Analysis. *Buildings*, 12(10). Article Number1511 <http://doi.org/10.3390/buildings12101511>

Pawlak, M. (2017). *Zarządzanie projektami (Project management)*. Warszawa (Polska): PWN.

Project Management Institute <https://www.pmi.org/learning/thought-leadership/megatrends>

Quinn, R. (2017). *Profesjonalne zarządzanie (Professional management)*. Warszawa (Polska): PWE.

Rodin, V., & Moser, S. (2021). The perfect match? 100 reasons why energy cooperation is not realised in industrial parks. *Energy Research & Social Science*, 74, Article Number 101964 <http://doi.org/10.1016/j.erss.2021.101964>

Shava, E., & Vyas-Doorgapersad, S. (2023). Inclusive participation in information and communication technologies (ICTs) processes for smart services in the city of Johannesburg, *Insights into Regional Development*, 5(1), 26-40. [https://doi.org/10.9770/IRD.2023.5.1\(2\)](https://doi.org/10.9770/IRD.2023.5.1(2))

Soderberg, E., & Liff, R. (2023). Reframing practice through policy implementation projects in different knowledge contexts. *International Journal of Project Management*, 41(2), Article Number 102452 <http://doi.org/110.1016/j.ijproman.2023.102452>

Tomaszewski, K. (2020). Odnawialne źródła energii w Polsce – perspektywa lokalna i regionalna (Renewable energy sources in Poland - local and regional perspective). *Rynek Energii*, Nr 4(149), <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element/baztech-91fd6274-ff29-46f2-a389-1d49b8e7ad42>

Yuksel, I. (2018). The South-Eastern Anatolia Project Factor on Water Management And Energy Demand In Turkey. *Fresenius Environmental Bulletin*, 27(1), 246-253

Vasquez-Ordonez, L.R., Lassala, C., Ulrich, K., & Ribeiro-Navarrete, S. (2022). Crowdfunding for renewable energy projects: key factors to improve performance. *Academia-Revista Latinoamericana De Administracion*, 35(2), 223-238. <http://doi.org/10.1108/ARLA-07-2021-0135>

What is a renewable energy source? What are the types of renewable energy sources? (2022) <https://hymon.pl/co-to-jest-oze-jakie-sa-rodzaje-zrodel-energii-odnawialnej/>

Witzel, M. (2013). *Pięćdziesiąt kluczowych postaci w zarządzaniu. (Fifty key figures in management)*. Londyn (Anglia): Routledge.

Wysocki, R.K. (20015). *Efektywne zarządzanie projektami (Effective project management)*. Gliwice (Polska): Helion.

Zimny, J. (2014). *Odnawialne źródła energii w budownictwie niskoenergetycznym (Renewable energy sources in low-energy construction)*. Kraków: (Polska). Polska Geotermalna Asocjacja.

**Data Availability Statement:** More information and data can be obtained from the author on a reasonable request.

**Mchał IGIELSKI Ph.D.**, Gdynia, Maritime University. Research interests: human resources management, entrepreneurship, competitiveness

**ORCID ID:** <https://orcid.org/0000-0003-4680-3733>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





**Publisher**

<http://jssidoi.org/esc/home>



---

## IMPACT OF TASK ASSIGNMENT ON EFFECTIVENESS IN WORK TEAMS

Jana Pechová <sup>1\*</sup>, Hana Volfová <sup>2</sup>, Anežka Jírová <sup>3</sup>

<sup>1,2,3</sup> SKODA AUTO University, Na Karmeli 1457, 293 01 Mlada Boleslav, Czech Republic

E-mails: <sup>1\*</sup> [jana.pechova@savs.cz](mailto:jana.pechova@savs.cz) (Corresponding author); <sup>2</sup> [hana.volfova@savs.cz](mailto:hana.volfova@savs.cz); <sup>3</sup> [edu.anezka.jirova@savs.cz](mailto:edu.anezka.jirova@savs.cz)

Received 17 February 2023; accepted 9 May 2023; published 30 June 2023

**Abstract.** Managerial work in all businesses worldwide aims to achieve subordinates' successful completion of work. Assigning tasks is one of the daily activities of a manager and significantly impacts the quality of work submitted. This paper focuses on task assignments and their effectiveness in work teams. From October 2022 to January 2023, a questionnaire survey was conducted, which pursued the goal of task assignment efficiency. Respondents were asked about their preference for specific assignments, the types of information they prefer in projects, and their priorities within the work allocation. At the same time, respondents rated other aspects related to effective work assignments, such as the meaningfulness of the work, responsibility for performance or autonomy, competence to complete the task or their level of involvement and relationship with the person assigning the task. In January 2023, a focus group survey was conducted with ten students. The respondents carried out the assigned task, and the whole task process, including its outcome, was mapped. The paper presents the results of the questionnaire survey in the form of graphs, including the authors' comments with the support of more complex statistical methods; the results of the focus group are graphically displayed in a semantic differential, and the conclusion of the paper is oriented towards specific recommendations for teachers, managers, or leaders for whom assigning tasks is their daily bread.

**Keywords:** task efficiency; task assigning; work team effectiveness; assignment types; managerial work

**Reference** to this paper should be made as follows: Pechová, J., Volfová, H., Jírová, A. 2023. Impact of task assignment on effectiveness in work teams. *Entrepreneurship and Sustainability Issues*, 10(4), 152-170. [http://doi.org/10.9770/jesi.2023.10.4\(10\)](http://doi.org/10.9770/jesi.2023.10.4(10))

**JEL Classifications:** M54

### 1. Introduction and review of literature

Managerial work in all businesses in the world stands and falls with the successful completion of the work of subordinates. An important and often underestimated administrative art is correctly assigning the necessary work to subordinates. Delegating tasks is one of the daily activities of a manager and significantly defines the quality of work submitted. According to Svozilova (2016), a task is part of a complex activity, we can specify the desired outcome, and it has a relatively short duration. Koubek (2010) adds that a task can consist of one or more operations. The manager can choose from two options when assigning tasks and delegating them to specific performers (Pechová, Volfová, Jírová, 2022). The right style can determine employee satisfaction and, thus, productivity.

Good workplace relations and positive motivation of workers also enhance productivity. We distinguish between extrinsic and intrinsic motivation. While achieving a result drives extrinsic motivation, intrinsic motivation is a preoccupation with a task or problem and a tendency to solve it. Employees with higher levels of intrinsic motivation perform better, are more efficient, more prosperous and appear more satisfied. There is also a direct link between motivation and the desire to succeed - the greater the passion, the greater the motivation to succeed. However, if there is a fear of failure, motivation decreases proportionally.

As business is usually associated with risk and uncertainty, the team must be able to adapt to changing conditions. They must find new ways to solve problems and adapt quickly to new situations. Especially in the early days of a business, when there are many unknown factors, the ability of the team to work together and adapt is crucial to success. In addition, entrepreneurs must have the ability to lead, inspire and motivate their team to work together to achieve common goals. A business can be very successful when a team works together and is motivated to achieve a common goal. In today's business world, teamwork is crucial to success. Entrepreneurs must be able to assemble a strong team and lead it to success. Cooperation provides the support and motivation necessary to achieve common goals. If entrepreneurs can build a team that can work together and adapt to rapidly changing conditions, they will be well-positioned to succeed in business (McGrath, 1984; Delfgaauw, Dur, & Souverijn, 2020).

Task management and teamwork are two critical elements for success in any organisation. Effective task management enables teams to plan, organise and complete tasks efficiently and on time, which is essential to achieving the organisation's goals and success. With proper task management, teams can be able to solve problems that were caused by ineffective task planning and management. Teamwork is based on the idea that a group of people working together is more efficient than individuals working alone. A properly managed team can be a powerful force for achieving the goals of an organisation. Teams that have clearly defined tasks and responsibilities can work better together and achieve more significant results.

Linking these two elements is crucial to an organisation's success. Effective task management can help teams better organise their tasks and improve performance. A good teamwork environment can help create effective teams and increase productivity. The benefits of good task management and teamwork are many. Organisations can reduce time delays, improve performance, and achieve goals more efficiently. In addition, adequately managed teams can produce creative and innovative solutions and improve the quality of an organisation's products and services. Ultimately, effective task management and teamwork are key elements to an organisation's success in a competitive and rapidly changing business environment. Organisations should invest in developing these elements and create an environment that fosters productivity, innovation, and sustainability (Truss et al., 2011; Jiang & Gu, 2015; Castellano, Davidson & Khelladi, 2017; Zhang et al., 2021).

Generationally, there are relatively large, even leapfrog changes in the abovementioned issues. The solution primarily focuses on proper task assignment, critically affecting all generations' bottom line. Practical task assignment is critical to successful job performance and overall team or organisational productivity. Good task assignment includes a clear description of the goal, precise task specifications, prioritisation, and a deadline for completion. In addition, when tasks are correctly assigned, employees know what is expected of them and are clear about their roles and responsibilities. This leads to better coordination and collaboration within the team and improves the overall efficiency of the work process (Černevičiūtė & Strazdas 2018).

A vast strand of literature is devoted to factors that must be considered while attributing particular tasks to employees. Weerasombat, Pumipatyothin, and Napathorn (2023) draw special attention to employees' skills.

Anes et al. (2023) developed a methodology for considering each team member's performance to achieve the optimal assignment of the agile teams in open innovation projects. Kaur et al. (2022) suggest considering the

necessity of retaining employees in nonprofit organisations while distributing tasks. Ren et al. (2022) highlight procedural justice when assigning tasks. The authors claim that procedural fairness can be combined with performance goals to reap the valuable aspects of goal setting while minimising some of the unintended side effects. They draw attention to the fact that there is an ongoing discussion on the impact of goal setting (Ren et al., 2022). Li et al. (2023) focus on the difficulties of order assignments in conditions of uncertainty. Kamei & Markussen (2022) analysed free-riding effects caused by inappropriate attribution of tasks. Liu et al. (2023) stress the role of leadership, organisational environment and justice in job assignment mode. Delfgaauw, Dur and Souverijn (2020) claim that favouritism, employees' seniority, preferences over tasks, and fairness considerations often play a role while assigning tasks to employees. Employee preferences are essential in setting key targets (Chen et al., 2021). Hsieh & Lee (2023) focus on autonomist and autocratic characteristics of employees, which ultimately affect work team performance.

Anyway, there is still no answer to how managers must consider factors such as age, gender or speciality of an employee while assigning a task.

The main objective of this paper is to fill the gap by presenting an applicable managerial approach to effective task management for different sociodemographic groups defined by gender, generation and study focus. The sub-objectives include the compilation of a literature review in the field of managerial practice with a focus on task management, task assignment, teamwork and generational differences. Based on this, the sub-objectives also include a preliminary validation of the possibility of applying motivational types theory to different groups of workers, and at the same time, in relation to these groups (sociodemographic factors, occupational/study focus), evaluating the importance of the different contextual components of task assignment. Among the sub-objectives, it can also be included in verifying whether other variables besides age define motivational types that can be successfully used in subsequent managerial work.

## **2. Task assignment**

Task assignment is a sub-element of management. The literature agrees that the basic criteria that should be clearly defined when assigning a task include the desired outcome, time horizon, responsibility for performance, available resources, and specification of what is considered successful completion of the task (Pechová, Volfová, & Jírová, 2022). According to Plamínek (2009), expressing support and creating space for questions and discussion is also an important point, as understanding the assigned task is considered the basis for future success and acceptance. In some ways, a well-managed process of defining the work task and the associated responsibilities can optimise the worker's approach to the assigned work from the beginning (Kriek, 2019).

Without setting a goal, the task could not exist. The question remains, however, to what extent it is also necessary to determine the way in which it is to be achieved. In this case, the preferences of each leader/manager are radically different (and usually closely related to the management style chosen), as are the priorities of each performer/subordinate/employee. Some need fixed structures and roles to achieve results, the presence of which reduces uncertainty, ambiguity, and misunderstanding. Others, on the other hand, maybe demotivated by such an approach (Parkes, 2016; Wielenga-Meijer et al., 2011)

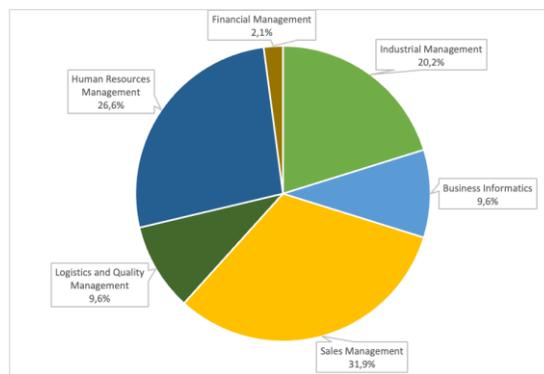
When assigning tasks and delegating them to specific performers, the one assigning it - the leader or manager can choose from two options. He can choose either "HOW" assignment or "WHAT" assignment (Plamínek, 1999).

In the case of the "HOW" assigning, or also the process type, it is mainly about specifying the methods and ways in which the performer's work is to be carried out, it contains an enumeration or direct description of working methods and yet it is burdened with frequent control and consultation, as a result of which the authority can manage only a small number of performers and its work becomes less efficient.

In "WHAT" type assignments, we encounter a more autonomous approach; only the outcome to be achieved and the evaluation criteria are specified. In the research investigations, the task type "WHAT" was assigned and is specified in Chapter 2.2.

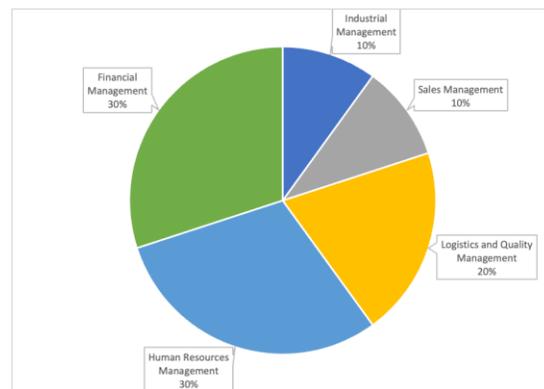
## 2.1 Characteristics of the target group

A total of 388 students from ŠKODA AUTO Vysoká škola o.p.s. and ŠKODA AUTO a.s. employees participated in the research survey between October 2022 and January 2023. The surveyed target group consists of 71% men and 29% women. A significant number (73%) of the respondents are aged 18-21 years and 22-25 years (14%). 78% of the respondents have a high school education, 20.6% have a bachelor's degree, and 1.4% have a master's degree, and their field of study is presented in Figure 1.



**Figure 1.** Field of study of the survey respondents  
*Source: the authors*

In total 10 students from ŠKODA AUTO Vysoká škola o.p.s. and employees of ŠKODA AUTO a.s. participated in the follow-up qualitative research using the focus group method in January 2023. Of those surveyed, 60% were male, and 40% were female. All respondents were 22-25 years old and had completed a bachelor's degree, with the field of study shown in Figure 2.



**Figure 2.** Field of study of the focus group respondents  
*Source: author the autor*

## **2. 2 Research methodology**

To fulfil the objective of this paper, a questionnaire survey, focus group method, observation, facilitated discussion and evaluation of the respondents' performance on the task were carried out.

In the questionnaire survey, a goal-oriented task was given in a "WHAT" manner. According to Campbell (1988) and Wood (1986), who classify tasks into simple and complex, a complex task was given. Or also according to Bakken and Andersson-Bakken (2021) an open-ended task can be solved in multiple ways. Respondents were given the task by their direct supervisor. The exact assignment was as follows: "Create an invitation to a three-day work team meeting in the first half of 2023."

A total of 25 questions were formulated as part of the survey. Each question pursued its own sub-objective with respect to the main objective. The aim of the questionnaire survey was to evaluate the effectiveness of the task assigned and each question in the questionnaire monitored the following criteria:

- Preferences for the type of tasks
- Willingness to work with risk
- Fear of failure
- Teamwork
- Willingness to take responsibility
- Motivation to complete the task
- Level of commitment
- Relationship with supervisor
- Supervisor communication

The last four questions of the survey aimed to identify respondents. After completing the questionnaire survey, another research investigation in the form of a focus group was conducted in which 10 participants carried out the above task. The task implementation involved process and outcome evaluation, including a facilitated discussion between the person assigning the task and the performers. The purpose of the facilitated discussion was to obtain additional information on the questionnaire survey and the effectiveness criteria of the assignment mentioned above. The results of the questionnaire survey and focus group are presented in Chapter 3.

## **3. Research investigations**

To meet the objective of this paper, quantitative research in the form of a questionnaire survey was conducted to determine statistically significant relationships between sociodemographic variables and the evaluation criteria defined above. This was followed by a qualitative focus group method focusing on the differences brought about by the specific implementation of the assigned task, facilitated discussion and evaluation of the respondents' work in performing the task.

The results are presented using graphs and authors' comments. The author's comments are supported by expert theories, which are presented in chapters 2.1, 3.3 and at the end of the paper. The effectiveness of the individual performers was simultaneously evaluated according to the gender, educational level, and field of study of the respondents.

The research investigation aimed to assess whether significant statistical relationships exist between sociodemographic variables and evaluation criteria associated with task effectiveness. Two research questions then followed this objective:

- Does the approach to accepting assignments differ by gender, age, a field of study and educational attainment?
- Which sociodemographic variable has been shown to have the most statistically significant effects when assigning and accepting tasks?

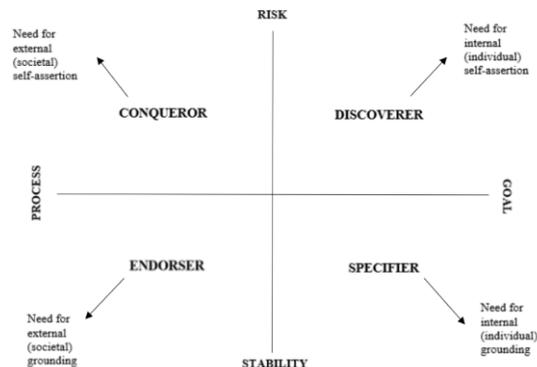
The Pearson chi-square test of goodness of fit was used to detect underlying relationships and associations at the level of descriptive statistics using contingency tables. Only relationships with asymp. sig. less than 0.05 were recorded. If a value less than 0.05 is reached between two variables, they can be said to have a relationship with each other.

The chi-squared test is often used to test whether there is a statistically significant association between two categorical variables. Specifically, it is a test of independence between two variables. The chi-squared test uses the observed and expected frequencies to determine if there is a statistically significant difference between the observed and expected results.

However, the chi-square test does not say anything more about the nature of the relationship between the variables, and it cannot be assumed that all relationships are significant enough to be generalised. For the interpretation of the research to be meaningful, it is necessary to know whether the relationship is conclusive with respect to individual identifying criteria such as age, gender, or job title. For this reason, so-called adjusted residuals were used in the contingency tables.

The adjusted residual is based on the difference between the empirical and expected frequencies, and when it is greater than 2.00 (or - 2.00 for negative direction relationships), we can be certain (with 95% probability) that the difference between the frequencies is not due to coincidence. For values greater than or equal to 3.29 (or - 3.29 for negatively oriented relationships), the probability of a random variation is less than 0.1%. Thus, the adjusted residuals determine the extent to which the assumption of independence is violated, which is satisfactory for evaluating these variables. Thus, it is possible to demonstrate relationships with sociodemographic variables and specify for which internal categories these significant relationships hold. Again, only statistically significant relationships were retained, and outliers were excluded.

Chapter 3. 3 also diagnoses the motivational types of respondents according to the theory of Jiří Plamínek, which is shown in Figure 3.



**Figure 3.** Field of study of the focus group respondents  
*Source:* Plamínek (1999, p. 41)

### **3. 1 Results of the questionnaire survey**

Respondents were tasked by their direct supervisor with creating an invitation to a three-day team meeting of the work team in the first half of 2023.

First, the results will be summarised in frequency analysis, which also shows interesting results.

In total 20.6% of the respondents believe that they have enough information to complete the task and 79.4% of the respondents need additional information in the assignment. The following types of information were most frequently identified by respondents (in the order determined by the frequency of responses):

- Information on the exact date, programme, focus and objectives,
- specific venue,
- what is the deadline for completing the task,
- the priority of the task,
- the reason or purpose for carrying out the task,
- whether the task is confidential or public
- and a thank-you or appreciation from the person assigning the task.

Interestingly, 73.6% of the respondents believe that there are no follow-up steps associated with the task, thus not classifying the task as complex and 23.7% of the respondents, on the other hand, consider follow-up steps within this task as evident. The most frequently mentioned follow-up steps include - organisational responsibility, booking the venue, informing the participants what they need for the meeting, finding out about specific participation, wishing them a happy stay, information about accommodation, catering or transport or the requirement for initial complex organisational arrangements for the team building and only afterwards providing an invitation.

Only 4.1% of respondents identified the task as the highest priority, 48.5% assigned a medium priority to the task, and 30.9% saw the task as a routine agenda.

A significant factor for 54.7% of the respondents is the person assigning the task. For 24.7%, this is of moderate importance, and for 20.7%, this is not important.

At the same time, 46.4% of respondents wish to be addressed when assigning a task; the most pleasant way of addressing respondents is by first name, then formally (dear sir/madam, colleague, or title). At the same time, 33% of the respondents did not notice the absence of addressing at all when assigning tasks and 20.6% did not miss it.

Only 12.4% of respondents prefer the spoken form of assignments, 30.9% like the written form, and 56.7% like the combined form of assignments.

When asked whether respondents found the team or individual type of task more motivating, 31.9% of respondents favoured the team type of task and 39.2% favoured the personal kind of task. The remaining 28.9% were undecided.

A total of 58.8% of the respondents would find it easier to complete the task with specific instructions for the procedure, 41.2% do not require instructions for completing the task.

While 58.8% of respondents perceive the task as creative, 23.7% classify this task as a medium level of creativity. The remaining respondents rate the task as routine.

Also, 69.3% of the respondents believe they have all the skills and abilities to complete the task, 30.9% have only some and 5.2% think they need more skills and abilities to complete the job.

According to the respondents, the following skills (in order of frequency) are essential for completing the task:

- Good interpretation of information,
- Good knowledge of grammar and stylistics
- Graphic skills,
- Ability to motivate in written text
- Fantasy and imagination

The majority (73.2%) of respondents believe they will complete the task within hours, 14.4% within minutes and 12.4% within days.

Regarding the possibility of diagnosing motivational types among respondents, questions with a clear link to these researched categories of evaluation criteria were defined.

Criteria were relevant to classifying respondents into different motivational types will be evaluated. The methodology for assessing statistically significant relationships is outlined above; here, we present the results as statistically significant relationships (with 95% probability or higher) between the sociodemographic criteria and the related questions from the questionnaire survey.

First, sets of questions were defined from the questionnaire survey, which corresponds in their nature to the different types - process orientation, goal orientation, risk orientation or certainty orientation, presented in Table 1.

**Table 1.** Survey questions diagnose respondents' process or goal orientation and their risk or certainty orientation.

Motivational types - statistic significant relations	Gender		Age						Specialization					Grade of Study		
	Man	Woman	18-21	22-25	26-29	30-35	36-39	>40	SM	HR	LQ	FM	IM	BI	Bachelor	Master
<b>Process orientation</b>																
I don't have enough information		2		2,4					2,3	2,6						2,3
I see follow-up		2,9		2,8				2,1	2	2,2					2,8	
I need guidance		2,4									3,1					
I don't have all the knowledge		2							2,5							
I'm comfortable with teamwork		2,9		2,7					2,7							2,9
<b>Goal orientation</b>																
I have enough information	2,4		2,8										2,7	2,1	2,4	
I don't see follow-up	2,5												2,1	2,6		
I have all the knowledge	2,1		2,2								2,4					
I don't need guidance	3,2										2,6	2,9	2,3	2,9		
I am comfortable with individual work	3,5						2,1						2,7	2,4		
<b>Risk orientation</b>																
I am not afraid to take on a task	2,6								2,4	2,4			2,6	2,8		2,4
I am confident that I will do the task well				2,1		2,2	3,2								2,2	
Skill willingness to take risks	2,3		2,9								2,2	2,9				
<b>Safety orientation</b>																
I am afraid to accept the task		2,3							3,1		2,2					2,8
I am not sure I will do the task well		2,1	2,2								2,8		2			

Source: the authors

All sociodemographic variables characterised in Chapter 2.1 were included in the evaluation; here, we add explanations for each specialisation:

- SM – Sales Management
- HR – Human Resources Management
- LQ – Logistics and Quality Management
- FM – Financial Management
- IM – Industrial Management
- BI – Business Informatics

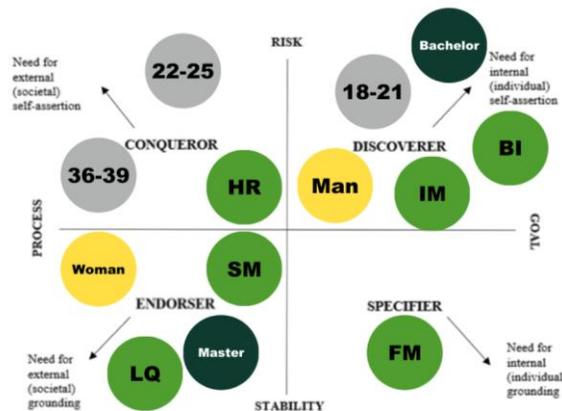
The table shows that some groups have a precise orientation within motivational types. The division is evident at the gender level, with women dominated by a process and certainty orientation, while men are goal-oriented and do not mind taking risks.

A similar orientation is also seen in individual study specialisations. Soft specialisations such as Sales and Human Resources Management are more process-oriented and prefer certainty. In contrast, more technical professions such as Industrial Management or Business Informatics emphasise a well-defined goal with the possibility of taking risks.

In terms of age, the youngest generally prefer a goal orientation and are not afraid to take some risks, while career orientation and security become more important with increasing age.

The level of study also plays a relatively important role, with respondents at the bachelor's level again being more willing to take risks and more likely to address goals, but this confirms previous findings regarding the emphasis on process and certainty later in life.

The results can also be displayed graphically in a matrix of motivational types to show which groups of respondents belong to each group (Fig. 4). The position in the quadrant is not significant within this method.



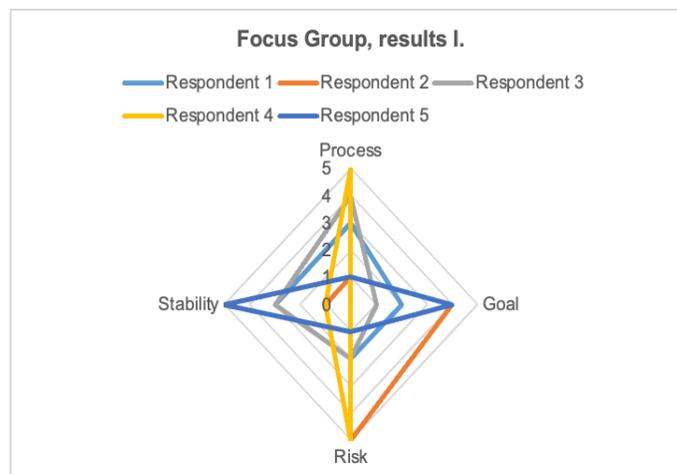
**Figure 4.** Motivational types by gender, educational attainment, and field of study of respondents  
*Source:* the authors

### 3. 2 Results of the focus group

The follow-up qualitative research using the focus group method involved ten respondents who had completed the assigned task. The individual outputs are archived in the Škoda Auto Vysoká škola o.p.s. academic information system.

To determine the motivational personality type of each team member according to gender, educational attainment, and field of study (Chapter 2.1), the task was first rated on a bipolar scale (Chapter 2.2). The extremes of the scale were assigned values of 5 (risk) and 1 (stability), as well as 5 (process) and 1 (goal), to respect the matrix format of the theory. The more respondents were willing to take risks, for example, by engaging creativity outside the assignment, the more points were assigned and vice versa. In the second case, they were then scored according to how comfortable they were with the what-type or how-type assignments. They scored higher if they needed a transparent process to reach the goal. They were assigned fewer points if they were satisfied with just the task they had thought about. The results are recorded in the semantic differential and then transferred to the matrix of motivational types in Section 3.3.

For greater clarity, the results are divided into two graphs. Figure 5 presents the results of the five respondents under the risk or certainty orientation and the process or goal task orientation, whilst Figure 6 shows the results of the other five respondents.



**Figure 5.** Risk or Certainty Orientation and Process or Goal-Oriented Task Assignment I  
*Source:* the authors

From Fig. 5, respondent 1 prefers procedural task assignment at level 3, and goal assignment at level 2. He is rated at level 2 in risk orientation and level 3 in certainty orientation. Respondent 1 felt slightly dissatisfied with the assignment; however, the assignor assessed the result of his work as almost fulfilled.

Respondent 2 has wholly fulfilled the task and is process oriented at level 1, and goal-oriented at level 4 with zero preference for certainty and maximum risk orientation. Respondent 2 completed the task willingly with a high level of commitment.

Respondent 3's task orientation is rated process orientation at level 4, goal orientation at level 1, risk orientation at level 2, and certainty orientation at level 3. Respondent 3 completed 80% of the task with a moderate level of concern, and a reluctance to take responsibility was noted.

Respondent 4 accepted the assignment but still needs to complete it. Respondent 4 was strongly demotivated by the type of task given, which was reflected in his low level of engagement. Respondent 4 is maximally process-oriented in task assigning, has zero goal orientation and prefers maximum certainty with zero risk acceptance.

Respondent 5 showed a high willingness to complete the task, even above and beyond. Unlike respondent 4, a respondent is process oriented at level 1, and goal-oriented at level 4 with maximum risk orientation and zero certainty preference.



**Figure 6.** Risk or Certainty Orientation and Process or Goal-Oriented Task Assignment II

Source: the authors

From Figure 6, respondent 6 is process oriented at level 4, and goal-oriented at level 1, with high certainty orientation and minimal risk orientation. Respondent 6 accepted and completed the task at 20%. He conditioned his further task performance only after precise tasking within each step by the supervisor.

Respondent 7 is maximally process oriented with zero goal orientation and prefers a maximum degree of certainty with zero risk acceptance. Respondent 7 hardly completed the task and was highly demotivated; a shallow commitment followed this.

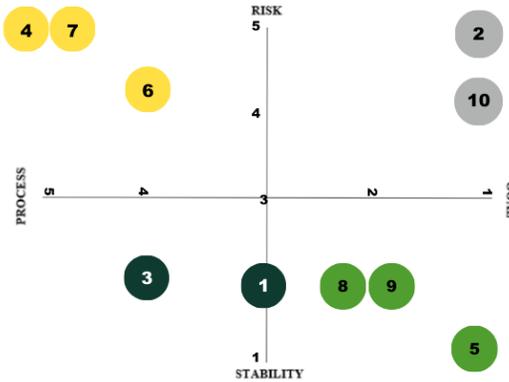
Respondent 8 has completed the task 100% and is process oriented at level 2 and goal-oriented at level 3. Risk orientation was scored as level 2, and certainty orientation was scored as level 3. The respondent fully completed the task but felt uncomfortable.

Respondent 9 completed the task 100%, with a process orientation at level 2, a goal orientation at level 3, a risk orientation at level 2, and a certainty orientation at level 3. Like respondent 8, he completed the task but with slight concerns.

Respondent 10 also fully completed the assigned task, demonstrating high engagement and maximum satisfaction with the autonomous assignment. Respondent 10 was noted to have a process orientation at level 1, a goal orientation at level 4, a risk orientation at level 4, and a certainty orientation at level 1.

### 3.3 Evaluation of the results of research surveys

The focus group results are recorded in the semantic differential in Chapter 3.2, and in Chapter 3.3 they are transferred to the matrix of motivational types and complement the questionnaire survey results (Fig. 7).



**Figure 7.** Motivational types of respondents in the focus group  
*Source:* the authors

The focus group's results confirmed the questionnaire survey's results in several ways. Specifically, the focus group results demonstrate a preference for procedural task assignment among women (respondents 3, 4, 6 and 7 are female). Whilst 5 male respondents were motivated more by goal-based task assignments, one male respondent occupied a middle position between procedural and goal-based task assignments.

Any women did not occupy the motivational type "Discoverer" position, and the goal and risk-oriented respondents were 2 and 10 - men.

For the different study specialisations, the so-called soft disciplines, such as Sales Management and Human Resources Management, hold more process-oriented preferences (respondents 3, 4, 6 and 7). Respondents of the so-called hard disciplines such as Industrial Management, Financial Management or logistics are motivated more by goal-oriented task assignments and hold the motivational type of "Discoverer" (respondents 2 and 10) or "Specifier" (respondents 5, 8 and 9).

Plaminek's theory of motivational types can be helpful for managers in practice in the context of working with the new generation of workers. Generation Z and Millennials often have different work motivation preferences and evaluate work differently than previous generations (Hee & Praveen, 2016). Research conducted by PwC in 2011 showed that younger employees (i.e., Generations Y and Z in particular) prefer work that allows them to develop their skills and gain new experiences. They prefer flexible working conditions and greater involvement in decision-making processes.

On the other hand, older employees (Generation X and Baby Boomers) prefer more stability and security, more responsibility, and a focus on results. Research conducted by EY in 2017 showed that the most motivating factor for Generation Z (born between 1995 and 2010) is the opportunity to grow and develop, both in their careers and personal lives (Gursoy Chi & Karadag, 2013).

Generation Z also prefers a work environment that allows for diversity, innovation, and flexibility. Conversely, financial reward, job security and stability are essential to older generations (Baby Boomers and Generation X).

Then, research conducted by Gallup in 2016 showed that the most motivating factors for employees from all generations are: clear goals and expectations, the opportunity to develop their skills and gain new experiences, positive feedback from supervisors and co-workers, and the opportunity to be involved in decision-making processes. At the same time, however, research has shown that different generations may have other preferences regarding how they prefer to interact with supervisors and co-workers and how they prefer to communicate these factors (Benson & Brown, 2011).

This paper also highlights the relation of the assignment of the task type "WHAT" to the optimal span of control. Determining the optimal span of power creates a hierarchical organisation, and the wider the span of control, the flatter the organisational pyramid. Conversely, if the optimal span of control is narrower, the number of managerial levels increases, and the corporate pyramid becomes steeper.

Suppose the number of organisational levels influences administrative (overhead, indirect) costs. In that case, the greater the number of levels in the corporate hierarchy, the greater the need for management staff. Thus, administrative costs rise sharply with the number of organisational levels. At the same time, the possibility of communication is also negatively affected. The high number of managerial levels also makes planning and control more difficult.

Vytautas Andrius Graicunas dealt with the determination of the optimal control margin in the 1930s.

Using exact computations, Graicunas established a progression between the number of subordinates and the possible number of relations in the unit. From Figure 8 below, it can be seen that there is a steep increase in the number of relations from the number of five subordinates. It can also be seen how the number of relationships changes when a third ( $\Delta V_1$ ) is added to two subordinates, compared to the sharp increase in relationships when, for example, a seventh ( $\Delta V_2$ ) is added to six workers. This is also why Graicunas argued, based on his computational analysis, that the maximum number of workers per manager should be five (Černevičiūtė & Strazdas, 2018).

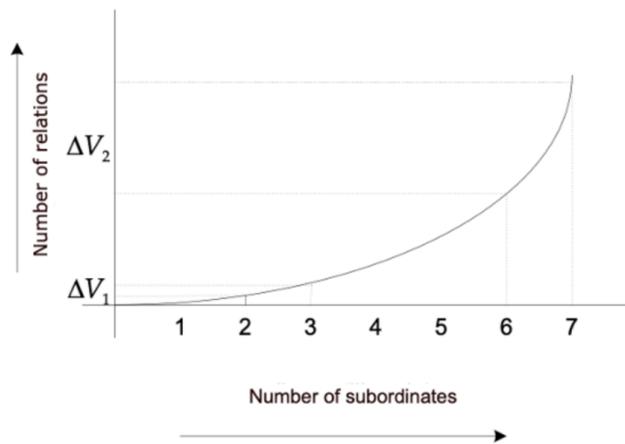


Figure 8. Motivational types of respondents in the focus group

Source: the authors

If Graicunas had considered in his calculations the individuality of each manager, the variability of the work environment, the development of today's technological approaches, and the motivation and ability of today's young generation to perform a given "WHAT" task, his maximum number of workers per manager would have been several times higher. Suppose a manager assigns a "WHAT" task - i.e. a goal-oriented task to be performed by the subordinate himself without the need for frequent consultation with the manager on single sub-steps while taking advantage of other aspects of today's times. In that case, he will significantly save his organisation, not only overhead costs.

#### **4. Novelty, practical value, and limitations of the research**

The article is based on the theory of motivational types, published in 1977. Even though more than thirty years have passed, it has seen clear application potential that can help identify ways of working with different workers. With the steady increase in retirement and the technological, psychological and social shift in the perceptions and behaviours of younger generations, ways need to be found to manage individuals and teams across the organisation effectively.

Motivational theory links areas that are key to business development - effective managerial work, the development of team collaboration and the importance of correct task assignment. Increasingly, workers of different generations, genders, and professional backgrounds work together in cross-functional teams, and their composition is critical to the final project outcome (Gegenfurtner, 2018).

Thanks to applying the theory of motivational types in both types of research, the findings presented in the literature review were confirmed concerning generational characteristics. The model was also enriched with results based on statistically significant dependencies on gender and occupational orientation.

This, therefore, simplifies the processes aimed at the effective composition of work teams and task management strategies, precisely task assignment. Simplifying processes can be essential for managers as it allows for more efficient use of time, resources and workforce. If processes are too complex, they can lead to unnecessary delays and errors in work. Simplifying processes can also lead to greater transparency, increasing collaboration and trust. In addition, simplifying processes can reduce costs and improve manager and business performance.

The undeniable practical benefit of applying this theory is its simplicity and clarity. Using clear, simple and understandable theories is very important for managerial work. More complex or clear theories can lead to misunderstandings, inefficiency, loss of motivation and productivity, and even loss of trust. When theories are too complicated, managers and, indirectly, workers can feel lost or confused, leading to mistakes and unsatisfactory results. It is, therefore, important to apply theories that are understandable and applicable to all involved. The theory of motivational types follows four basic factors, which it evaluates. The output is four motivational types with sufficiently specified congruent features. Thus, internal homogeneity and external heterogeneity are ensured, as these groups differ.

In addition to deepening the theory of motivational types, both kinds of research conducted worked with a specific and defined task. This task management component also deserves ample attention as it provides concrete insights regarding communication, task type, authority or task complexity that need to be respected in managerial practice. Managing work teams effectively requires giving them quality task assignments. This is an added value, as the task under investigation in both types of research was quite specific; the respondents used their knowledge and competence framework to the maximum extent to answer and perform the job (in a focus group) in real-time. This makes it possible to compare the differences between the assignment and the actual performance and to check the theoretical knowledge and the outcomes defined by quantitative research.

In this case, the practical aspect is defined from two perspectives. Since sustainable business must be primarily future-oriented, university students were the leading group of respondents. It is, therefore possible to use the findings from both surveys not only when they actively enter the labour market and become a whole part of it but also as a basis for a more effective teaching and learning approach. Learning styles broadly define future work habits, so the choice of modern and agile approaches will also be reflected in this way.

However, it cannot be assumed that the chosen research has no limitations. Quantitative analysis in the form of a questionnaire survey has several limitations that are important to consider. First, there may be bias in respondents' answers due to ignorance, misunderstanding or forgetting of information. Second, some questions may need to be clarified or understood differently, leading to inconsistent results. Third, some factors, such as the context or personality of respondents, may influence their answers. The primary focus was given to a group of university students in the qualitative framework. Students represent a specific group of people who have their interests, motivations, and preferences. These factors may influence the research results and make it difficult to generalise the data obtained to the whole population.

Furthermore, higher education may influence students' opinions, attitudes and behaviours, and these factors may differ from the rest of the population. As mentioned above, in this case, the focus was purposive, i.e. to find valuable and helpful information about this group that will actively enter the labour market in the near future and to help better understand the specific issues that concern them. However, for the results obtained to apply to the population as a whole, it would be necessary to ensure that the sample is representative and to try to minimise the influence of factors that could bias the results. Such research would have to be carried out on an order of magnitude larger scale, however, and this was not the paper's primary aim.

Finally, quantitative research often focuses on specific aspects and may overlook the complexity and contextuality of real life. These limitations should be considered when interpreting results and selecting methods for future research.

On this basis, the quantitative research was complemented by a qualitative study using the focus group method, especially in confirming or refuting the preliminary results. The focus group method has several limitations, including small sample size, social desirability bias, where respondents may be more vigilant about what they say, limited time, dominant participants, or more complex interpretation of results, which in this case was, however, ensured by a clear set of surveyed and scored indicators.

## **Conclusions**

In this paper, the objectives that were set were met. In the theoretical part, a literature review has been compiled on the issues of managerial practice - task management, task assignment, teamwork and generational differences. Furthermore, according to Plaminek (1999), the theory of motivational types was introduced, while the possibilities of its practical application were subsequently explored in the practical part of quantitative and qualitative research. Among the sub-objectives of the thesis was also the verification of the possibilities of applying these theories to different groups of workers with different sociodemographic and professional/studying characteristics, which is evident from the synthesis of the results of both conducted researches. It has been shown that not only the belonging to a particular generation largely determines the identifying motivational type of the respondent, but also gender and study or professional background are influential. The most statistically significant variables influencing task assignment were also defined. Overall, the objectives of this thesis were met and the results presented can be used in managerial practice for effective task management.

This paper deals with the effectiveness of work teams in assigning tasks and is intended for a target group of managers who will lead major companies in the future. It is also intended for HR professionals or educators to

prepare this future successful generation of managers. Managers of major companies will have to cope with changes in value orientations, various aspects of globalisation, the need for flexible responses, and pressing environmental, social, and political factors in managing and leading work teams. That is, managers need more and more time for strategic activities, and effective task assignments can help them gain this valuable time. Task assignment of the "WHAT" type is almost timesaving for the manager. You need to assign the "WHAT" type task to those subordinates who are truly motivated by this type of task.

The paper Impact of Task Assignment on Effectiveness in Work Teams emphasises the importance of assigning tasks to teams in two different ways. The paper presents the results of several research investigations. The frequency analysis results are presented, demonstrating the necessity of assigning tasks in different ways based on defined criteria for assignment effectiveness. At the same time, with the help of Pearson chi-square and adjusted residuals, it was shown that the respondent's approach to receiving tasks of both types differs according to gender, age, the field of study and educational attainment. The implementation phase of the focus group task confirmed these findings.

With the assignment of tasks, other observed criteria such as willingness to work with risk, fear of failure, teamwork, willingness to take responsibility, motivation to complete the task, and level of commitment or communication of the manager were defined.

Based on the conducted research investigations, goal-oriented task assignment motivates younger workers, especially men, to study fields such as Logistics and Quality Management, Financial Management, Industrial Management or Business Informatics.

For older workers and women in the humanities fields, the "HOW" type of assignment is motivating. These workers prefer a process guide, i.e., task assignments in the form of sub-steps and ongoing checks from the supervisor are important to them and influence the overall outcome of the task.

It can also be noted that employees who request combined assignments (written and spoken) usually wish to be addressed by their first name. Assignments should include precise specific information, the deadline for completing the assignment, the reason or purpose for completing the assignment, the degree of confidentiality, and a thank you or appreciation from the person assigning the task. But is this really how managers assign tasks in everyday practice?

## References

- Anes, V., Abreu, A., Dias, A., & Calado, J. 2023. A new approach for agile teams' allocation in open innovation projects. *Administrative Sciences*, 13(2), Article Number 62 <http://doi.org/10.3390/admsci13020062>
- Bakken, J., & Andersson-Bakken, E. (2021). *The textbook task as a genre*. *Journal of Curriculum Studies*, 53(6), 729-748, <http://doi.org/10.1080/00220272.2021.1929499>
- Benson, J. & Brown, M. (2011). Generations at work: are there differences and do they matter? *The International Journal of Human Resource Management*, 22(9), 1843-1865. <https://doi.org/10.1080/09585192.2011.573966>
- Campbell, D. J. (1988). Task Complexity: A Review and Analysis. *The Academy of Management Review*, 13(1), 40. <https://doi.org/10.2307/258353>
- Castellano, S. Davidson, P., & Khelladi, I. (2017). Creativity techniques to enhance knowledge transfer within global virtual teams in the context of knowledge-intensive enterprises. *Journal of Technology Transfer*, 42(2), 253-266. <http://doi.org/10.1007/s10961-016-9509-0>

- Černevičiūtė, J. & Strazdas, R. (2018). Teamwork management in Creative industries: factors influencing productivity. *Entrepreneurship and Sustainability Issues*, 6(2), 503-516. [http://doi.org/10.9770/jesi.2018.6.2\(3\)](http://doi.org/10.9770/jesi.2018.6.2(3))
- Chen, S.Q., Zhang, L., Shi, H.L., & Wang, Y.M. (2021). Two-sided matching model for assigning volunteer teams to relief tasks in the absence of sufficient information. *Knowledge-Based Systems*, 232. Article Number 107495 <http://doi.org/10.1016/j.knosys.2021.107495>
- Delfgaauw, J., Dur, R., & Souverijn, M (2020). Team incentives, task assignment, and performance: A field experiment. *Leadership Quarterly*, 31(3), Article Number 101241 <http://doi.org/10.1016/j.leaqua.2018.03.003>
- Gegenfurtner, A. (2018). Testing the gender similarities hypothesis: differences in subjective task value and motivation to transfer training. *Human Resource Development International*, 1-12. <http://doi.org/10.1080/13678868.2018.1449547>
- Gursoy, D., Chi, C. G.-Q., & Karadag, E. (2013). Generational differences in work values and attitudes among frontline and service contact employees. *International Journal of Hospitality Management*, 32, 40-48. [10.1016/j.ijhm.2012.04.002](http://doi.org/10.1016/j.ijhm.2012.04.002)
- Hee, S. J. & Praveen, M. (2016). Exploring Millennial Generation in Task Values and Sector Choice: A Case of Employment in Planning. *International Journal of Public Administration*, 39(3), 173-183. <https://doi.org/10.1080/01900692.2014.1003385>
- Hsieh, C., & Lee, W.J. (2023). How would autonomist and autocratic teammates affect individual satisfaction on pre-founding entrepreneurship teams? *Journal of Small Business Management*, 61(2), 659-703. <http://doi.org/10.1080/00472778.2020.1815471>
- Jiang, W., & Gu, Q. (2015). Leader creativity expectations motivate employee creativity: a moderated mediation examination. *The International Journal of Human Resource Management*, 28(5), 724-749. <https://doi.org/10.1080/09585192.2015.1109535>
- Kamei, K., & Markussen, T. (2022). Free Riding and Workplace Democracy-Heterogeneous Task Preferences and Sorting. *Management Science*, 1-21. <http://doi.org/10.1287/mnsc.2022.4556>
- Kaur, M.P., Smith, S., Pazour, J.A., & Schumacher, A.D. (2022). Optimisation of volunteer task assignments to improve volunteer retention and nonprofit organisational performance. *Socio-Economic Planning Sciences*, 84, Article Number 101392 <https://doi.org/10.1016/j.seps.2022.101392>
- Koubek, J. (2010). *Řízení lidských zdrojů: Základy moderní personalistiky*. 4<sup>th</sup> Edition. Praha: Management Press. ISBN 978-80-7261-168-3.
- Kriek, D. (2019). *Team Leadership: Theories, Tools and Techniques*. Knowledge Resources, ISBN 9781869227739.
- Li, Y.T., Cote, J.F., Zhang, C., & Zhang, S (2023). Order assignment and scheduling under processing and distribution time uncertainty. *European Journal of Operational Research*, 305(1), 148-163. <http://doi.org/10.1016/j.ejor.2022.05.033>
- Liu, D.P., Li, J.X., Liang, P., & Pang, X.H. (2023). How does organisational political environment influence leader justice rule adherence? *Acta Psychologica Sinica*, 55(3), 496-509. <http://doi.org/10.3724/SP.J.1041.2023.00496>
- McGrath, J. E. (1984). *Groups: Interaction and performance*. Englewood Cliffs. New Jersey: Prentice-Hall.
- Parkes, A. (2016). The effect of individual and task characteristics on decision aid reliance. *Behaviour & Information Technology*, 36(2), 165-177. <https://doi.org/10.1080/0144929X.2016.1209242>
- Pechova, J., Volfová, H. & Jírová, A. (2022). The International Working Team and its effectiveness in the Emerging trends of globalisation. *In The 22th International Scientific Conference Globalization and its Socio-Economic Consequences*. Rajecké Teplice. 1134-1143.
- Plamínek, J. (1999). *Synergický management: vedení, spolupráce a konflikty lidí ve firmách a týmech*. Praha: Argo. ISBN 80-7203-258-5.
- Ren, R., Simmons, A.L., Barsky, A., See, K.E., & Gogus, C.I. (2022). It's not my job: Compensatory effects of procedural justice and goal setting on proactive preventive behaviour. *Journal of Management & Organization*, 28(4), 792-810. Article Number PII S183336721800069X <http://doi.org/10.1017/jmo.2018.69>

Svozilová, A. (2016). *Projektový management: Systémový přístup k řízení projektů*. 3<sup>rd</sup> upgraded and extended edition. Praha: Grada, p.143-144. ISBN 978-80-271-0075-0.

Truss, K., Soane, E., Delbridge, R., Alfes, K., Shantz, A., & Petrov, G. (2011). Employee engagement, organisational performance and individual well-being: exploring the evidence, developing the theory. *The International Journal of Human Resource Management*, 22(1), 232-233. <https://doi.org/10.1080/09585192.2013.798921>

Weerasombat, T., Pumipatyothin, P., & Napathorn, C. (2023). Skill redefinition and classification, capitalism, and labour process theory of work: evidence from Thailand. *International Journal of Organizational Analysis*, Early Access MAR 2023 <http://doi.org/10.1108/IJOA-08-2022-3394>

Wielenga-Meijer, E. G. A., Taris, T. W., Wigboldus, D. H. J., & Kompier, M. A. J. (2011). Costs and Benefits of Autonomy When Learning a Task: An Experimental Approach. *The Journal of Social Psychology*, 151(3), 292-313. <https://doi.org/10.1080/00224545.2010.481688>

Wood, R. E. (1986). Task complexity: Definition of the construct. *Organisational Behavior and Human Decision Processes*, 37(1), 60–82. [https://doi.org/10.1016/0749-5978\(86\)90044-0](https://doi.org/10.1016/0749-5978(86)90044-0)

Zhang, H., Zhang, R., Abd Rahman, A., Chen, L., Yin, Z., Yin, J. (2021). Influence of Task–Technology Fit on Consumer Perceived Value from the Perspectives of Man–Machine Interaction and Interpersonal Interaction. *Transformations in Business & Economics*, Vol. 20, No 2A (53A), pp.515-538.

**Data Availability Statement:** More information and data can be obtained from the authors on a reasonable request.

**Author Contributions:** The authors contributed equally; they have read and agreed to the published version of the manuscript.

**Jana PECHOVÁ** graduated from Economics and Management at the Technical University of Liberec (1999, Ing.). She received her Ph.D. degree in 2010 at the Czech Agricultural University in Prague, Faculty of Operational Economics in the field of management. Since 2000, she has worked in various positions at ŠKODA AUTO, a.s., the longest as a specialist in the Adult Education Department in the Supra-professional Training Group. Since 2012, she has been working at ŠKODA AUTO Vysoká škola, o.p.s. as a teaching assistant at the Department of Marketing and Management. She has published several monographs and professional articles, especially in the field of managerial competences. She specialises in the fields of management, personnel management, social communication, entrepreneurship, creativity and innovation.

**ORCID ID:** <https://orcid.org/0000-0002-1822-8754>

**Hana VOLFOVÁ** graduated from the Faculty of Economics of the University of South Bohemia in České Budějovice with a specialisation in tourism. During her doctoral studies, however, she profiled more in the field of marketing, specialising in consumer behaviour, marketing communication and sustainable economic approaches. In practice, she has worked with companies such as TANY, s.r.o., or Hönigsberg & Düvel Datentechnik Czech on product launch projects (winning the EcoTrophelia ČR competition) or changing the company's marketing strategy. As part of sustainable development activities, she created a fair trade simulator for Fairtrade ČR or a fair trade product trail. She has worked at ŠKODA AUTO Vysoká škola, o.p.s. since 2013 and has been an assistant professor at the Department of Marketing and Management since the beginning of 2019.

**ORCID ID:** <https://orcid.org/0000-0003-3068-5146>

**Anežka JÍROVÁ** graduated in Human Resource Management from Škoda Auto University within the study programme Economics and Management and continues her engineering studies with a focus on finance in international business.

**ORCID ID:** <https://orcid.org/0009-0006-0165-9327>

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





**Publisher**

<http://jssidoi.org/esc/home>



---

## ENTREPRENEURIAL INTENTION OF SAUDI STUDENTS: ROLE OF SAUDI ARABIAN UNIVERSITIES IN ACHIEVING THE GOAL OF VISION 2030\*

**Vikram Jeet**

*University of Jeddah, College of Business, Department of Business Administration, Jeddah, Saudi Arabia*

*E-mail: [vjram@uj.edu.sa](mailto:vjram@uj.edu.sa)*

*Received 5 March 2023; accepted 8 May 2023; published 30 June 2023*

**Abstract.** The present study is focused on Saudi students' entrepreneurial intention and Saudi Arabian universities' role in achieving Vision 2030. The paper examines Saudi universities' role in the predictive value of students' self-efficacy, subjective norms, and attitudes towards entrepreneurship for entrepreneurial intentions. The data were collected from the student enrolled in the varied programs in Saudi universities. A total of 208 Saudi students enrolled in various disciplines, and those who attended entrepreneurial educational programs offered by the universities participated in the research. The collected data were analysed using descriptive statistics, correlation, and stepwise multiple regression analysis. Results of the study revealed that Saudi universities strengthened the students' self-reliance and positive attitude toward entrepreneurship and reduced the impact of social norms on entrepreneurial intentions.

**Keywords:** self-efficacy, subjective norms; attitude towards entrepreneurship; entrepreneurial intentions; universities

**Reference** to this paper should be made as follows: Jeet, V. 2023. Entrepreneurial intention of Saudi students: role of Saudi Arabian universities in achieving The Goal of Vision 2030. *Entrepreneurship and Sustainability Issues*, 10(4), 171-183. [http://doi.org/10.9770/jesi.2023.10.4\(11\)](http://doi.org/10.9770/jesi.2023.10.4(11))

**JEL Codes:** M1, M13, I21, I23, J24

### 1. Introduction

Global unemployment rates are continuously rising. Many countries are proactively addressing these reoccurring concerns through numerous policies and strategies. Entrepreneurship is a suitable and widely used alternative approach to reduce the adverse impact of unemployment (Nazri et al. 2016). The relevance of Entrepreneurship in the growth of the national economy, innovativeness, and job creation is highly significant (Badulescu and Badulescu 2013). Entrepreneurial education is needed to equip young minds for success in today's work and to embrace them in living environments. However, shifting the young mind towards entrepreneurship and developing entrepreneurial intentions is among the big challenge for policymakers.

---

\* This research work was funded by the University of Jeddah, Jeddah, Saudi Arabia, under grant No. (UJ-22-DR-71). I acknowledge and thanks the University of Jeddah for its technical and financial support.

Many global debates have been observed to identify the factors that contribute most to developing entrepreneurial attitudes. Entrepreneurship education is one of the main factors for developing entrepreneurship intentions, and it has attracted many researchers and academicians for many decades (Wach and Głodowska, 2019). Entrepreneurship education is a strong foundation and provides essential knowledge, skills, and motivation in new business setups (Lee et al., 2005). Entrepreneurship education can be among the vital sources to change the mentality of job seekers to job providers and helps to consider business as a career option. Developing entrepreneurship intentions to generate interest towards self-employment, start-ups, boot start-ups, and small and medium businesses can become an essential source of employment generations. Besides entrepreneurship education, researchers have also identified several other factors which contribute most to entrepreneurial intentions are as; cultural and social norms (Wach, 2015), early childhood education (Huber et al., 2014), secondary education (Rachwał et al., 2016), higher education (Wach, 2019) learning experiences (Hägg and Kurczewska, 2021), professional perspective (Marona and Głuszak, 2014).

The Kingdom of Saudi Arabia is one of the largest oil-producing countries in the world. The economy of the Kingdom of Saudi Arabia is based on oil production and its export. Like other developing and developed nations, Saudi Arabia has also recognised the challenges of unemployment and trying to boost supportive entrepreneurial activities in the region with a comprehensive strategic plan named "Saudi Vision 2030", launched in April 2016. It included several strategic objectives, specified targets, and KPIs that would be achieved through collaboration between the Kingdom of Saudi Arabia's public, private, and non-profit sectors (KSA Vision 2030). "A key focus for Vision 2030 is creating an environment that unlocks business opportunities, broadens the economic base, and creates jobs for all Saudis. Vision 2030 is creating future jobs, supporting innovation, and promoting exports by providing services to SMEs, which are important drivers of economic growth. The Vision is creating employment opportunities for citizens by supporting entrepreneurship, driving privatisation, and attracting investments in new industries" (KSA Vision 2030). Remarkably, one of the critical aims of Saudi Vision 2030s is to develop and support entrepreneurial education to provide more job opportunities and encourage self-employment among young Saudi graduates; hence objectives are to reduce the unemployment rate from 11.6% to 7 % by 2030. However, it is vital to identify young talent and facilitate them with all requirements. In this regard, universities and higher educational institutions can contribute and facilitate in achieving the set targets of enhancing entrepreneurial education in the region.

The present research examines the student's entrepreneurial intentions and the role of universities' facilitation towards entrepreneurial education in Saudi Arabia. More specifically, the emphasis is to analyse the impact of entrepreneurship education on the student's attitude, capability, skills, knowledge, and intentions toward entrepreneurship. To explore the students' willingness and abilities to be entrepreneurs and nurture their entrepreneurial sense. A brief introduction to the topic is discussed in the first section of the paper. In the second section hypothesis and conceptual framework are discussed in the light of a detailed literature study. In the subsequent section, the methodology of the research and results are discussed. In the last section of the paper, the conclusion has been drawn, and policy implications have been discussed.

## **2. Review of Literature and Hypothesis Formulation**

A great deal of research explores entrepreneurial intentions, mainly focusing on university students (e.g., Franke and Luthje, 2004; Dahalan, et al., 2015; Laspita and Sarri, 2019; Liu et al., 2019; Usman, 2019; Zovko, Dulcic, and Bilic, 2020; Alrubaishi, 2020). Entrepreneurial intentions are the attributes that inherently encourage an individual to incorporate a self-driven and self-monitored business unit. Entrepreneurial intentions are an individual's motives to turn ideas into a business and to work as an entrepreneur (Hmieleski and Corbett 2006). These are the prerequisites as desires and mindsets that help an individual develop practical and specific business plans and may be considered an essential predictor of planned entrepreneurship behaviour. It also ensures, to a great extent, that individual efforts and attitudes are self-motivated (Krueger et al., 2000).

The role of entrepreneurship education on entrepreneurial intentions has been examined in numerous research studies and observed diverse outcomes. Such as the relevance of entrepreneurship education and the university environment in influencing students' entrepreneurial interests is significant among Saudi Arabian students. (Ababtain and Akinwale, 2019). Wang and Ortiz (2022) also endorsed a statistically significant and positive relationship among entrepreneurship learning, entrepreneurial attitude, entrepreneurship education, and management students' entrepreneurial intention. Entrepreneurial education significantly facilitates individuals to establish a new venture. Another perspective of entrepreneurial education in developing students' ability to recognise opportunities and take advantage of them is that new start-ups have been found significant (Zhang et al., 2020). At the same time, entrepreneurial education significantly improves the fundamental knowledge for initiating new businesses (Rive et al., 2017).

On the contrary, Alrubaishi (2020) findings indicated that the university entrepreneurial environment has no significant impact on the entrepreneurial intentions of Saudi students. Whereas another study by Zovko et al. (2020), more precisely on Croatian students, revealed no vital relationship exists between self-efficacy, social norms, education, and entrepreneurial intention. In the same opinion, Betáková et al. (2020) also confirm that, generally, entrepreneurial support is expected by students. Still, it seems to be insufficient knowledge provided by the university in specific countries like Slovakia, Poland, the Czech Republic, and Hungary.

It is evidenced in numerous research studies that several antecedents may influence entrepreneurial intention. Such as Bird (1988) categorised personal and environmental as the two main factors affecting entrepreneurial intentions. Thus, individual characteristics are developed and exercised within the interaction of environmental and related activities. Two fundamental models which also help to analyse the different intentions towards entrepreneurship are: "Entrepreneurial event theory" (EET) (Shapero and Sokol, 1982) and "Theory of Planned Behavior" (Ajzen, 1991). Entrepreneurial event theory argues that entrepreneurial intentions result from an individual's perceptions of "personal desirability, feasibility, and the propensity to act". At the same time, the theory of Planned Behavior suggests that personal factors such as "personal attractiveness, social norms, and feasibility" generally develop entrepreneurial intentions. Other factors which also have a significant impact on entrepreneurial intentions are sociodemographic, environmental, and economic variables (Liñán et al., 2011), situational and social-cultural factors (Elfving et al., 2017), "seeking opportunities, valuing entrepreneurial traits, capability beliefs, taking responsibility and risk aversion" (Stephan et al., 2009).

Based upon the above-discussed research studies, the first research gap was identified regarding mixed impressions of entrepreneurial education on entrepreneurial intentions. Second, a comprehensive model predicts entrepreneurial intention with a mediating effect of entrepreneurial education towards entrepreneurship on the specific group of students. Based on the above-stated research gaps, the research aims to identify and analyse the entrepreneurial intention and mediating role of universities towards entrepreneurship. Hence, the following hypothesis has been formulated.

H1 Students' attitudes about entrepreneurship significantly influence their intentions toward entrepreneurship.

H2 Subjective norms significantly influence students' intentions about entrepreneurship.

H3 Self-efficacy exerts a significant effect on students' desire for entrepreneurship.

H4 Entrepreneurial education significantly improves the association between student's attitudes and entrepreneurship intentions.

H5 Entrepreneurial education significantly improves the association between subjective norms and entrepreneurship intentions.

H6 Entrepreneurial education significantly improves the association between self-efficacy and entrepreneurship intentions.

**3. Research Design**

The study design for the research is a cross-sectional study. Data has been collected with the help of online structured questionnaires. The questionnaire design is based on Entrepreneurial Intentions Questionnaire (EIQ) developed by Liñán and Chen (2009). Another reference has been taken from Shah et al. (2022) to make the questionnaire more precise. Some items from the scale have been removed, and some new items have been included to complete the questionnaire more related to the study and objectives. The scale was categorised into five parts, namely students' "Demographic factors", "Entrepreneurship intentions (EI)", "Subjective Norm (SN)", "Self-efficacy (SE)", and "Attitude toward Entrepreneurship (ATE)".

Generally, universities offer entrepreneurship programs in many ways. Every university has a different approach to highlighting the importance of entrepreneurship. In the present questionnaire, the university offerings were clubbed into four different types of programs, i.e., 1) Specific workshops, Lectures, or seminars on Entrepreneurship, 2) Specific Training for Networking and coaching opportunities, 3) Entrepreneurship Advisory/guidance units, and 4) Specific academic course on Entrepreneurship.

The respondents for the research work were the students of graduate and postgraduate programs enrolled in Saudi Universities. The data was collected from the students during 2022-23. The targeted students in the survey were in the third year or fourth year of the graduate program and were selected based on the random sampling technique. All questionnaire was filled under the observation of the faculty members. The collected data has been classified into two categories of students, i.e., one group who have completed or attended any entrepreneurship program or support and the second those who have not attended any program in any form. The number of students who participated in the survey was 308, out of which 96 students did not attend any entrepreneurial program offered by the university; hence they were eliminated from the research. Thus, the total number of students who have taken the entrepreneurial educational program and were considered for the study was 208. Data analysis was conducted with SPSS statistics and Amos 26, using frequencies and binary logistic regression.

**4. Results and Discussion**

Table 1 represents the demographic variables of a sample of males and females. The sample consists of 58.17% male and 41.82% female. Sample selected from Government Universities 78.36% and 21.63% from Private Universities. Similarly, the field of study accounted for 59.61% of management, 22.59% of engineering, and 17.78% of other streams of study. Students enrolled in the Bachelor program represent 82.21%, diploma 12.50%, and others represent 5.28% of the sample distribution.

**Table 1.** Distribution of the sample and Demographic characteristics (N=208)

<b>Variables</b>	<b>Frequency</b>	<b>Result</b>
<b>Gender</b>		
<i>Male</i>	121	58.17%
<i>Female</i>	87	41.82%
<b>University Type</b>		
<i>Government</i>	163	78.36%
<i>Private</i>	45	21.63%
<b>Field of Study</b>		
Management	124	59.61%
Engineering	47	22.59%
Other	37	17.78%
<b>Program enrolled</b>		
Bachelor	171	82.21%
Diploma	26	12.50%
Others	11	5.28%

<b>Know Entrepreneur</b>		
Attended Entrepreneurship Education program (in any four forms)	208	69.42%
Not Attended Entrepreneurship Education program (in all four forms)	96	31.57%

The main objective of this research is to find the influence of university entrepreneurship education programs on the entrepreneurial intention of the study. The number of participants who completed the survey questionnaire was 304; out of the total participants in this research, 69.42% were known to entrepreneurship through courses offered by the university or different entrepreneurial programs organised by the university to make them aware of the new start-ups.

Table 2 shows the internal consistency of items selected for this research based on the item total Bivariate correlation matrix. The most significant aspect of students' attitude towards entrepreneurship is a career as an entrepreneur revealed a correlation of .649, which is significant at .01 levels. Attitude toward entrepreneurship among various options they would instead prefer to be an entrepreneur showed a correlation of .648 followed by being an entrepreneur would entail great satisfaction (.595), the opportunity and resources, I would like to start a firm (.558), and entrepreneur implies more advantages than disadvantages (.299). The participant's awareness of entrepreneurship through the courses offered and programs organised by the university attracted the attitude towards entrepreneurship.

The Vision 2030 of Saudi Arabia is highly favourable toward entrepreneurial activity and revealed a correlation of .597 which is significant at .01 levels of significance. Most people in Saudi Arabia consider it acceptable to start their own business (.570), followed by belief in the entrepreneur's role that contributes to the economy in Saudi Arabia (.569). Vision 2030 attracts the youth towards entrepreneurship in Saudi Arabia.

Self-Efficacy is one of the important facets of entrepreneurship that attracts participants toward entrepreneurial intention. The relationship between the overall score of scale and one of the aspects of self-efficacy revealed a significantly high internal consistency (.676) that as an entrepreneur, they would have sufficient control over the business followed by participants are prepared to start a viable business showed a correlation of .616 significant at .01 level of significance as a result of university contribution towards entrepreneurship. The internal consistency score between the overall score of scale and the necessary practical details to start a firm revealed .515 significance at .01 levels of significance. The university accounted for developing entrepreneurship skills among the students to create their businesses to realise Vision 2030. The internal consistency between overall score and professional goal to start their own business revealed a significant relationship (.681) beyond .01 levels of significance. The participants are willing to take risks and start their businesses, showing an intention towards entrepreneurship, revealing an internal consistency score of .668 which is significant at .01 levels of significance, followed by the determination of participants to run their businesses to realise the Saudi Arabia Vision 2030.

**Table 2.** Internal consistency of selected items and Cronbach's Alpha based on standardised Items for sub-scales

<b>Item Codes</b>	<b>Items of scale</b>	<b>Internal consistency of individual item of scale</b>	<b>Cronbach's Alpha based on standardised Items for sub-scales</b>	<b>Overall reliability of test determined by Cronbach's Alpha</b>
ATE1	Being an entrepreneur implies more advantages than disadvantages to me	.299**	.836**	
ATE2	A career as an entrepreneur is attractive for me	.649**		
ATE3	If I had the opportunity and resources, I would like to start a firm	.558**		

ATE4	Being an entrepreneur would entail great satisfaction for me	.595**		.893
ATE5	Among various options, I would rather be an entrepreneur	.648**		
SNR1	My family members believe that I should pursue a career as an entrepreneur	.530**		
SNR2	My mentors at the university believe that I should pursue a career as an entrepreneur	.535**		
SNR3	Most people in my country consider it acceptable to start their own business	.570**		
SNR4	The Vision 2030 of Saudi Arabia is highly favourable toward entrepreneurial activity	.597**	.845**	
SNR5	The entrepreneur's role in the economy is generally valued in Saudi Arabia	.569**		
SE1	To start a business and keep it working would be easy for me	.485**		
SE2	I am prepared to start a viable business	.616**		
SE3	As an entrepreneur, I would have sufficient control over my business	.676**		
SE4	I know the necessary practical details to start a firm	.515**	.835**	
SE5	If I tried to start a firm, I would have a high probability of succeeding	.588**		
ITE1	I am ready to do anything to start my own business	.668**		
ITE2	My professional goal is to start my own business	.681**		
ITE3	I am determined and will make every effort to start and run my firm	.626**		
ITE4	I intend to start a business within five years of graduation	.564**	.879**	
ITE5	I have chosen entrepreneurship as a career option	.565**		

Source: Shah et al. (2022)

Results revealed in Table 2 showed the items of scale had been standardised. In the second step, Cronbach's Alpha based on standardised items for sub-scales as attitude toward entrepreneurship and total score found .836 significant at .01 levels of significance determines the reliability of sub-scale. Similarly, Cronbach's Alpha between total score and subjective norms (.845), Self-efficacy (.835), and Intentions toward entrepreneurship (.879) are highly significant that determine the reliability of sub-scales. Finally, the overall reliability of the test has been determined by Cronbach's Alpha .893. The test is reliable for measuring entrepreneurial intention.

**Table 3.** Descriptive Statistics and Pearson Product Moment Correlations (N=208)

Factors	Mean	Sd.	ATE TOTAL	SNR TOTAL	SE TOTAL	ITE TOTAL
ATE TOTAL	20.4712	3.59672	1			
SNR TOTAL	18.9279	3.92312	.537**	1		
SE TOTAL	17.4135	3.90370	.521**	.598**	1	
ITE TOTAL	19.2548	4.51166	.572**	.484**	.601**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 3 presents the descriptive statistics and Pearson Product Moment correlation between subscales and Intentions toward the entrepreneurship scale. The mean and sd. of attitude toward entrepreneurship were found 20.47 and 3.59. In contrast, for Subjective norms, it appeared at 18.92 and 3.92, and the correlation between attitudes towards entrepreneurship and subjective norms was calculated at .537, which is significant at .01 levels of significance. The mean and sd. on self-efficacy were observed at 17.41 and 3.90. In contrast, the mean and sd. of intention towards entrepreneurship appeared at 19.25 and 4.51 with a correlation of .601 significant at .01 levels of significance. The scores were found normally distributed for all sub-scales of the test. Based on this analysis, a Model of Intention toward Entrepreneurship has developed as an effect of university roles.

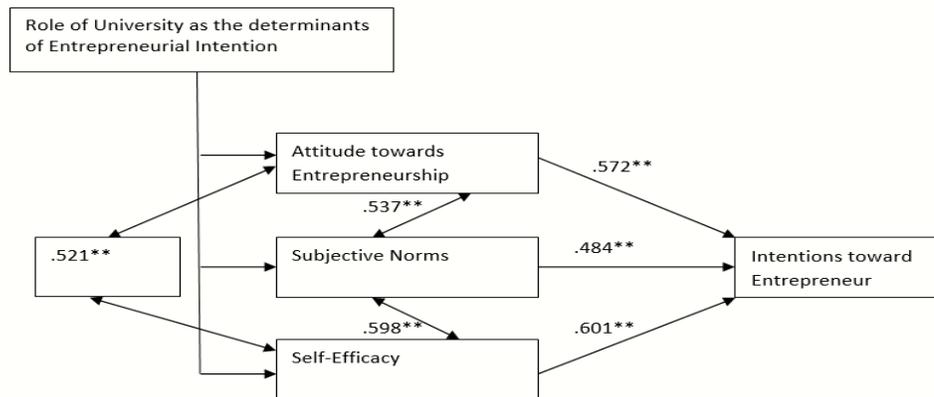


Figure 1. Intention towards Entrepreneurship Model

University played a significant role in entrepreneurship among the students—intention towards entrepreneurship results from an attitude towards entrepreneurship, subjective norms, and self-efficacy. The university is considered an external factor that accounted for the development of entrepreneurial intention among the students. The Saudi Universities offer specific academic courses on entrepreneurship, organise different workshops, lectures, and seminars, and provide particular entrepreneurship training programs for the students.

The proposed entrepreneurship model has shown the relationships between the factors and intention toward entrepreneurship. The interrelationship between attitude towards entrepreneurship and subjective norms found .537 is significant at .01 levels. The relationship between subjective norms and self-efficacy established a significant positive correlation of .598 ( $P < .01$ ). The relationship between attitude towards entrepreneurship and self-efficacy revealed a significant positive correlation of .521 at .01 levels of significance. The relationship between attitude towards entrepreneurship and intention towards entrepreneur observed .572 significant at .01 influencing intention towards entrepreneurship. Subjective norms and intention towards entrepreneurship significantly correlated with .484 at .01 levels. Finally, self-efficacy and intention towards entrepreneurship revealed a significant positive correlation of .601 beyond .01 levels of significance. Attitude toward entrepreneurship, subjective norms, and self-efficacy contributed to developing intention towards entrepreneurship among students to create and run their businesses.

**Table 4.** Model summary of Regression analysis on Intention towards Entrepreneurship among University students in Kingdom of Saudi Arabia (N=208)

Model	R	R Square	Adjusted R Square	Change Statistics		
				R Square Change	F Change	Sig. F Change
1. Self-Efficacy	.601 <sup>a</sup>	.362	.358	.362	116.649	.000
2. Self-Efficacy, Attitude Towards Entrepreneurship	.673 <sup>b</sup>	.453	.448	.092	34.468	.000
a. Predictors: (Constant), Self-Efficacy						
b. Predictors: (Constant), Self-Efficacy, Attitude Towards Entrepreneurship						

Table 4 presents the model summary of regression analysis indicating that self-efficacy appeared to be the most dominant predictor of intention toward entrepreneurship among Saudi Arabian students. In the first step coefficient of correlation between self-efficacy and intention towards entrepreneurship was found R=.601 regressed the intention towards entrepreneurship, and the coefficient of determination was observed R<sup>2</sup>= .362, which accounted for 36.2% variation in the dependent variable. A significant positive correlation between self-efficacy and intention towards entrepreneurship and observed self-efficacy emerged as the predictor of intention towards entrepreneurship among university students (Franke and Luthje, 2004; Dahalan, et al., 2015; Laspita and Sarri, 2019; Liu et al., 2019; Usman, 2019; Zovko, Dulcic, and Bilic, 2020; Alrubaishi, 2020). The result attributed to self-efficacy that encourages an individual intention towards entrepreneurship to incorporate a self-driven and self-monitored business unit. The result suggested that self-efficacy influenced entrepreneurial intention among university students. Entrepreneurship education and training play a significant role in developing entrepreneurship intentions (Wach, and Głodowska, 2019). Entrepreneurship education is a strong foundation and provides essential knowledge, skills, and motivation in new business setups (Lee et al., 2005). The F change (F=116.649, p<.001) on the intention towards entrepreneurship was significant. Thus, the proposed hypotheses H3 and H6 were accepted that self-efficacy influenced intention towards entrepreneurship. In the second step observed coefficient of correlation between self-efficacy, attitude towards entrepreneurship, and intention towards entrepreneurship found R= 0.673 regressed the intention towards entrepreneurship, and the coefficient of determination R<sup>2</sup>=0.453 accounted for 45.3% variation in intention towards entrepreneurship and attitude towards entrepreneurship alone accounted for 9.2% variation in intention towards entrepreneurship. Attitude towards entrepreneurship emerged second most dominant predictor influencing choice towards entrepreneurship among university students. Wang and Ortiz (2022) observed a significant and positive relationship between entrepreneurship learning, entrepreneurial attitude, entrepreneurship education, and management students' entrepreneurial intention. The value of F change (F=34.468) is significant beyond .001 levels of significance. The proposed hypothesis H1 and H4 is accepted.

**Table 5.** ANOVA of Multiple Regression analysis on Intention towards Entrepreneurship among University students in Kingdom of Saudi Arabia (N=208)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1523.326	1	1523.326	116.649	.000 <sup>a</sup>
	Residual	2690.169	206	13.059		
	Total	4213.495	207			
2	Regression	1910.540	2	955.270	85.034	.000 <sup>b</sup>
	Residual	2302.955	205	11.234		
	Total	4213.495	207			
a. Predictors: (Constant), Self-Efficacy						
b. Predictors: (Constant), Self-Efficacy, Attitude towards Entrepreneurship						

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1523.326	1	1523.326	116.649	.000 <sup>a</sup>
	Residual	2690.169	206	13.059		
	Total	4213.495	207			
2	Regression	1910.540	2	955.270	85.034	.000 <sup>b</sup>
	Residual	2302.955	205	11.234		
	Total	4213.495	207			
a. Predictors: (Constant), Self-Efficacy						
c. Dependent Variable: Intention towards Entrepreneurship						

It is evident from the result shown in Table 5 that the obtained F- value for intention towards entrepreneurship as the effect of self-efficacy was found significant ( $F = 116.649, p < .001$ ). Similarly, the effect of Attitude towards Entrepreneurship and Self-Efficacy on Intention towards Entrepreneurship was observed significantly, and the F-value ( $F = 85.034, p > .001$ ) was found significant. The results suggested that predictors contributed to Intention towards Entrepreneurship among university students. Thus, in the case of the above predictors, the proposed hypotheses were accepted.

**Table 6.** Coefficient of Regression on Intention towards Entrepreneurship among Students in Kingdom of Saudi Arabia (N=208)

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.154	1.148		6.231	.000
	Self-Efficacy	.695	.064	.601	10.800	.000
2	(Constant)	1.759	1.406		1.251	.212
	Self-Efficacy	.481	.070	.416	6.875	.000
	Attitude Towards Entrepreneurship	.446	.076	.355	5.871	.000

a. Dependent Variable: Intention towards Entrepreneurship

Table 6 represents the regression coefficient for the intention toward entrepreneurship of university students in Saudi Arabia. In the first model intention towards entrepreneurship made constant at  $B=7.154$  unstandardised coefficient  $B=.695$ , standard error 0.064 for self-efficacy in the regression equation. Self-efficacy appeared as the most dominant predictor of intention toward entrepreneurship among students. The variations in sample scores are shown as standard errors in the regression equation. The standardised coefficient Beta for self-efficacy was found 0.601 explained all variables in standardised form with a significant t-value ( $t=10.80, p<.001$ ) showing a linear relationship. In the second model, attitude toward entrepreneurship along with self-efficacy emerged as the predictor of intention towards entrepreneurship among university students in Saudi Arabia. In this model 1.759 made constant, unstandardised  $B= 0.481$  with a standard error of 0.70 for self-efficacy, and unstandardised  $B=.446$  with a standard error of 0.76 observed for attitude towards entrepreneurship. Standardised coefficient Beta calculated .355 with a significant t-value ( $t= 5.871 < p .001$ ) alone for attitude toward entrepreneurship among students showing the linear relationship and fit for the regression model. The standard error shows the variations in the sample scores. The results of the present research revealed that self-efficacy and attitude toward entrepreneurship influenced the entrepreneurial intention of Saudi students.

## **5. Conclusion and implications**

The present study aimed to investigate the role of Saudi universities and their impact on the entrepreneurial intentions of Saudi students. The study focused on Saudi Arabian students enrolled in varied disciplines at different universities. The results significantly approve the proposed model of study. The descriptive analysis of the study results signifies that The Vision 2030 of Saudi Arabia is highly favourable toward entrepreneurship. Students accepted Saudi Arabia as an excellent place to start their own business and believed in the entrepreneur's role and contribution to the economy in Saudi Arabia. Hence, the results signify that Vision 2030 attracts youth toward entrepreneurship in Saudi Arabia. The study results confirm that the students who have attended or participated in the entrepreneurial program significantly affect their self-efficacy and intention toward entrepreneurship. The above results are consistent with the studies like Liu et al. (2019), Usman (2019), Zovko, Dulcic, and Bilic (2020), Alrubaishi (2020), which supports the significant effect of the entrepreneurial program on students' self-efficacy and intention toward entrepreneurship. The study's results affirm Saudi universities' role in enhancing the students' self-efficacy and appeared as a major predictor of intention toward entrepreneurship (Valliere, 2015; Sondari, 2014).

Further, it is confirmed by the results that entrepreneurship education plays a significant role in establishing a remarkable association between Saudi students' attitudes toward entrepreneurship and entrepreneurial intentions, which signifies similar results in the study conducted by Wach and Wojciechowski (2016) on a group of students in Poland. The results support the finding of Gerba (2012), Maresch et al. (2016) and confirm that the students who completed any entrepreneurship educational program have a more significant influence on entrepreneurship intentions. However, subjective norms appeared weak in the results and have no relationship with entrepreneurial intentions. It has been observed that Saudi universities strengthened the students' self-reliance and positive attitude toward entrepreneurship and reduced the impact of social norms on entrepreneurial intentions. Results are in support of the studies of Carey et al. (2010), Miranda et al. (2017) and Zovko et al. (2020), who also confirmed an insignificant relationship between social norms and entrepreneurial intentions. Overall, the study's results inferred that Saudi universities effectively enhance the entrepreneurial intentions among Saudi students and significantly the approach towards the objectives of Vision 2030.

The results of the study proposed several implications for academia and policymakers. First, the research under discussion emphasises the significance of entrepreneurship education and how it affects entrepreneurial intentions in connection to self-efficacy, societal norms, and entrepreneurial attitude. Second, for policymakers, the study will be a valuable tool for identifying the determinant of entrepreneurial intention. Further, the present study signifies the mediating role of universities in developing young entrepreneurial minds in Saudi context, which helps universities to promote their entrepreneurial programs.

## **6. Limitations and scope of future research**

The small sample size and few factors utilised to predict entrepreneurial intentions are limitations of this study. Future studies can better predict students' entrepreneurial desires using a broader sample of Saudi universities. Additional empirical research is required to comprehend how entrepreneurship education can inspire students in other disciplines, such as corporate entrepreneurship or intrapreneurship. Furthermore, more investigation into the impact of digital academic entrepreneurship on students' entrepreneurial motivation and behaviour is necessary.

**Funding:** This research work was funded by the University of Jeddah, Jeddah, Saudi Arabia, under grant No. (UJ-22-DR-71). I acknowledge and thanks the University of Jeddah for its technical and financial support.

## References

- Ababtain, A., & Akinwale, Y. (2019). The role of entrepreneurship education and university environment on entrepreneurial interest of MBA students in Saudi Arabia. *Journal of Economics and Sustainable Development*, 10(4), 45-56. <https://www.iiste.org/Journals/index.php/JEDS/article/view/46506#:~:text=DOI%3A%2010.7176/JESD/10%2D4%2D05>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Alrubaishi, D. (2020). The Entrepreneurial Intention of University Students in Saudi Arabia. *International Journal of Management*, 11(9), 1494-1504. <https://doi.org/10.34218/IJM.11.9.2020.144>
- Badulescu, A & Badulescu, D. (2013). How Entrepreneurial are Doctoral Students? Some Evidence from Romania. *Journal of Eastern Europe Research in Business & Economics*, Article ID 186798. <https://doi.org/10.5171/2013.186798>
- Betáková, J., Havierníková, K., Okřeglická, M., Mynarzová, M., & Magda, R. (2020). The Role of Universities in Supporting Entrepreneurial Intentions of Students toward Sustainable Entrepreneurship. *Entrepreneurship and Sustainability Issues*, 8(1), 573-589. [http://doi.org/10.9770/jesi.2020.8.1\(40\)](http://doi.org/10.9770/jesi.2020.8.1(40))
- Bird, B.J. (1988) Implementing entrepreneurial ideas: The case for intentions. *Academy of Management Review*, 13(3). <https://doi.org/10.5465/amr.1988.4306970>
- Carey, T., Flanagan, D., & Palmer, T. (2010). An examination of university student entrepreneurial intentions by type of venture. *Journal of Developmental Entrepreneurship*, 15(4), 503-517. <https://doi.org/10.1142/S1084946710001622>
- Dahalan, N., Jaafar, M., & Rosdi, S. A. M. (2015). Attitude and entrepreneurial intention among rural community: the mediating role of entrepreneurial opportunity recognition. In SHS Web of Conferences (Vol. 18, p. 01005). <https://doi.org/10.1051/shsconf/20151801005>
- Elfving, J., Brännback, M., & Carsrud, A. (2009). Toward A Contextual Model of Entrepreneurial Intentions. In: Carsrud, A., Brännback, M. (eds) *Understanding the Entrepreneurial Mind*. International Studies in Entrepreneurship, vol 24. Springer, New York, NY. [https://doi.org/10.1007/978-1-4419-0443-0\\_2](https://doi.org/10.1007/978-1-4419-0443-0_2)
- Franke, N., & Lüthje, C. (2004). Entrepreneurial intentions of business students—A benchmarking study. *International Journal of Innovation and Technology Management*, 1(3), 269-288. <https://doi.org/10.1142/S0219877004000209>
- Gerba, D. T. (2012). Impact of entrepreneurship education on entrepreneurial intentions of business and engineering students in Ethiopia. *African Journal of Economic and Management Studies*, 3(2), 258-277. <https://doi.org/10.1108/20400701211265036>
- Hägg, G., & Kurczewska, A. (2021). Toward a learning philosophy based on experience in entrepreneurship education. *Entrepreneurship Education and Pedagogy*, 4(1), 4-29. <https://doi.org/10.1177/2515127419840607>
- Hmieleski, K.M., & Corbett, A.C. (2006). Proclivity for improvisation as a predictor of entrepreneurial intentions. *J. Small Bus. Manag.*, 44, 45-63. <https://doi.org/10.1111/j.1540-627X.2006.00153.x>
- Huber, L. R., Sloof, R., & Van Praag, M. (2014). The effect of early entrepreneurship education: Evidence from a field experiment. *European Economic Review*, 72, 76-97. <https://doi.org/10.1016/j.euroecorev.2014.09.002>
- Krueger, N.F., Reilly, M.D., & Carsrud, A.L. (2000). Competing models of entrepreneurial intentions. *J. Bis. Ventur.*, 15, 411-432. [https://doi.org/10.1016/S0883-9026\(98\)00033-0](https://doi.org/10.1016/S0883-9026(98)00033-0)
- KSA vision 2030: Strategic objectives and vision realisation programs. (2020). Retrieved from <https://www.vision2030.gov.sa/>

- Laspita, S., & Sarri, K. (2019). The Attitude of Greek Students towards Entrepreneurship: Latest Data and Recommendations. In European Conference on Innovation and Entrepreneurship (pp. 1259-XXV). Academic Conferences International Limited. <https://doi.org/10.34190/ECIE.19.269> <https://www.proquest.com/openview/f3c180037f4a92c7a165c86fe1892102/1?pq-origsite=gscholar&cbl=396494>
- Lee, S.M., Chang, D. & Lim, Sb. (2005). Impact of Entrepreneurship Education: A Comparative Study of the U.S. and Korea. *The International Entrepreneurship and Management Journal*, 1, 27-43. <https://doi.org/10.1007/s11365-005-6674-2>
- Liñán, F., Santos, F. J., & Fernández, J. (2011). The influence of perceptions on potential entrepreneurs. *International Entrepreneurship and Management Journal*, 7, 373-390. <https://doi.org/10.1007/s11365-011-0199-7>
- Liñán F, & Chen Y. (2009) Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship Theory and Practice*, 33(3), 593-617. <https://doi.org/10.1111/j.1540-6520.2009.00318>
- Liu, X., Lin, C., Zhao, G., & Zhao, D. (2019). Research on the effects of entrepreneurial education and entrepreneurial self-efficacy on college students' entrepreneurial intention. *Frontiers in Psychology*, 10, 869. <https://doi.org/10.3389/fpsyg.2019.00869>
- Marona, B. & Gluszek, M. (2014). The Ties that Bind? Real Estate Education in Europe and Regulatory Framework in Poland. *The New Educational Review*, 35(1), 187-201. <https://doi.org/10.15804/tner.14.35.1.15>
- Maresch, D., Harms, R., Kailer, N., & Wimmer-Wurm, B. (2016). The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business studies university programs. *Technological Forecasting & Social Change*, 104, 172-179. <https://doi.org/10.1016/j.techfore.2015.11.006>
- Miranda, F., Chamorro-Mera, A., & Rubio, S. (2017). Academic entrepreneurship in Spanish universities: An analysis of the determinants of entrepreneurial intention. *European Research on Management and Business Economics*, 23(2), 113-122. <https://doi.org/10.1016/j.iedeen.2017.01.001>
- Nazri, M. A., Aroosha, H., & Omar, N. A. (2016). Examination of Factors Affecting Youths Entrepreneurial Intention: A Cross-Sectional Study. *Information Management and Business Review*, 8(5), 14-24. <https://doi.org/10.22610/imbr.v8i5.1456>
- Rachwal, T., Kurek, S., & Bogus, M. (2016). Entrepreneurship education at secondary level in transition economies: A case of Poland. *Entrepreneurial Business and Economics Review*, 4(1), 61.
- Rive, J., Bonnet, M., Parmentier, C., Pelazzo-Plat, V., & Pignet-Fall, L. (2017). A contribution to the laying of foundations for dialogue between socially responsible management schools. *The International Journal of Management Education*, 15(2), Part B, 238-248. <https://doi.org/10.1016/j.ijme.2017.04.002>
- Shah, I.A., Amjed, S. & Jaboob, S. (2022). The moderating role of entrepreneurship education in shaping entrepreneurial intentions. *Economic Structures*, 9, 19. <https://doi.org/10.1186/s40008-020-00195-4>
- Shapero, A. & Sokol, L. (1982). *The Social Dimensions of Entrepreneurship*. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship, Available at SSRN: <https://ssrn.com/abstract=1497759>
- Sondari, M. C. (2014). Is entrepreneurship education really needed? Examining the antecedent of entrepreneurial career intention. *Procedia – Social and Behavioral Sciences*, (115), 44–53. <https://doi.org/10.1016/j.sbspro.2014.02.414>
- Usman, B. (2019) Understanding the entrepreneurial intention among international students in Turkey. *Journal of Global Entrepreneurship Research*, 10. <https://doi.org/10.1186/s40497-018-0136-0>
- Valliere, D. (2015). The comparative state of entrepreneurial intent in Cameroon. *Journal of Entrepreneurship in Emerging Economies*, 7(3), 241-255. <https://doi.org/10.1108/JEEE03-2015-0022>
- Wach, K. (2015). Impact of cultural and social norms on entrepreneurship in the EU: cross-country evidence based on GEM survey results. *Zarządzanie w Kulturze*, 16(1), 15-29.
- Wach, K., & Głodowska, A. (2019). The Role of University in the Development of Entrepreneurial Intentions of Younger Generations: Selected Models. *Fostering Entrepreneurial and Sales Competencies in Higher Education*, 45-63. <https://doi.org/10.12657/9788379862801-4>

- Wach, K., & Wojciechowski, L. (2016). Entrepreneurial Intentions of Students in Poland in the View of Ajzen's Theory of Planned Behaviour. *Entrepreneurial Business and Economics Review*, 4(1), 83-94. <https://doi.org/10.15678/EBER.2016.040106>
- Wang, Z., & Ortiz, G. G. R. (2022). Assessing the management student's entrepreneurial intentions: Role of entrepreneurship education and technology transfer. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.953324>
- Zhang, W., Wang, Y., Yang, L., & Wang, C. (2020). Suspending classes without stopping learning: China's education emergency management policy in the COVID-19 outbreak. *Journal of Risk and Financial Management*. 13(3), 55. <https://doi.org/10.3390/jrfm13030055>
- Zovko, L., Bilić, I., & Dulčić, Ž. (2020). Determinants of students' entrepreneurial intention: An empirical research. *Management: Journal of Contemporary Management Issues*, 25(1), 25-44. <https://doi.org/10.30924/mjcmi.25.1.2>

**Vikram JEET** is presently working as assistant professor at the University of Jeddah, College of Business, Department of Business Administration, Jeddah, Saudi Arabia. He earned his Ph.D. in business administration from IKG Punjab Technical University, Punjab, India. His research focuses on HRM, organisational commitment, employee behaviour, organisational performance and corporate social responsibility.

**ORCID ID:** <https://orcid.org/0000-0003-0647-3952>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



## CREATING AN INCLUSIVE AND DIVERSE WORKPLACE ENVIRONMENT: CURRENT REALITIES AND TRENDS FOR IMPROVEMENT

Kristina Samašonok <sup>1</sup>, Eimantas Kamienas <sup>2</sup>, Vilma Gegužienė <sup>3</sup>, Rūta Valentukevičiūtė <sup>4</sup>, Agnė Šimkienė <sup>5</sup>

<sup>1,2,3,4,5</sup> Vilniaus kolegija/Higher Education Institution, Saltoniškių Str. 58, Vilnius, Lithuania

E-mails: <sup>1\*</sup>[k.samasonok@vuf.viko.lt](mailto:k.samasonok@vuf.viko.lt) (Corresponding authors); <sup>2</sup>[e.kamienas@vuf.viko.lt](mailto:e.kamienas@vuf.viko.lt), <sup>3</sup>[v.geguziene@vuf.viko.lt](mailto:v.geguziene@vuf.viko.lt), <sup>4</sup>[r.valentukeviciute@vuf.viko.lt](mailto:r.valentukeviciute@vuf.viko.lt), <sup>5</sup>[a.simkiene@vuf.viko.lt](mailto:a.simkiene@vuf.viko.lt)

Received 15 February 2023; accepted 17 May 2023; published 30 June 2023

**Abstract.** Openness to different groups of people, including people of different social classes, ethnic groups, age, gender, disability, sexual orientation, political opinion, and their inclusion in society, as well as in the labour market, becomes of particular importance. This article concretises the following questions: how do we build an inclusive and diverse community in today's labour market? What are the opportunities for diversity processes and inclusion in today's labour market? Taking into account the importance of the equal inclusion of different groups in society in the context of the scientific literature, this study examines the situation of building an inclusive and diverse community in today's labour market, and identifies the possibilities for promoting diversity and inclusion in today's labour market. The survey covered 202 Lithuanian residents participating in the labour market. Analytical, descriptive, quantitative and statistical research methods were used. Using a quantitative research strategy, it identifies the situation of building an inclusive community in today's labour market, and identifies opportunities for realising an inclusive and diverse community in today's labour market. The results show that in most cases there is a positive view and attitude towards the diversity of employees/colleagues. Nevertheless, some of the participants in the study perceive the recognition of differences in the work environment as unnecessary. The study also revealed cases of being uncomfortable around, avoiding or even initiating bullying, or even gossiping unjustifiably, and refusing to help or work together with people of different age, gender, disability, nationality, religion, sexual orientation and other characteristics, as well as a lack of regular surveys of staff, discussions with supervisors or colleagues to improve the working environment with a focus on implementing inclusion and diversity, as well as organized trainings or seminars and mentoring programmes aimed at fostering positive attitudes towards employees of different ages, genders, working styles, disabilities, etc. as well as other colleagues having individual features. The results of the study will have a lasting value in the academic debate on the importance of equal inclusion of different groups in society in today's labour market, and their practical implications for identifying possible ways to shape society's openness to diversity and inclusion, ensuring equal opportunities for all groups, including people with disabilities, different ethnicities, sexual orientation, etc., to successfully integrate into the labour market and participate in it on equal terms and with equal opportunities.

**Keywords:** inclusion and diversity; labour market; an inclusive community

**Reference** to this paper should be made as follows: Samašonok, K., Kamienas, E., Gegužienė, V., Valentukevičiūtė, R., Šimkienė, A. 2023. Creating an inclusive and diverse workplace environment: current realities and trends for improvement. *Entrepreneurship and Sustainability Issues*, 10(4), 184-201. [http://doi.org/10.9770/jesi.2023.10.4\(12\)](http://doi.org/10.9770/jesi.2023.10.4(12))

**JEL Classifications:** M12

**Additional disciplines:** sociology, information and communication

## 1. Introduction

Today's society is concerned with the success of its members, their effective participation in social interactions and their self-fulfilment in the workplace, which is why the implementation of the principles of inclusiveness and diversity becomes of paramount importance. This has also been influenced by the social, political, value and legal changes that have taken place around the world over the last few decades, which have led to a shift in attitudes towards people with individual differences. The evolving approach to inclusion and diversity is reflected in the initiatives implemented, and in the legal documents, laws and resolutions adopted on an ongoing basis. With the principles of inclusion and diversity as one of the European Union's core values, and today's communities becoming increasingly diverse in many respects, there is a need for to increase orientation towards diversity and to build an inclusive and sustainable society in Europe. The European Commission has a number of initiatives to implement policies based on diversity and inclusion (*EU Platform of Diversity Charters by Country, the European Capitals of Inclusion and Diversity Award, the European Diversity Month*), and the principles of diversity and inclusion are being implemented at various levels through strategic documents such as the *European Union's Strategy for Gender Equality 2020-2025 and the Strategy on Disability Rights for 2021-2030*, The *2021-2027 "Erasmus+ programme* in partnership with SALTO's Education and Training Resource Centres for Inclusion and Diversity to remove barriers and increase opportunities in the areas of education, training and youth work. The United Nations Convention on the Rights of Persons with Disabilities (2006) should also be noted, as it stresses the need to protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities in society. The dominant paradigm of social integration in relation to the diversity of individuals has led to the development of inclusion and diversity policies, not only at the level of strategic EU institutions, but also at the level of various public sector organisations and private capital companies. The implementation of inclusion and diversity policies is underpinned by the European Court of Auditors' *Diversity and Inclusion Strategy 2021-2025, and the European Network of Agencies and Joint Undertakings' Inclusion and Diversity Report (2022)*, which brings together as many as 34 EU agencies. The high correlation of equality, diversity and inclusion with increased innovation, productivity and performance, talent recruitment and retention, and workforce well-being is supported by a report from the International Labour Organisation (*Transforming enterprises through diversity and inclusion, 2022*).

The increasing number of decrees and laws in the context of achieving the goals of building an inclusive and diverse community provides more and more opportunities to address many of the pressing issues in relation to the diversity of individuals. The examinations of the problems related to the implementation of the principles of inclusion and diversity in today's labour market is not an exception, when considering how to create conditions for the inclusion of all groups in the working environment, which make the physical space, the psychological atmosphere and the microclimate in the workplace suitable and adaptable for all groups and for employees with different characteristics, eliminating prejudice and discrimination in recruitment, professional development and career advancement. A number of research studies have confirmed the positive impact of inclusion and diversity on an organisation. According to Bourke et al. (2017) diversity affects all business dynamics, so companies and organisations need to take a stance and put it into practice that supports and embraces all individual personal differences. On the other hand, the recognition and non-discrimination of each employee leads to higher employee satisfaction, which is crucial for the effectiveness of the organisation and the successful implementation of the organisation's strategies (Croitoru, Florea et al., 2022), and as Tobbell, Burton, Gaynor, Golding, Greenhough, Rhodes and White (2021) point out, social inclusion also enables the experience of positive emotions at work. Panicker, Agrawal, Khandelwal (2018) found in their research that organisations with a supportive climate for inclusion, high quality inclusion practices and strong leadership commitment lead to high organisational citizenship behaviour (OCB).

However, it should be acknowledged that the modern labour market is facing challenges in terms of ensuring equality of treatment and inclusion of employees in the organisation (Panicker, Agrawal, Khandelwal, 2018;

Fujimoto and Uddin, 2020; Guillaume, Loufrani-Fedida, 2023). Therefore, the issue of inclusion and diversity remains relevant and prompts the analysis of inclusion and diversity processes in the labour market to look for a change in attitudes in today's labour market towards people working in organisations with differences such as, according to Torrico, Jiménez-Millán and Hinojosa-Pareja (2021), covering: different social classes, ethnic groups, different ages, genders, disabilities, educational backgrounds, religions.

Considering the importance of the equal inclusion of different groups of society in the labour market and the relevance of the topic, the research problem is defined by the following *questions*: how is an inclusive and diverse community being built in today's labour market? What are the opportunities for diversity processes and inclusion in today's labour market?

*The aim of the study* is to identify the situation of building an inclusive and diverse community in today's labour market and to identify the possibilities for the realisation of diversity processes and inclusion principles in today's labour market.

*Study objectives*:

1. To find out respondents' views on the state of inclusion and diversity in today's labour market.
2. To investigate and compare the indicators and differences in the attitudes towards building an inclusive and diverse community in today's labour market between those in management positions in the organisation and those in non-management positions.
3. To clarify and anticipate the preconditions for the realisation of diversity processes and inclusion principles in today's labour market.

The significance of this study lies in the development of an instrument based on theoretical arguments. It can be used to understand the situation of implementation of inclusion and diversity in an organisation and to identify the preconditions for the realisation of an inclusive community in today's labour market. In addition, the situation of creating and realising an inclusive and diverse community in today's labour market has been addressed in a comprehensive way, including the recognition and valuing of individual differences, creation of equal opportunities for employment, development and career advancement, as well as aspects of social, emotional and physical well-being at work. On the basis of the results of the study and based on the highlighted aspects, this can be easily extrapolated to other contexts for optimally anticipating the realisation of an inclusive and diverse community in today's labour market. The authors' research could be further developed in the future by applying methods of statistical comparative data analysis, qualitative research and forecasting methods, by examining in detail the problems of creating an inclusive and diverse community in today's labour market and by providing solutions.

## **2. Theoretical background**

In today's labour market, organisations and companies have a duty to represent the diversity of their workforce and to ensure the (self)creation of an inclusive community (Panicker, Agrawal, Khandelwal, 2018). It must be acknowledged that organisations are also encouraged to implement the principles of inclusion and diversity by the challenges of modern competition in the labour market, where, according to Croitoru, Florea et al. (2022), companies are encouraged to do whatever it takes to become and remain competitive, i.e., to gain competitive advantages, to motivate and thus engage all employees to maximize the company's performance (Pleasant, 2017, Gao et al., 2021). However, when considering the profiles of inclusive and diverse organisations, it is important to clarify the concepts of diversity and inclusion, which are often treated as indivisible phenomena, but which, according to the authors Jeronimo and Henriques (2022), cannot be considered equivalent or synonymous terms, since diversity focuses on the demographic, psychographic and social characteristics of the organisation, while

inclusion focuses mostly on removing barriers to diversity in the organisation by focusing on the achievement of shared and high-quality results. Diversity is more than just a person's gender or disability. This is also supported by authors Jeronimo and Henriques (2022), who argue that the growing need for an increasingly diverse workforce is not only due to the higher number of women in organisations, but also to the integration of minorities related to ethnicity, sexual orientation or religion, while Madera (2018) adds the additional dimension of social class and the personal skills available. As it can be seen, in modern organisations it is important to recognise the authenticity and uniqueness of employees, as diversity can be defined as the result of interactions between individuals with different identities living in the same social system (Mateescu, 2017) and Krithi and Pai (2021) define diversity in three levels: Primary dimension, highlighting race, ethnicity, gender, age, disability; Secondary dimension, highlighting religion, lifestyle, work, experience, economic status, culture, sexual orientation, marital status, political orientation, thinking style, geographic location, nationality, language, education; and Tertiary dimension, highlighting beliefs, assumptions, group norms, values, feelings. The latter levels reflect the diversity of people working in organisations and the breadth and depth of their labour market participation. This allows to suggest that it is not easy to manage diversity in an organisation, as it is not enough to adopt pragmatic business practices, but it is necessary to continuously develop them and to communicate within the organisation the diversity policy in the business (Croitoru, Florea et al., 2022), because diversity implementation is only successful if it correlates with the strategic goals and strategic guidelines of the organisation, if all employees feel a sense of inclusion, the phenomenon creates a close relationship with the team, the interests of employees are then taken into account, and individuals are integrated into the company (Madera et al, 2017; Ashikali, Groeneveld, Kuipers, 2021; Ferdman, 2017), even creating new business processes and linking them to the organisation's core objectives if necessary (Ferdman, 2017). At the same time, while Saqib and Khan (2022), acknowledge that modern organisations promote diversity and strive to create inclusive communities, they note that there is a lack of consensus on what makes an inclusive organisation, although it is stressed that the concept of an inclusive organisation cannot be standardised, as the authentic context in which each organisation operates is crucial. In this case, according to Shore and Chung (2021), the position of the leader is important in order to increase and improve the inclusive experience in the organisation, as the management and leadership style determines how the needs for engagement and uniqueness of the group members are fulfilled (Randel et al., 2018), by supporting the group members, their views, ensuring fairness, impartiality, shared decision-making and thus creating organisational norms (Ashikali, Groeneveld, Kuipers, 2021). Jeronimo, Henriques and Carvalho (2021) performed research that shows that inclusive leadership has a positive effect on employees' perceptions of inclusion (Lawson, Cruz, Knollman, 2017), which in turn has a positive effect on employees' perceptions of diversity. A leader must strive to build as diverse a team as possible, including different talents and balancing their different needs and dimensions of diversity; ethnically diverse teams experience a more inclusive climate, but this requires that leaders' management styles are as inclusive as possible (Shore et al., 2018; Ashikali, Groeneveld, Kuipers, 2021), and that employees are valued for the differences and the contribution they bring to the organisation (Ashikali, Groeneveld, Kuipers, 2021).

While diversity policies are generally positive, however authors Jeronimo and Henriques (2022) highlight the dual impact of organisational diversity - positive in terms of increased creativity, effective problem-solving, productivity, employee engagement and quality of results, but negative in terms of creating a negative environment that can lead to poor quality results, due to increased opportunities for interpersonal conflicts, declining social integration, rigidity in decision-making etc. The negative effects of organisational diversity, according to Bourke et al. (2017) and (Shore et al., 2018), may simply be due to the existence of a mismatch between a company's communication of its diversity policy and its actual practices, i.e., between the implementation and the results of the diversity policy, which in any case limits the potential for competitive advantage.

It is relevant to analyse and discuss the profile of inclusive working environments. Andrews and Ashworth (2014) argue that inclusivity, an inclusive climate, can be observed when the workplace is characterised by high diversity

(Saqib and Khan, 2022). This allows to suggest that the diversity of human capital is one of the factors that must be invested in and that conditions should be made for it being integrated, while the company uses the diversity of its workforce to achieve organisational results. This highlights the need for modern organisations to find ways of adapting existing and creating new conditions for people with individual differences. In support of this idea, Boehm et al. (2014) argue that HR inclusiveness guarantees an inclusive climate within the organisation. Bendick et al (2010) argue that inclusion is also fostered by fair policies and respect for diverse views. The problem of creating an enabling environment for inclusion is highlighted by the lack of understanding among employees of how each individual perceives inclusion and the conditions necessary for it (Saqib and Khan, 2022). This allows to suggest that successful inclusive workplaces require enabling the organisation's employees to understand what inclusion is and how they, with their individual differences, can contribute to and complement it through their presence and diversity, and thus enable the organisation to operate successfully in this context and in these conditions. According to Li et al. (2019), the view from the perspectives of both an organisation's management and its employees are crucial in analysing the importance of inclusion and the conditions and opportunities for it in the workplace. The role of the organisation's management is highlighted in the implementation of diversity and inclusion programmes, and according to Sparkman (2019), employees' attitudes become important in how they view the environment in which they work (Saqib and Khan, 2022). This suggests that while it is crucial to design and implement inclusive and diversity-friendly working conditions and workplaces, it is equally important to invest in human capital and its understanding of what is happening in the work environment, and how each employee can personally contribute with his or her individuality and potential. Similarly, organisations aiming to ensure equal inclusion and diversity of their workforce model conceptual frameworks for social entrepreneurial inclusion, which include the following normative themes: an organisational perspective to promote social equality, empowering relationships, a sense of inclusion, and organisational access to valuable resources (Fujimoto, Uddin, 2020). Scientific research also looks at the integration of socially vulnerable people into the labour market and inclusive employment management, where policies are promoted that favour an employability management system. The importance of managerial development and training in the recruitment of people with health problems is noted, however with the provisions for the potential for professional development of the recruited workers (Guillaume, Loufrani-Fedida, 2021).

### **3. Study methodology**

The following systematic logic was followed in organising the study: 1) analysis, evaluation and generalization of scientific and methodological literature close to the topic of the work, as well as of the results of the research conducted on the topic. This has helped to clarify aspects of building an inclusive and diverse community in today's labour market and to design the research instrument; 2) conducting a diagnostic study, which allowed to investigate the attitudes of the study participants towards the situation of building an inclusive community in the organisation, to identify the factors promoting the realisation of an inclusive community, and to envisage the possible ways of realising the equal inclusion of different groups of society in the current labour market. The method of questionnaire distribution used was an online survey; 3) formulation of conclusions based on the analysis of scientific literature and research data and provision of the possibilities of building an inclusive community in today's labour market.

*Study performance procedure.* A CAWI (Computer Assisted Web Interview) survey method was used, where the respondent is sent a link to a survey which he or she completes at his or her convenient time. The link created by the MS Forms survey software is unique, i.e., the questionnaire cannot be completed multiple times. Without prejudice to the protection of personal data, the survey link was sent to publicly accessible email addresses of private and public sector companies and organisations and, after consent was received to send the survey link by private email, to specific working persons. 500 invitations to take part in the survey were sent to different companies and organisations, and the reminder and the request for completion were repeated twice. The return rate for answers is 45% (the average return rate for online surveys is 44% (Wu, Zhao, Fils-Aime, 2022)) - 223

completed surveys were returned. The survey followed the principle of quality control, i.e., an internal review of the completion of the survey took place (completeness of the questionnaire filling, consistency and duration of the survey). Incomplete or inattentively filled questionnaires (e.g., the same numbers in all check points, etc.) were excluded from further data analysis. For further data analysis, 202 questionnaires were used, which are considered suitable for statistical analysis. The duration of the survey - two weeks. The results were processed using SPSS/PC software, presented in a summarised form, and confidentiality of the data was guaranteed.

*Sample of subjects.* The survey was carried out among the Lithuanian labour market participants (n=202), of whom more than two-thirds were women (n=139 (68.8%)) and less than one-third were men (n=57 (28.2%)), and 6 (3%) did not indicate their gender. The survey revealed that the majority of respondents are in the age groups of 36-45 (n=54 (25.7%)) and 46-55 (n=52 (25.7%)), with only a small minority of respondents aged under 21 and over 55 (n=8 (4%) and n=12 (5.9%) respectively). Analysis of the distribution of respondents by length work experience shows that a quarter of respondents have 10 years or more of experience in the organisation (n=51 (25.4%)), and a smaller proportion have up to a year (n=44 (21.9%)) and 2 to 5 years of experience in the organisation (n=43 (21.4%)). The analysis of the survey data also revealed that the majority of respondents work for a private sector organisation (n=142 (70.6%)), while only almost a third of the respondents are employees of public/municipal sector organisations (n=59 (29.4%)).

The survey was conducted using an electronic system, which is likely to have led to a more passive involvement of Lithuanian labour market participants, despite the efforts of the researchers. Therefore, this study is small in size and the results may not be fully representative of the population as a whole, and are more likely to be a pilot study version. However, the results of these types of studies can be reliable without being transformed outside the treatment group. However, in the perspective of further research, in order to be more representative, to formulate statistically significant conclusions with regard to the phenomenon under study, and to be able to draw conclusions about the general population from the results obtained, it would be advisable to go deeper into the subject by expanding the sample and controlling the selection of the subjects.

*Research methods. Analysis of scientific literature.* The scientific literature related to the topic is analysed, the results of research carried out in Lithuania and abroad are discussed and summarised. *Quantitative approach.* A quantitative research method (questionnaire survey) was used to assess the situation of the creation and realisation of an open and inclusive community in today's labour market. In the light of the phenomenon under study, the indicators that best reflect and measure the opinions of the participants in the study on the state of inclusion and diversity in today's labour market were identified. The questionnaire was constructed on the basis of theoretical findings, an analysis of the factors of inclusion and diversity identified in the scientific literature, and the identified components. In the view of most scientists Ashikali, Groeneveld, Kuipers, (2021), the *recognition and appreciation of each person regardless of their individual differences, a positive attitude towards the diversity of employees and fair and just treatment for the work they do*, are among the conditions for the inclusion of all groups of people in the work environment. Therefore, the questionnaire paid particular attention to the recognition of *individual differences (age, gender, disability, ethnicity, sexual orientation, political opinion, work style, etc.)*. The group of questions/statements on *equal opportunities for employment, professional development and career advancement* draws on the works of Chen and Tang (2018), which highlights the importance of *providing equal opportunities for professional development for all employees, regardless of their individual differences, eliminating prejudice and discrimination in both recruitment and professional development and career advancement*. According to Pleasant (2017), a *work environment that has conditions to be inclusive of all groups, and having an equitable work environment where both the physical spaces and the psychological atmosphere created are appropriate and adapted to the diversity of the workforce*, are some of the aspects of creating and realising an open and inclusive community in today's labour market. Based on this fact, a set of questions/statements *on social, emotional and physical well-being in the workplace* has been identified. Based on works by Jeronimo, Henriques, Carvalho (2021), the *role of education in building an inclusive community is of*

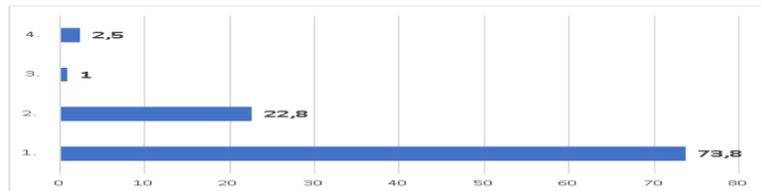
*particular importance and can be one of the ways in which society can develop positive attitudes towards the diversity of individuals.* Based on this provision, the questionnaire included a set of questions on **building an inclusive and diverse community**, the statements of which allowed to assess the state of *the training, workshops, mentoring programmes, regular surveys and discussions to assess the current situation.* Thus, the aspects identified in the scientific literature as some of the preconditions for the realisation of equal inclusion of different groups of society in today's labour market have led to the identification of key groups of questions/statements that are relevant for the assessment of the situation of an inclusive community in the labour market today. Based on the theoretical insights and criteria identified in the scientific literature, a questionnaire was constructed. The questionnaire consists of 4 groups of questions with 29 statements. After checking the internal consistency degree (*Cronbach's alpha*), the results of the statistical analysis of the data show that the overall degree of internal consistency of the statements (number of variables = 29) is high (*Cronbach's alpha* = 0.9682) and ranges from 0.9657 to 0.9709. The internal consistency of the variables was also tested separately for a question (16 statements) with five levels of response options, ranging from 1 "strongly disagree" to 5 "strongly agree". *Cronbach's alpha* values were calculated equal to 0.9722, ranging from 0.9706 to 0.9724. Based on the fact that internal consistency should be between 0 and 1 and a *Cronbach's alpha* of 0.60 is considered appropriate for research (Pakalniškienė, 2012), the *Cronbach's alphas* calculated in this study indicate that the groups of questions are consistent with each other, and that the variables included in the constructed questionnaire are reflective of the part being studied and are oriented to the same subject. *Statistical method.* Statistical analysis methods were used to process the data collected during the study: statistical means, Student's *t* criterion (to compare the means of two independent samples). Quantitative data analysis was also carried out by calculating the percentage distribution (frequency) and applying the Chi - Square ( $\chi^2$ ) test. The results are considered statistically significant when they meet the significance level *p*. Statistical analysis of the data was performed using SPSS/PC software version 17.

#### 4. Analysis of the study results

Globalisation has changed the structure of the world's workforce, both domestically and internationally, and this is leading to a reassessment and a different realisation of the processes of diversity and inclusiveness in the labour market, both nationally and globally. Given that the promotion of human diversity and the realisation of inclusion is becoming an integral feature of modern society, one of the key objectives of today's labour market is to be open to diverse groups of people, encompassing different social classes, ethnic groups, age, gender, disability, disability, sexual orientation and political opinion.

In order to explore the situation of creating and realising an open and inclusive community in today's labour market, the study first sought to find out the respondents' attitudes towards the diversity of the employees (colleagues) working in their organisation. The analysis of the data shows (see Figure 1) that the vast majority of the respondents, i.e., more than two-thirds of the respondents (73.8%), recognise and respect every employee/colleague regardless of their individual differences, such as their age, gender, disability, ethnicity, sexual orientation, political opinion, working style, job title or other characteristics. The latter result reflects the positive attitude of the participants towards the importance of inclusion for everyone. The results also revealed that a proportion (22.8%) of respondents identify the implementation of inclusion and diversity in the organisation with the success of the organisation, i.e., almost a quarter of the respondents' perception reveals that the recognition of every employee/colleague, regardless of their individual differences, is a key to the success of the organisation. Thus, some of the participants in the study associate the implementation of inclusion and diversity in the organisation with competitive advantage in the market and the creation of a positive image and reputation of the organisation in society, where the implementation of the principle of inclusion and diversity in the organisation is ensured without exception for all employees, regardless of gender, sexual orientation, age, disability, ethnicity, attitudes or beliefs and other individual differences.

On the other hand, the latter result reveals a still prevalent societal attitude, often associated with inclusive practices, where the latter are oriented towards the company's or organisation's own self-gain, through reputational improvement, diversity image building, etc. Only a small minority of respondents recognise that they have to work with colleagues regardless of their individual differences (2.5%), while 1% of respondents believe that it is unnecessary to recognise every employee/colleague in the organisation, regardless of their age, gender, disability, ethnicity, sexual orientation and other differences.



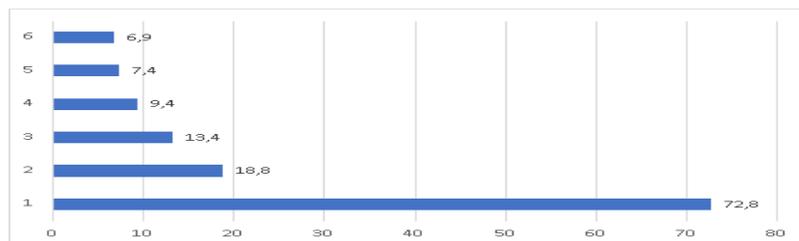
**Figure 1.** Survey participants' assessment of attitudes towards employee/colleague diversity (n=202; %)

*Note:*

- |   |   |
|---|---|
| <p>1. I recognise and respect every employee/colleague regardless of differences in age, gender, disability, ethnicity, sexual orientation, political opinion, working style, job title, etc.</p> <p>2. I understand that recognising each employee/colleague, regardless of their individual differences, is key to the success of the organisation.</p> | <p>3. Recognition of every employee/colleague in the organisation, regardless of differences in age, gender, disability, ethnicity, sexual orientation, political opinion, work style, job title, and other differences, is unnecessary.</p> <p>4. I am compelled to work with colleagues regardless of differences in age, gender, disability, ethnicity, sexual orientation, political opinion, work style, job title, etc.</p> |
|---|---|

The latter results are also supported by the fact (see Figure 2) that despite the fact that the vast majority, i.e., more than two thirds (72.8%) of the participants in the study usually observe colleagues' and managers' usual behaviour towards people of different age, gender, disability, nationality, religion, sexual orientation and other characteristics in the work environment, and (13.4%) of participants observe the wish and interest of their colleagues and managers to work with colleagues indiscriminately from their individual differences, however, there are also cases of being uncomfortable around colleagues (18.8%), avoidance (9.4%) or even initiating bullying or unjustified gossiping (7.4%), and refusal to help or work together (6.9%) in the work environment.

The recent results therefore confirm the need to look for opportunities to implement diversity processes and inclusion principles.



**Figure 2.** Assessment of colleagues' and managers' behaviour towards diversity (n=202; %)

*Note:*

- |  |  |
|--|--|
| <p>1. Normal behaviour</p> <p>2. Uncomfortable feeling while being around</p> <p>3. Willingness/interest in working together</p> | <p>4. Avoidance</p> <p>5. Initiating bullying or unfounded gossip</p> <p>6. Refusing to help/work together</p> |
|--|--|

In summary, the findings of the survey show that in most cases there is a positive view and attitude towards the differences between employees/colleagues. Nevertheless, some of the participants in the study perceive the recognition of differences in the work environment as unnecessary and, for subjective or objective reasons, are reluctant or unable to, or avoid, recognising diversity. Therefore, in order to ensure equal opportunities for all groups, including people with disabilities, ethnicity, sexual orientation, etc., to successfully integrate and participate in the labour market with equal rights and opportunities, it is necessary to find ways to develop a societal openness to the diversity of individuals and to the implementation of inclusion.

In order to build an inclusive and diverse community in today's labour market, and to ensure the successful realisation of inclusiveness, it is important to find out how individuals behave towards their colleagues in a way that takes into account their individual differences. Perhaps the most common aspects of diversity are gender, age, sexual orientation, ethnicity, external characteristics, religion, beliefs, health conditions, etc. These can be identified as characteristics that can lead to devaluation or discrimination. All of these can lead to poor wellbeing in the workplace, limiting and hindering creative potential and self-expression, reducing motivation, productivity and quality of work.

When looking at respondents' views on their behaviour towards colleagues, taking into account their individual differences, the analysis of the data in the overall sample revealed a majority of respondents with a positive attitude towards the diversity of colleagues, with more than two-thirds of the respondents describing their behaviour towards colleagues as normal, regardless of their individual differences (see Table 1), i.e., when assessing their behaviour in terms of political views, appearance, religion, gender, age, nationality, unusual style of dress, health status, the prevalence ranged from 73.8% to 55%, except for the assessment of their behaviour towards a colleague with HIV/AIDS, where more than two-thirds (66.3%) of the respondents indicated that they had no experience of working with such people.

**Table 1.** Evaluation of the behaviour of the participants towards the diversity of colleagues (n=202; %)

	I avoid communication	I feel uncomfortable being around	I refuse to help him / work together	I initiate bullying / unfounded gossip	I behave normally	I like working together	I have no such experience
Older colleague (55+ years)	1.5	2	0.5	0	65.8	22.8	6.9
Young colleague (up to 29 years)	0	0.5	0.5	0	60.9	35.6	1.5
Colleague of the opposite sex	0	1.5	0.5	0	61.4	31.2	4
Colleague with a physical or other disability	0	4	0.5	0.5	55.9	8.9	29.2
A colleague of a nationality other than mine	0	1	0.5	0	64.4	20.8	12.4
A colleague with a different faith from me	0.5	1	0	0	65.8	13.9	17.3
A colleague with different political views	4.5	2	0.5	1.5	73.8	9.9	6.9
Colleague with a different sexual orientation	0	3	0	0	55	13.4	27.7
A colleague with a different appearance (e.g., massive body tattoos, coloured hair, strange hairstyle, large number of earrings, etc.)	0	2	0	1	66.8	15.3	13.9
A colleague with an unusual style of dress (e.g., goth, etc.)	0	2.5	0	0.5	61.4	12.4	22.3
A colleague with HIV/AIDS	0.5	5.4	0	0.5	19.8	5	66.3

However, despite this rather positive tendency for employees to behave normally in the work environment, ignoring possible differences between colleagues, the study found some, albeit not significant, differences in behavioural expressions in terms of how differently they reacted to the differences between colleagues (see table 1). The age of employees is perhaps the most common aspect that still poses challenges in today's organisations, and the difference in age groups is identified as one of the key elements that can create difficulties in the work environment, which can be linked to: a) the retention and keeping at work of older workers, who are experienced and highly qualified, but who, because of their older age, often have difficulties integrating into modernised workplaces and are slower to accept and apply technological change in the work environment; b) the retention of the motivation of middle-aged workers; and c) the recruitment of younger workers who do not have enough work experience. This is confirmed by the data, where a statistically significant difference (Chi-Square ( $\chi^2$ ) test  $p=0.03$ ) suggests that younger participants in the study (aged 29 and under) tend to have a less positive attitude towards working with a colleague aged 55+, i.e., they tend to avoid socialising (5.6%) and feel uncomfortable around an older (55+ years of age) colleague (5.6%). This result confirms that promoting age diversity is one of the more important elements of the overall organisational climate and working atmosphere. On the other hand, the integration of people with disabilities into the labour market and the creation of adapted jobs for them are of particular importance for building inclusive communities. However, it should be acknowledged that the stereotypical perception that people with physical or mental disabilities are under-qualified, have health problems, and lack the necessary competences and work skills to perform certain activities is not changing as fast as we would like. In order to find out how the participants of the study perceive their behaviour towards a colleague with a disability, the data analysis revealed that although slightly more than half of the respondents (55.9%) perceived that they behave normally towards colleagues with disabilities, one third of the respondents (29.2% of respondents indicate that they have no experience of working with a colleague with a disability, and a small proportion (4%) of respondents say they feel uncomfortable around a colleague with a disability (see Table 1). These results highlight the need to change the attitudes of society, employers and employees towards people with disabilities, to create an open, safe and responsive working environment, and to enable people with disabilities to successfully integrate into the labour market. Despite the fact that gender roles are undergoing a clear transformation in both theoretical and practical terms, and that laws, regulations and workplace documents clearly define a non-discriminatory approach to gender, it should nevertheless be acknowledged that gender inequalities in the workplace are still a possible phenomenon, despite the measures taken. When examining the views of the participants on their behaviour towards colleagues of the opposite sex, the majority of respondents have a predominantly non-discriminatory attitude towards colleagues of the opposite sex. The survey found that two-thirds of both men and women reported that they behave normally when working with the opposite sex, and one-third of respondents reported that they like working with the opposite sex (see Table 1). Furthermore, the results of the survey revealed that both men and women had similar experiences of working with colleagues of a different sexual orientation, with only 1.5% of all respondents reporting that working with a colleague of a different sexual orientation made them feel uncomfortable, i.e. only a small proportion of the participants admitted to feeling uncomfortable when working with a colleague of a different sexual orientation, and 27.7% of the respondents admitted to not having had any experience of working with such people.

Recognising each individual, treating them fairly and justly and valuing their efforts, providing them with working conditions that are appropriate to their needs, capabilities and individual differences, and developing attitudes towards the diversity of workers are not in doubt. Creating an inclusive work environment can have a direct impact on employee motivation, work performance, can condition job satisfaction, strengthen commitment to the organisation's overall goals, increases loyalty, efficiency and productivity, and is an essential component of psychological well-being. Therefore, creating a level playing field for all employees without singling them out on the basis of individual differences, involving all employees in decision-making, and pursuing an inclusive strategy while maintaining the individual identity of the employee, are among the key directions in shaping and creating an inclusive work environment. On the other hand, inclusion and diversity are perceived as integral parts of an organisation's success in today's competitive labour market. Given the importance of inclusion and diversity in

today's labour market, it is therefore appropriate to look for ways to enable all groups of people to integrate successfully into the labour market, irrespective of their individual differences. It is therefore important to analyse: the extent to which the organisation makes efforts to involve all employees in common activities, taking into account their individual abilities and skills, and the competences they possess; whether employees' personal qualities are recognised and utilised in the working environment; whether all employees are encouraged to take part in the organisational processes, irrespective of individual differences; and whether the working environment and atmosphere are free from any negative prejudices against the diversity of employees, and is an environment where no member of the organisation is favoured or discriminated against.

In order to explore the possibilities of creating an inclusive and diverse community in the labour market, it is useful to analyse how the participants in the study perceive the situation of the employees in the organisation where they work, taking into account their individual differences. The average estimates found in the overall sample of participants in the survey showed (see Figure 3) that respondents perceived that the organisation recognises and respects every employee, regardless of their individual differences ( $M=4.41$ ). On the other hand, according to the respondents' assessment, the organisation has a climate free of negative prejudices towards diversity of employees ( $M=4.4$ ). Thus, the prevailing positive stance towards differences between workers is evident, without prejudice to the dignity of the individual, his or her rights and freedoms and equal opportunities. A mindset that focuses on the perception and recognition of the individual's abilities, the appreciation of the individual's efforts, and the opportunity to express opinions without prejudice and to act and make decisions independently, thus contributing to the achievement of the organisation's objectives, can be one of the preconditions for the realisation of inclusion. On the other hand, empirical results from other researchers suggest that employees who feel valued regardless of their individual differences are more loyal and committed to the organisation.

According to the Law on Equal Opportunities of the Republic of Lithuania (adopted in 2003 and updated in 2017), recruitment must be based on the same selection criteria for all people, provide equal opportunities for all employees to improve their qualifications and professional development, and provide equal opportunities for professional career development. It is recognised that an orientation towards empowering employees' personal growth and development, and providing opportunities to develop skills and abilities, are among the factors that increase employee satisfaction in their work activities. In order to find out the participants' perception of the professional development opportunities presented by their organisations regardless of individual differences, the participants' assessment showed that their organisation provides equal opportunities for professional development ( $M=4.39$ ) and hires people with the most relevant qualifications regardless of individual differences ( $M=4.35$ ). It is therefore clear that an organisation's inclusive and diverse policy is a prerequisite for attracting new employees whose qualifications and competences are relevant to the activities they perform. It also creates an image of the organisation as "desirable", which attracts talented professionals and improves the organisation's competitive advantage.

On the other hand, building an inclusive and diverse community requires taking into account the existence of different groups within it, recognising the individual characteristics of each member and acknowledging their differences. These groups may have specific needs or interests, so it is important to recognise them and be able to meet them through facilitating working conditions, tools, measures, etc. However, the relatively low estimate score ( $M=3.76$ ) based on the respondents' assessment indicates that there is a lack of a workplace that is tailored to the different needs and abilities of employees. Meanwhile, the importance of creating a working environment, adapting physical spaces and aids, and facilitating the interests, needs and individual characteristics of different groups of people in order to achieve inclusion was identified by most researchers.

The slightly lower estimate scores also indicate that the survey participants do not feel that the creation and building of an inclusive and diverse community is sufficiently implemented in their organisation. According to

the survey data, it can be seen that there is a lack of effort geared and attention paid towards organizing trainings, seminars and using mentorship programs, oriented at forming a positive attitude of employees towards colleagues of different sex, work style, disability and other individual specifics (M=3.41). The low estimate scores also suggest that organisations lack regular employee surveys, discussions with managers or colleagues to improve the work environment oriented towards achieving inclusion and diversity (M=3.32). These results suggest that the lack of information on the individual differences and needs of different groups may be one of the obstacles to the development and implementation of employee inclusion in the labour market. The results also revealed the importance of regular surveys to build an inclusive and diverse community in today's labour market, for example through reliable and valid methodologies for measuring and evaluating inclusion.



**Figure 3.** Assessment of the situation of employees in the organisation, taking into account their individual differences (n=202, average values, max=5)

- |   |  |
|---|--|
| <p>1. Every employee is recognised and respected, regardless of their individual differences</p> <p>2. An environment is created free from negative prejudices against diversity</p> <p>3. Fair and equitable recognition is granted to all employees for the work they do, regardless of their individual differences</p> <p>4. Equal opportunities are made for all people to apply for a job, regardless of their individual differences</p> <p>5. Employees with the most appropriate qualifications are recruited, regardless of their individual differences</p> <p>6. All employees are given equal opportunities for professional development, regardless of their individual differences</p> <p>7. All employees have the same career opportunities</p> <p>8. Action is taken against and preventive measures are in place to combat cases of discrimination and abuse based on age, gender, disability, ethnicity, sexual orientation, political opinion, values, work style, job title, etc.</p> | <p>9. Equal rights (workload, working conditions, etc.) are guaranteed for all employees, regardless of their individual differences</p> <p>10. Jobs are designed around the different needs and capabilities of workers</p> <p>11. Training, seminars, mentoring programmes to promote positive employee attitudes towards colleagues of different age, gender, disability, ethnicity, sexual orientation, political opinion, values, work style, job title, and other colleagues are performed.</p> <p>12. Employees are helped to overcome professional difficulties (in acquiring the skills and knowledge they lack) regardless of their individual differences</p> <p>13. The organisation provides opportunities for employees to express their views, suggestions and ideas freely and openly on matters relating to the organisation's activities and responds to them regardless of individual differences between employees</p> <p>14. An equitable working environment is created in which each employee does not feel superior or inferior to others, regardless of their individual differences</p> <p>15. Regular employee surveys, discussions with managers or colleagues, etc. to improve the working environment (microclimate) are being held</p> <p>16. Informal communication and communality are encouraged</p> |
|---|--|

After generalizing the collected data, we can observe a clear trend with the highest average estimate scores awarded for the factors associated with personal recognition, creating an environment free from preliminary negative bias towards employee differences, fair recognition of employees' efforts, and equal opportunities created for professional development for all employees, regardless of their individual differences. Meanwhile, according to the assessment of the survey participants, the following aspects of building an inclusive and diverse community in the organisation were identified as areas intended for improvement: lack of training, seminars, mentoring programmes to encourage employees to develop a positive attitude towards diversity, as well as a lack of surveys and discussions on the topic of inclusiveness and diversity. On the other hand, participants acknowledge that the different needs and abilities of workers are not always taken into account when designing the workplace. There is no doubt that the factors identified above make it difficult to implement an inclusive community in an organisation. Therefore, the importance of training and seminars to educate members of the community about diversity and its manifestations, to provide them with knowledge about individual differences and to build practical skills, in order to build a more successful relationship with people with individual specifics and to create preconditions for an inclusive environment that is more open to diversity in the organisation, is highlighted in the context of the creation of an inclusive and diverse community in the current labour market. In addition, identifying and addressing the problems associated with negative diversity attitudes, monitoring employees and regularly conducting surveys and discussions to identify negative trends are likely to not only guarantee inclusion and diversity, but also ensure an inclusive environment for everyone, it would also make it possible to achieve the organisation's or company's objectives more effectively, to anticipate the specific steps that should be taken in the future to build an inclusive and diverse community in today's labour market, and to design, modify and develop the organisation's processes, contributing to change at both the organisational and the social levels.

Considering that the realisation of an inclusive and diverse community in today's labour market depends to a large extent on the manager's views, attitudes, values and beliefs, as well as on the actions and efforts taken to implement diversity processes and inclusion principles in the organisation, this study aimed to investigate the differences in the attitudes of managerial and non-managerial respondents in their perception of the situation of employees in the organisation, taking into account their individual differences.

Using *Student's t* criteria, statistically significant differences in average assessments were found in the group statements regarding the evaluation of equal employment opportunities, opportunities to develop and to climb corporate ladder (see Table 2). The study results showed that the group of participants in managerial positions had presented significantly higher average assessment scores for equal opportunities to apply for a job ( $M=4.41$ ,  $SD=0.72$ ) and to take part in professional development ( $M=4.56$ ,  $SD=0.74$ ) for all individuals, regardless of their individual differences, compared to the non-managerial group ( $M=4.1$ ,  $SD=1.02$  and  $M=4.28$ ,  $SD=0.98$  respectively). The calculation of the *t-test* also revealed significantly higher estimates for the perception of those in managerial positions that the most qualified employees are hired regardless of their individual differences ( $M=4.5$ ,  $SD=0.68$ ) and that all employees are given the same career opportunities ( $M=4.48$ ,  $SD=0.83$ ), compared to the assessments of the non-managerial participants, who had significantly lower scores ( $M=4.25$ ,  $SD=0.89$  and  $M=4.04$ ,  $SD=1.09$ , respectively), which suggests that the latter assess the situation of their employees/colleagues in the organisation where they work, taking into account their individual differences such as age, gender, disability, ethnicity, sexual orientation etc., see instances of prejudice against individuals in relation to their differences when assessing situations of recruitment and career opportunities within the organisation. On the other hand, the statistically significant differences in the average responses recorded in the survey (see Table 2) show that respondents in managerial positions, in terms of their perception of the treatment of people with differences in the work environment, acknowledge that employees are helped to overcome professional difficulties (in acquiring the skills and knowledge they lack), regardless of their individual differences ( $M=4.28$ ,  $SD=0.98$ ) and that their organisation provides opportunities for employees to freely and openly express their opinions, suggestions and ideas on issues related to the organisation's activities, and responds to them irrespective of their

individual differences (M=4.31, SD=0.86), compared to the assessments of the non-managerial participants in the study, whose significantly lower indicators (M=3.92, SD=1.14 and M=4.0, SD=1.14, respectively) indicate the latter's perceived bias towards differences between employees in terms of the situations of assistance provided to help them overcome their professional difficulties and the opportunities provided to freely and openly express their opinions or make suggestions on issues of ongoing activities, despite individual differences. These results confirm other studies showing the importance of the role of the manager in contributing to the realisation of openness to and inclusion of diverse groups of people in the labour market processes, including different social classes, ethnic groups, age, gender, disability, disability, sexual orientation and political opinion. When analysing the situational assessment indicators for the treatment of employees with differences (age, gender, disability, ethnicity, sexual orientation, etc.) within the organisation, no statistically significant differences ( $p > 0.05$ ) were found in relation to other aspects (see Table 2). The statistically insignificant differences in the averages indicate that, in these respects, employees' situations in the organisation are assessed at a similar level, regardless of their individual differences in terms of job position.

**Table 2.** Average indicators of assessments (M), standard deviations (SD) and difference significance level (p) of the differences in the situation of employees in relation to their individual differences (age, gender, disability, ethnicity, sexual orientation, etc.) between respondents in managerial (n=78) and non-managerial (n=124) groups

Statements	Group of respondents in managerial positions		Group of respondents in non-managerial positions		t	p
	M	SD	M	SD		
Every employee is recognised and respected, regardless of their individual differences	4.47	0.79	4.37	0.81	0.83	0.408
An environment is created free from negative prejudices against diversity	4.47	0.8	4.36	0.86	0.893	0.373
Fair and equitable recognition is granted to all employees for the work they do, regardless of their individual differences	4.37	0.87	4.15	0.96	1.624	0.106
Equal opportunities are made for all people to apply for a job, regardless of their individual differences	4.41	0.72	4.1	1.02	2.293	<b>0.023</b>
Employees with the most appropriate qualifications are recruited, regardless of their individual differences	4.5	0.68	4.25	0.89	2.064	<b>0.04</b>
All employees are given equal opportunities for professional development, regardless of their individual differences	4.56	0.74	4.28	0.98	2.124	<b>0.035</b>
All employees have the same career opportunities	4.48	0.83	4.04	1.09	2.96	<b>0.003</b>
Action is taken against and preventive measures are in place to combat cases of discrimination and abuse based on age, gender, disability, ethnicity, sexual orientation, political opinion, values, work style, job title, etc.	4.06	1.15	3.95	1.2	0.587	0.558
Equal rights (workload, working conditions, etc.) are guaranteed for all employees, regardless of their individual differences	4.36	0.9	4.12	1.14	1.558	0.121
Jobs are designed around the different needs and capabilities of workers	3.94	1.04	3.64	1.25	1.647	0.101
Training, seminars, mentoring programmes to promote positive employee attitudes towards colleagues of different age, gender, disability, ethnicity, sexual orientation, political opinion, values, work style, job title, and other colleagues are performed.	3.61	1.48	3.28	1.58	1.364	0.174
Employees are helped to overcome professional difficulties (in acquiring the skills and knowledge they lack) regardless of their individual differences	4.28	0.98	3.92	1.14	2.198	<b>0.029</b>
The organisation provides opportunities for employees to express their views, suggestions and ideas freely and	4.31	0.86	4.0	1.14	2.053	<b>0.041</b>

openly on matters relating to the organisation's activities and responds to them regardless of individual differences between employees						
An equitable working environment is created in which each employee does not feel superior or inferior to others, regardless of their individual differences	4.24	0.92	4.03	1.05	1.382	0.168
Regular employee surveys, discussions with managers or colleagues, etc. to improve the working environment (microclimate) are being held	3.39	1.47	3.27	1.38	0.533	0.595
Informal communication and the feel of communality are encouraged	4.08	1.05	3.91	1.22	0.966	0.335

In summary, the results show that the group of participants in management positions provides higher scores in the assessment of the treatment of employees with differences in the organisation in situations where they have equal opportunities for employment, development and career advancement, this group also provides higher average scores than the non-managerial employees in the field of recognition and appreciation of individual differences in the work environment, whose group has showed significantly lower indicators, showing that they perceive cases of bias towards diversity of employees in their organizations.

**Conclusions**

1. The study explores the situation of inclusion and diversity in today's labour market:

1.1. the results of the study showed a predominantly positive stance towards employee/colleague diversity. More than two-thirds of respondents recognise and respect every employee/colleague regardless of their individual differences, and in the work environment, colleagues and managers are most likely to observe colleagues' and managers' normal behaviour or even willingness and interest in working with people of different age, gender, disability, nationality, religion, sexual orientation and other specifics, while almost a quarter of respondents equate the implementation of inclusiveness and diversity in the organisation with the success of the organisation. However, some of the participants in the study acknowledge that they have to force colleagues to work together regardless of their individual differences, and see the recognition of every employee/colleague in the organisation regardless of their age, gender, disability, ethnicity, sexual orientation and other differences as unnecessary. The study also revealed cases of being uncomfortable around, avoiding or even initiating bullying or unjustified gossip, and refusing to help or work together with people of different age, gender, disability, nationality, religion, sexual orientation and other characteristics.

1.2. recorded highest estimate averages show, that the organizations also recognise and respect every employee, regardless of individual differences, and create a climate free from prejudice against differences between employees, as well as provides equal opportunities for professional development and recruiting the most qualified people, regardless of individual differences. However, the low average estimate averages identified highlighted areas for improvement: there is a lack of regular employee surveys, discussions with managers or colleagues to improve the working environment for inclusiveness and diversity, and little focus on training or seminars and mentoring programmes aimed at building positive attitudes towards colleagues of different age, sex, working styles, disabilities and other individual differences.

2. The completion of a comparative statistical analysis of the data showed that participants in management positions had given higher scores for the treatment of employees with differences in the organisation, in terms of equal opportunities for employment, development and career progression, as well as the recognition and appreciation of individual differences in the work environment, than the non-managerial participants in the study, whose given lower scores reflect the latter's perceived cases of bias towards diversity of the employees.

3. Training and seminars to promote positive attitudes towards people of different age, gender, disability, ethnicity, sexual orientation, political opinion or other individual differences, regular surveys and discussions on inclusion and diversity are likely to create positive attitudes towards the diversity of persons, and would likely help to ensure the smooth application and implementation of the principles of inclusion and diversity in all activities and areas related to the functions of the organisation.

## References

- Andrews, R., & Ashworth, R. (2014). Representation and Inclusion in Public Organizations: Evidence from the U.K. Civil Service. *Public Administration Review*, 75(2), 279-288. <https://doi.org/10.1111/puar.12308>
- Ashikali, T., Groeneveld, S., & Kuipers, B. (2021). The Role of Inclusive Leadership in Supporting an Inclusive Climate in Diverse Public Sector Teams. *Review of Public Personnel Administration*, 41(3), 497-519. <http://doi.org/10.1177/0734371X19899722>
- Bendick, Jr., M. et al. (2010). Employment Discrimination in Upscale Restaurants: Evidence from Paired Comparison Testing. *Social Science Journal*, 47, 802-18. <http://dx.doi.org/10.1016/j.soscij.2010.04.001>
- Boehm, S. (2014). Spotlight on Age-Diversity Climate: The Impact of Age-Inclusive HR Practices on Firm-Level Outcomes. *Personnel Psychology*, 67(3). <https://onlinelibrary.wiley.com/doi/10.1111/peps.12047>
- Bourke, J., Garr, S., Berkel, A., & Wong, J. (2017). *Diversity and Inclusion: the Reality Gap. Global Human Capital Trends*. Deloitte University Press.
- Chen, C., & Tang, N. (2018). Does Perceived Inclusion Matter in the Workplace?. *Journal of Managerial Psychology*, 33(1), 43-57. <http://doi.org/10.1108/JMP-02-2017-0078>
- Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions A Union of Equality: Gender Equality Strategy 2020-2025*. COM/2020/152 final. Available at: [EUR-Lex - 52020DC0152 - EN - EUR-Lex \(europa.eu\)](EUR-Lex - 52020DC0152 - EN - EUR-Lex (europa.eu))
- Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions Union Of Equality: Strategy For The Rights Of Persons With Disabilities 2021-2030*. Available at: <Union of Equality: Strategy for the Rights of Persons with Disabilities 2021-2030>
- Croitoru, G., Florea, N.V., Ionescu, C.A., Robescu, V.O., Paschia, L., Uzla, M., & Manea, M.D. (2022). Diversity in the Workplace for Sustainable Company Development. *Sustainability*, 14(11), 6728. <https://doi.org/10.3390/su14116728>
- Diversity and Inclusion* (2022). Network of EU Agencies and Joint Undertakings. Available at: [euan\\_di\\_2022.pdf \(euagencies.eu\)](euan_di_2022.pdf (euagencies.eu))
- Diversity and Inclusion Strategy 2021-2025* (2021). Australian Competition and Consumer Commission. Available at: <ACCC and AER Diversity and inclusion strategy 2021-2025 Inclusion Strategy 2021-2025>
- Erasmus+ Programme Guide*. In the case of conflicting meanings between language versions, the English version prevails. Available at: [2022-erasmusplus-programme-guide.pdf \(europa.eu\)](2022-erasmusplus-programme-guide.pdf (europa.eu))
- Gao, W., Wang, L., Yan, J., Wu, Y., & Musse, S. (2021). Fostering Workplace Innovation through CSR and Authentic Leadership: Evidence from SME Sector. *Sustainability*, 13, 5388. <https://doi.org/10.3390/su13105388>
- Guillaume, M., & Loufrani-Fedida, S. (2023). Stakeholder engagement in inclusive employability management for employees whose health at work is impaired: empirical evidence from a French public organisation. *Personnel Review*, 52(1), 121-144. <http://doi.org/10.1108/PR-06-2021-0404>
- Ferdman, B.M. (2017). Paradoxes of Inclusion: Understanding and Managing the Tensions of Diversity and Multiculturalism. *The Journal of Applied Behavioral Science*, 53(2), 235-263. <http://doi.org/10.1177/0021886317702608>
- Fujimoto, Y., & Uddin, M. J. (2020). Poor-inclusive workplace model: A Relational Perspective. *Equality, Diversity and Inclusion: An International Journal*, 39(8), 881-900. <http://doi.org/10.1108/EDI-11-2019-0267>

- Jeronimo, H.M., Henriques, P.L., & Carvalho, S.I. (2021). Being Inclusive Boosts Impact of Diversity Practices on Employee Engagement. *Management Research: Journal of the Iberoamerican Academy of Management*, 20(2), 129-147. <http://doi.org/10.1108/MRJIAM-05-2021-1175>
- Jeronimo, H.M., & Henriques, P.L. (2022). Being Inclusive Boosts Impact of Diversity Practices on Employee Engagement. *Management Research: Journal of the Iberoamerican Academy of Management*, 20(2), 129-147. <http://doi.org/10.1108/MRJIAM-05-2021-1175>
- The United Nations Convention on the Rights of Persons with Disabilities* (2006). Available at: <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.335882>
- Krithi, & Pai, R. (2021). A Review on Diversity and Inclusion in the Workforce for Organizational Competitiveness. *International Journal of Creative Research Thoughts (IJCRT)*, 9 (7), 159-171.
- Lawson, J.E., Cruz, R.A., & Knollman, G.A. (2017). Increasing Positive Attitudes Toward Individuals with Disabilities Through Community Service Learning. *Research in Developmental Disabilities*, 69, 1-7. <http://doi.org/10.1016/j.ridd.2017.07.013>
- Li, J.Y., Sun, R., Tao, W., & Lee, Y. (2021). Employee coping with organizational change in the face of a pandemic: The role of transparent internal communication. *Public Relations Review*, 47. <https://doi.org/10.1016/j.pubrev.2020.101984>
- Madera, J.M., Dawson, M., & Neal, J.A. (2017). Managers' Psychological Diversity Climate and Fairness: the Utility and Importance of Diversity Management in the Hospitality Industry. *Diversity and Employee Engagement. Journal of Human Resources in Hospitality and Tourism*, 16(3), 288-307. <http://doi.org/10.1080/15332845.2017.1253442>
- Madera, J.M. (2018). What's in it for me? Perspective taking as an intervention for improving attitudes toward diversity management. *Cornell Hospitality Quarterly*, 59(2), 100-111. <http://doi.org/10.1177/1938965517730319>
- Mateescu, V. M. (2017). Cultural Diversity In The Workplace - Discourse And Perspectives. *On-line Journal Modelling the New Europe*, 24, 23-35. <https://doi.org/10.24193/OJMNE.2017.24.02>
- Pakalniškienė, V. (2012). Tyrimo ir įvertinimo priemonių patikimumo ir validumo nustatymas. Metodinė priemonė (Determining the reliability and validity of research and evaluation tools. Methodological tool). Vilnius: Vilniaus Universiteto leidykla.
- Panicker, A., Agrawal, R. K., & Khandelwal, U. (2018). Inclusive workplace and organizational citizenship behavior. Equality, Diversity and Inclusion: *An International Journal*, 37(6), 530-550. <http://doi.org/10.1108/EDI-03-2017-0054>
- Pleasant, S. (2017). Crossing the Boundaries of Employee Engagement and Workplace Diversity and Inclusion: Moving HRD forward in a Complicated Socio-Political Climate. *New Horizons in Adult Education and Human Resource Development*, 29(3), 38-44. <http://doi.org/10.1002/nha3.20191>
- Randel, A., Galvin, B., Shore, L. M., Chung, B., Ehrhart, K. H., Dean, M., & Kedharnath, U. (2018). Inclusive Leadership: Realizing Positive Outcomes Through a Focus on Belongingness and Being Valued for Uniqueness. *Human Resource Management Review*, 28(2), 190-203. <http://doi.org/10.1016/j.hrmr.2017.07.002>
- Saqib, Z., & Khan, M. (2022), Striving for Inclusion of Diverse Employees: How Important is the Context? *South Asian Journal of Human Resources Management*, 1-23. <http://doi.org/10.1177/23220937221083813>
- Shore, L. M., Cleveland, J.N., & Sanchez, D. (2018). Inclusive Workplaces: a Review and Model. *Human Resource Management*, 28(1), 176-189. <http://doi.org/10.1016/j.hrmr.2017.07.003>
- Shore, L.M., & Chung, B.G. (2021), Inclusive Leadership: How Leaders Sustain or Discourage Work Group Inclusion. *Group & Organization Management*, 47(4), 723-754. <http://doi.org/10.1177/1059601121999580>
- Sparkman, T.E. (2019). Exploring the Boundaries of Diversity and Inclusion in Human Resource Development. *Human Resource Development Review*, 18(2) 173-195. <https://doi.org/10.1177/1534484319837030>
- Transforming Enterprises Through Diversity and Inclusion* (2022). International Labour Organization. [https://www.ilo.org/actemp/publications/WCMS\\_841348/lang--en/index.htm](https://www.ilo.org/actemp/publications/WCMS_841348/lang--en/index.htm)
- Tobbell, J., Burton, R., Gaynor, A., Golding, B., Greenhough, K., Rhodes, Ch., & White, St. (2021) Inclusion in higher education: an exploration of the subjective experiences of students. *Journal of Further and Higher Education*, 45(2), 284-295. <http://doi.org/10.1080/0309877X.2020.1753180>

Torrico, M.G.C., Jiménez-Millán, A., & Hinojosa-Pareja, E.F. (2021). We're New to this. Diversity agendas in public Spanish universities according to their leaders. *The Social Science Journal*, <http://doi.org/10.1080/03623319.2020.1859818>

Wu, M.-J., Zhao K., & Fils-Aime, F. (2022). Response rates of online surveys in published research: A meta-analysis. *Computers in Human Behavior Reports*, 7, 100206. <https://doi.org/10.1016/j.chbr.2022.100206>

**Funding:** This research was funded by Vilnius University of Applied Sciences, Lithuania

**Data Availability Statement:** More information can be obtained from the authors on a reasonable request.

**Author Contributions:** Conceptualisation: Samašonok, K., Kamienas, E., Gegužienė, V., Valentukevičiūtė, R., Šimkienė, A., methodology: Samašonok, K., Kamienas, E., Gegužienė, V., Valentukevičiūtė, R., Šimkienė, A., data analysis: Samašonok, K., Gegužienė, V., writing—original draft preparation: Samašonok, K., Kamienas, E., Gegužienė, V., Valentukevičiūtė, R., Šimkienė, A., writing; review and editing: Samašonok, K., Kamienas, E., Gegužienė, V., Valentukevičiūtė, R., Šimkienė, A., visualisation: Samašonok, K., Kamienas, E., Gegužienė, V., Valentukevičiūtė, R., Šimkienė, A. All authors have read and agreed to the published version of the manuscript.

**Kristina SAMAŠONOK**, Doctor of Social Sciences (Educology), Docent of the Faculty of Business Management of Vilniaus kolegija, Higher Education Institution, Didlaukio Str., 49, Vilnius, e-mail: administracija[eta]vfv.viko.lt; research interest areas: social exclusion risk for adolescence adaptation, institutional development and adaptive behaviour modelling, the first year students' adaptation to the study process, motivation factors for choosing studies, developing students' creative thinking in a higher school. ORCID ID: <https://orcid.org/0000-0002-8985-6942>

**Eimantas KAMIENAS**, Lecturer of Social Sciences (Business Management), Lecturer of the Faculty of Business Management of Vilniaus kolegija, Higher Education Institution, Didlaukio Str., 49, Vilnius, e-mail: administracija[eta]vfv.viko.lt; research interest areas: business management, business simulation, business process management, study process, creativity in the studies, etc. ORCID ID: <https://orcid.org/0000-0002-0676-6053>

**Vilma GEGUŽIENĖ**, Lecturer of the Faculty of Business Management of Vilnius University of Applied Sciences, Didlaukio Str., 49, Vilnius, e-mail: administracija[eta]vfv.viko.lt; research interest areas: sociology of education, research methodology, public speaking theory and practice, development of creative thinking in higher education. ORCID ID: <https://orcid.org/0000-0002-9568-020X>

**Rūta VALENTUKEVIČIŪTĖ**, Lecturer of Social Sciences (Business Management), Lecturer of the Faculty of Business Management of Vilniaus kolegija, Higher Education Institution, Didlaukio Str., 49, Vilnius, e-mail: administracija[eta]vfv.viko.lt; research interest areas: public speaking theory and practice, personal expression, organizational behavior, study process, creativity in the studies, etc. ORCID ID: <https://orcid.org/0009-0004-0331-2859>

**Agnė ŠIMKIENĖ**, Doctor of Social Sciences (Educology), Docent of the Faculty of Business Management of Vilniaus kolegija, Higher Education Institution, Didlaukio Str., 49, Vilnius, e-mail: administracija[eta]vfv.viko.lt.; research interest areas: inclusive, multicultural education in higher and general education school, acquisition and development of general and subject competencies, formation of identity in adolescence. ORCID ID: <https://orcid.org/0000-0001-9732-8616>



**Publisher**

<http://jssidoi.org/esc/home>



---

## SUSTAINABLE AND TRANSPARENT PURCHASING IN THE AUTOMOTIVE INDUSTRY\*

Sebastian Bunzendahl <sup>1\*</sup>, Jan Papula <sup>2</sup>

<sup>1,2</sup>Comenius University in Bratislava, Faculty of Management, Department of Strategy and Entrepreneurship, Odbojarov 10, 011 07 Bratislava, Slovakia

E-mails: <sup>1\*</sup> [bunzendahl1@uniba.sk](mailto:bunzendahl1@uniba.sk) (Corresponding author), <sup>2</sup> [jan.papula@uniba.sk](mailto:jan.papula@uniba.sk)

Received 14 February 2023; accepted 22 May 2023; published 30 June 2023

**Abstract.** Sustainable purchasing in the automotive industry is present as never before. The Supply Chain Act in Germany and the European Green Deal (EGD) are legal incentives to focus on sustainability across industries. The automotive industry is large and important in Europe, which implements new purchasing channels through the supply chains. Suppliers are usually Small and medium-sized enterprises (SMEs), which account for 99% of the European economy (Europäische Kommission, 2003). Original Equipment Manufacturers (OEMs) have already passed on their climate neutrality targets to suppliers and called for worldwide engagement throughout the supply chain. In addition to the necessary emission reductions in the individual parts of the value chain, there are growing demands for a product footprint to show the CO<sub>2</sub> emissions for the supplied parts. The CO<sub>2</sub> emissions should be systematically reduced. This study shows how transparency in purchasing can be created and how this transparency can be used to impact sustainable purchasing. This study continues different studies chronologically from 2016 until March 2022. The results are confirmed by ten expert interviews with specialists in the automotive industry. The focus is on digitisation in purchasing and is linked to the resulting transparency. Transparency shows how the impact on sustainable purchasing can be increased by using cost brake downs (CBD) and provides an outlook on CO<sub>2</sub> CBD (Product Carbon Footprint) to reduce CO<sub>2</sub> emissions.

**Keywords:** Automotive Industry; Purchasing 4.0; Purchasing; Sustainability; Product Carbon Footprint

**Reference** to this paper should be made as follows: Bunzendahl, S, Papula, J. 2023. Sustainable and transparent purchasing in the automotive industry. *Entrepreneurship and Sustainability Issues*, 10(4), 202-222. [http://doi.org/10.9770/jesi.2023.10.4\(13\)](http://doi.org/10.9770/jesi.2023.10.4(13))

**JEL Classifications:** H57, L62, O14

---

\* Comenius University Faculty of Management, Bratislava, Slovakia. Research grant VEGA 1/0614/23 The readiness of enterprises for the challenges associated with Industry 4.0 from the point of view of business processes and process management.

## 1. Introduction

Governments and business leaders worldwide are working together to create policies and procurement processes that encourage using sustainable materials, components and products, aiming to decrease greenhouse gas emissions and support sustainable development initiatives (Rebane, Reihan, 2016; Marcysiak, 2020; Gubíniová, et al. 2019). The continuous carbon emissions from the manufacturing sector raise concerns among industrialists and policymakers about the effectiveness of operational adjustments and current or proposed strategies in meeting the Paris Agreement targets. Addressing the complex nature of industrial challenges and opportunities requires collaboration and the development of open-source toolboxes that span all business disciplines, supported by a common language, enabling professionals to communicate easily, which will foster responsible consumption and production practices more readily (Huaccho Huatuco, Ball, 2019; Mishra, Singh, 2021). Low-carbon manufacturing, which focuses on reducing emissions through efficient resource utilisation, has become an important research area due to increasing public concern (Holotová, et al. 2023; Peráček, 2020). Numerous researchers explore the triple bottom line and low-carbon supply chains, developing four decentralised supply chain models to determine optimal pricing decisions, carbon emissions, sales quantities, and profits (Miklosik et al. 2021; Lorincova, et al. 2022). These models provide a reliable theoretical foundation for low-carbon firms to select emission reduction strategies while considering stakeholder approaches and adapting to evolving customer perceptions (Gubíniová et al., 2019). The automotive industry is a critical actor in implementing and realising new technologies and new sustainable requirements. The current situation of regulations, restrictions and supply chain disruptions presents unprecedented challenges for the industry (Spieske et al., 2022). The demand for climate neutrality is no longer just a matter of CSR requirements but is now regulated by law (Ma, Lu, 2023). One measure is a registration stop for vehicles with gasoline engines from 2035, except for vehicles that can be operated with e-fuel or CO<sub>2</sub>-neutral (Die Bundesregierung, 2023). The transformation from the classic combustion engine to the electric vehicle must be achieved to meet the Paris Agreement's legal requirements to limit the temperature increase to 1.5°C if possible (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, 2015). The European Parliament defines climate neutrality as the balance between generated carbon emissions and the absorption capacity from the atmosphere. Net-zero emissions are achieved when greenhouse gas emissions vs carbon capture are balanced globally (Europäisches Parlament, 2022). This includes not only carbon dioxide (CO<sub>2</sub>) but also gases such as methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and various fluorinated greenhouse gases (F-gas) (Umweltbundesamt, 2020). Climate neutrality is scientifically clear, but companies can buy certificates certifying their own production's climate neutrality (Werner, 2021 & Climate Extender, 2023).

According to Table 1 from its direct suppliers, the automotive industry claims climate neutrality. The European economy consists of 99% SMEs, which have to realise this task within the supply chains (Europäische Kommission, 2003). In this context, purchasing is given a particular role and, in addition to cost reduction programs, must also implement the new legal regulations of the Supply Chain Act and guarantee climate neutrality in the supply chain. The OEMs have already defined carbon neutrality goals (Mercedes Benz Group, 2023; BMW, 2023; Volkswagen Group, 2023; Volvo, 2023 & General Motors, 2023), in some cases scaled according to Scope 1, Scope 2 and Scope 3 (see Table 1). Scope 1 emissions are generated directly in the company's value chain at the production facilities. Scope 2 is emissions that are related to electricity consumption. Scope 3 are external emissions, e.g. at suppliers or on the transport from suppliers or to customers (Hertwich, Wood, 2018 & Ganda, Milondzo, 2018). The development of new powertrain technologies takes place all the time. It is a double challenge for the supplier industry: conventional technologies must continue to be supplied, and at the same time, high investments must be made in the new technologies.

**Table 1.** OEMs Carbon Neutrality Goals

OEM   Organization   County	The goal of Carbon Neutrality	Special Term for Scope 1 & 2
Daimler AG	2039   2040	
BMW AG	2050	
Volkswagen AG	2050	2035
Volvo	2040	2025
General Motors	2040	
Paris Agreement	2050	
Germany	2050	

Source: Own Table

The Greenhouse Gas Protocol defines Scope 1 as emissions of gases directly produced by a company through heating, operation of vehicles and so on. Scope 2 includes the greenhouse gases that were generated for the production of the electricity that is used. Scope 3 includes external indirect emissions, such as purchased materials or greenhouse gas emissions generated by transport (Greenhouse Gas Protocol, 2004).

A cross-sector benchmark by the Carbon Disclosure Project from 2014 surveyed different industries. The study was evaluated on the share of CO<sub>2</sub> emissions from Scope 1-3. Based on the automotive sector's values, Scope 1, with 2% and Scope 2, with 4%, have a tiny part in CO<sub>2</sub> emissions. Scope 3, with a share of 94%, is the most critical lever for CO<sub>2</sub> reduction in the automotive industry (Carbon Disclosure Project, 2014). The automotive industry focuses on making the emissions from Scope 3 transparent and reducing them significantly, as the leverage is very high in relation to Scope 1 & 2. The other industry sectors differ in emission levels and are not analysed and considered further in this study.

Transparency is special in this context because it enables accurate tracking and management of emissions across the entire value chain (Miklosik et al., 2021). This, in turn, fosters informed decision-making and targeted actions for reducing CO<sub>2</sub> emissions more effectively. Different levels of fabricated products must be considered to define the greatest possible impact factors in manufacturing. Purchasing is critical if emissions are to be impacted in Scope 3. Sustainability must be focused on along the whole supply chain to achieve a balanced emission ratio. Purchasing must guarantee that the use of resources for the purchased products is specified so that future generations are not restricted in the availability of these resources (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, 2023).

This study identifies how transparency can be created in purchasing and how this transparency can be used to impact sustainable purchasing. For this purpose, existing studies are used, as well as data from the own survey.

## 2. Theoretical background

The challenge is creating transparency that makes measuring and influencing emission levels possible. Since Mr. José Ignacio López de Arriortúa Lopez implemented cost transparency in sourcing decisions as chief buyer of Volkswagen AG in 1993, the transparency of product costs has increased through Cost Break-Downs (CBD) (Meissner, 2012). Today, this instrument has been developed to the extent that supplier nominations can be made with the help of a variety of decision criteria. Besides material and manufacturing costs, logistics costs, packaging costs, quality factors, or overhead costs can be included in the strategic decisions.

Within the theoretical framework of cost transparency in the automotive supply chain, new tools and innovations are paving the way for companies to attain enhanced supply chain transparency (Singh, 2015). This, in turn, significantly bolsters organisational endeavours in achieving cost transparency. By leveraging cutting-edge technologies and innovative solutions, businesses can access and analyse accurate, real-time information, fostering trust and collaboration among supply chain partners. (Stacho et. al., 2023, Kohnova, Salajova, 2023). IoT technologies, such as barcoding, RFIDs, and carbon labelling, enable tracking of product components and raw materials throughout the product life cycle, streamlining production and logistics processes while monitoring real-time carbon emissions. The data from central repositories can be used to evaluate product life expectancy and potential carbon emissions during use, helping management make informed decisions about raw materials and components to minimise environmental impacts (Mishra, Singh, 2021).

Consequently, this transparency enables stakeholders to identify inefficiencies, optimise processes, and make informed decisions, ultimately contributing to cost reductions and increased competitiveness in the automotive industry. Digital technologies and innovative tools foster flexibility and agility in the supply chain by enabling real-time data collection, monitoring, and analysis (Qamar, Hall, Collinson, 2018). Companies can quickly identify trends, respond to changes, and make informed decisions, enhancing their ability to adapt to varying customer demands and market conditions, not only in the corporate world (Iqbal, Ahmad, 2022). Industry 4.0 technologies, such as IoT, AI, blockchain, and big data analytics, facilitate communication and collaboration among supply chain partners, leading to leaner and more efficient processes while reducing waste. By integrating digital solutions, smart supply chains become more flexible, agile, and responsive, driving efficiency and promoting circular economy strategies that lead to joint emission reduction decisions, improved profits, and better collaboration among all supply chain members for a multi-win outcome (Mishra, Singh, 2021; Gažová et al., 2022; Yousaf et al., 2023)

Integrating lean and agile methodologies has been demonstrated to enhance a firm's performance by offering benefits such as increased efficiency, waste elimination, and rapid adaptation to diverse and unpredictable customer demands (Raji et al., 2021). The primary objective of implementing digital technologies, such as Industry 4.0, is to boost operational efficiency, leading to improved performance (Kohnova, Salajova, 2023). Managers contemplating the adoption of these technologies require a compelling incentive. The potential performance impacts of integrating digital technologies with supply chain operations warrant investigation, as previous studies have seldom explored the implications on performance (Adhi Santharm, Ramanathan, 2022).

The professionalisation of purchasing has occurred since ancient times when purchasing knowledge was already taught at trading schools (Hillenberg, 2017). The stages of the 4<sup>th</sup> industrial revolution were publicised at the Hanover Fair in 2011 with the presentation of Industry 4.0, the "*High-Strategy 2020*" of the German Federal Government (Deutscher Bundestag, 2016). In this context, Prof. Wolfgang Wahlster, Prof. Henning Kagermann and Prof. Wolf-Dieter Lukas called the 4<sup>th</sup> Industrial Revolution "4." linked to the World Wide Web as ".0" (VDI Nachrichten, 2011). This can be taken as the basis for comprehensive digitisation opportunities in purchasing.

The independent of Fraunhofer-Institut für Materialfluss und Logistik IML & Bundesverband Materialwirtschaft und Logistik IML e.V study confirms that digitisation is seen as an added value and is also being implemented in practice. Digitisation generates a large amount of data that significantly impacts transparency in the supply chain. In the pre-study on Purchasing 4.0, 72% of respondents agreed that purchasing has the role of active creator and supporter, while 28% agreed that it has the function of leader and driver. The survey focused on transferring the 4.0 idea to purchasing (Fraunhofer-Institut für Materialfluss und Logistik IML & Bundesverband Materialwirtschaft und Logistik IML e.V., 2016, p. 25). Bogaschewsky and Müller (2021, p.98) confirm purchasing as a key factor in impacting sustainable performance. The participants were asked about the future importance and role of purchasing concerning environmental and social sustainability tasks. 78.5% of the participants (n=219) rated the importance of purchasing as "much stronger" (28.3%) and "stronger" (50.2%)

(Bogaschewsky, Müller, 2021, p. 98). The results of the question "How important is it for you shortly that information on the environmental sustainability of suppliers/service providers is available on the platform?" (Number 17, page 88 of the survey) can be used as an indicator of further digital development in the area of transparent information on sustainability for suppliers. The analysis of the question focusing on the use of digital platforms indicates that the provision of environmental sustainability information of suppliers is rated as "very important" by 27.6% and as necessary by 48.1% (n=224). The SME score (n=126) shows a similar score to the population, with 25.4 % "very important" and 52.4 % "important". In the same way, the importance/relevance of providing the information is asked in a further question (Number 18, page 89 of the survey). The results show a value of 25.2% "very important" and 48.1% "important" in the basic population of n=214 (Bogaschewsky, Müller, 2021, pp. 88-89).

The University of Würzburg, in collaboration with the University of Leipzig, supported by the German Association of Materials Management, Purchasing and Logistics (BME) has examined the "ELECTRONIC PROCUREMENT 2020" in his study in March 2020. This empirical study focuses on the effects of digitalisation on purchasing and compares the survey from 2019 with the results from 2020. Participants could rate different categories as "yes" or "no" according to the need for digitalisation. Specifically, the category "supplier management" was seen as a necessary category of digitisation in 2019 (n=264) with 92.4% and in 2020 (n=159) with 90.6%. Similarly, the category "quality management" was rated as an important area of digitisation in 2019 (n=263) with 70 % and in 2020 (n=157) with 75.2 % (Bogaschewsky, Müller, 2020, p. 6).

The studies indicate that purchasing has a particular function in sustainable procurement and is seen as a driver. Digitalisation and the use of platforms increase transparency through greater data availability. Based on the results of the studies, digital transformation has a significant impact on purchasing. The own study from 2022 asked the participants how advanced digital transformation is in the different business units in the company (Figure 1). Except for production, all companies confirm that more than 65% of the departments have implemented digitalisation or are already optimising it.

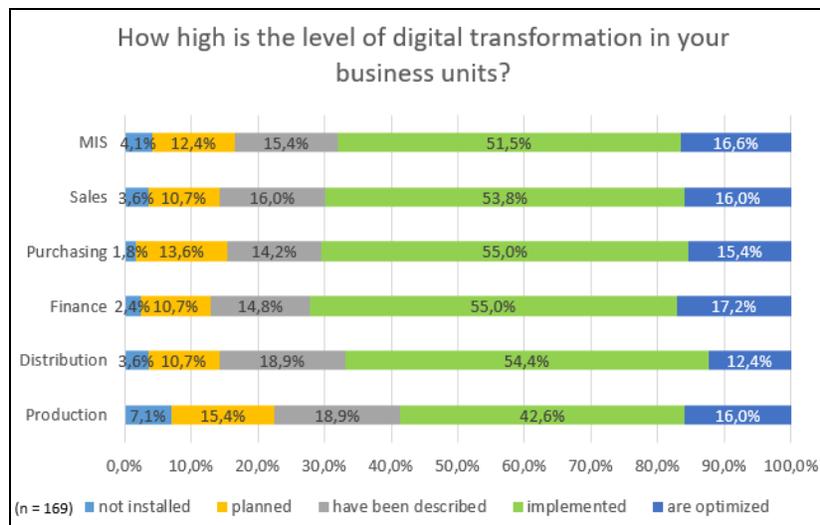


Figure 1. How high is the level of digital transformation in your business unit?

Source: Own Survey 2022

With the use of digitalisation, transparency is being created that allows a direct impact on sustainable purchasing.

Digitalisation provides new opportunities to create transparency with the help of the 4.0 idea. Proven tools can be applied in a new form. In the automotive industry, the Cost Break-Down (CBD) is a proven purchasing tool that provides cost transparency for goods. The CBD, which Mr Lopez introduced as a purchasing tool based on costs, is referenced significantly. Implementing and using the tool in purchasing creates transparency in the supply chain in combination with digitalisation. In this study, the resulting benefits are demonstrated to have an impact on sustainable purchasing. The OEMs' carbon neutrality targets are forwarded to the supply chain, as shown in Table 1. Compliance with the Supply Chain Act and the EGD are also affected and must be considered. OEMs will demand a Product Carbon Footprint in the future to control CO<sub>2</sub> emissions and have the most significant leverage for reducing emissions. The current state of research and the level of readiness for implementation in the industry will be highlighted.

This study identifies the current state of purchasing methods to create transparency in the context of advancing digitalisation. Based on the 4.0 idea, connecting internal data with data from the Internet of Things (IoT) is a significant step forward in creating transparency.

### **3. Research objective and methodology**

This study is based on literature research as secondary research and an own survey as primary research. The literature research is valuable for systematically identifying the scientific research state and the research questions (Adam et al., 2007, p. 56-57). Secondary data in this study are public statistics and existing empirical surveys. Secondary data are suitable for answering research questions (Saunders, Lewis, Thornhil, 2009, pp. 256-257). The survey result will be used to define the impact of purchasing on sustainable purchasing in more detail. Important here is the rising transparency by digitisation and the research if this supports the effect on sustainability. The primary research is accompanied by secondary surveys, from which the results will be taken to the next stage. The Vorstudie "Einkauf 4.0 - Digitalisierung im Einkauf" of the BME from the year 2016, the study "Elektronische Beschaffung 2020" of the BME-Barometer from the year 2019 and 2020 as well as the study "Fortgeschrittene Digitale Lösungen zur Unterstützung von Einkauf und SCM 2021" of the BME from the year 2021 will be used and developed further with our survey dated on March 2022.

The literature research focused on the keywords "Automotive Industry", "Purchasing 4.0", "Sustainability" and "Product Carbon Footprint". The following search programs were used: Google Scholar | Research Gate | Scopus | SpringerLink. Since Purchasing 4.0 has not been thoroughly researched scientifically, the essential elements are summarised in Figure 6 with the purchasing levels. The compiled results are the authors' representations from a literature of 143 relevant publications.

This study is based on a survey of March 2022 based on sustainable purchasing in the automotive industry. The structure of the questions was based on the Likert Scale; the participants were invited to give feedback on their relevance. Furthermore, open questions were asked, categorised and evaluated with the program MaxQDA. The population for the study was based on an average of 933 companies in the German automotive industry (Statista, 2022). 169 representatives of the companies participated in the survey. The confidence level was assumed to be 90 %, with a 6 % margin of error. Under these conditions, 158 responses were required (Questionstar, 2023). Participants from the automotive supply industry worldwide were approached to achieve an empirically usable result. The suppliers can supply directly to the OEM (Tier-1) or be involved in the supply chain further in the supply chain (Tier-n). All participants are in the automotive industry and are familiar with the requirements of sustainability aspects and the special responsibility of purchasing.

To make the results even more reliable, 10 experts from the purchasing department were interviewed based on the results of the surveys. Expert interviews were selected to validate the survey results and represent a qualitative research method (Baur, N., Blasius, J., 2014, p. 970). All interview experts are CEOs or in leading purchasing positions in the automotive industry. The interviews were done in January 2023. The questions focus on transparency and sustainability as well as AI technology. All answers were categorised with MaxQDA Software to compare the answers. The results of the survey and the expert interviews provide the foundation for the study. The mixed methodology represents the comparison of the primary research studies.

To evaluate the dependencies of the questions, the Chi-Square test and Pearson correlation coefficient were determined. For this purpose, the Microsoft SPSS program (CHAID Function or F-Test based on the data) was used to perform the calculations. To determine the correlation, corresponding hypotheses are formed. The hypotheses are repeated in the comparative analysis to highlight the correlation in detail. Hypotheses H<sub>0</sub> and H<sub>1</sub> are represented here.

H<sub>0</sub>: Question X and question Y **are not** dependent on each other

H<sub>1</sub>: Question X and question Y are dependent on each other

As a result of Pearson's correlation analysis, values from -1 to + 1 (r-value) can be obtained. The calculation was performed with the SPSS program according to the formula:

$$r\text{-value} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{(N - 1)s_x s_y}$$

**Table 2.** Legend of the variables

r-value	x <sub>i</sub>	y <sub>i</sub>	$\bar{X}$	$\bar{y}$	N	S <sub>x</sub>	S <sub>y</sub>
correlation	Value x <sub>i</sub>	Value y <sub>i</sub>	Arithmetic average x	Arithmetic average y	Total population	standard deviation x	standard deviation y

Source: Scribber, 2020

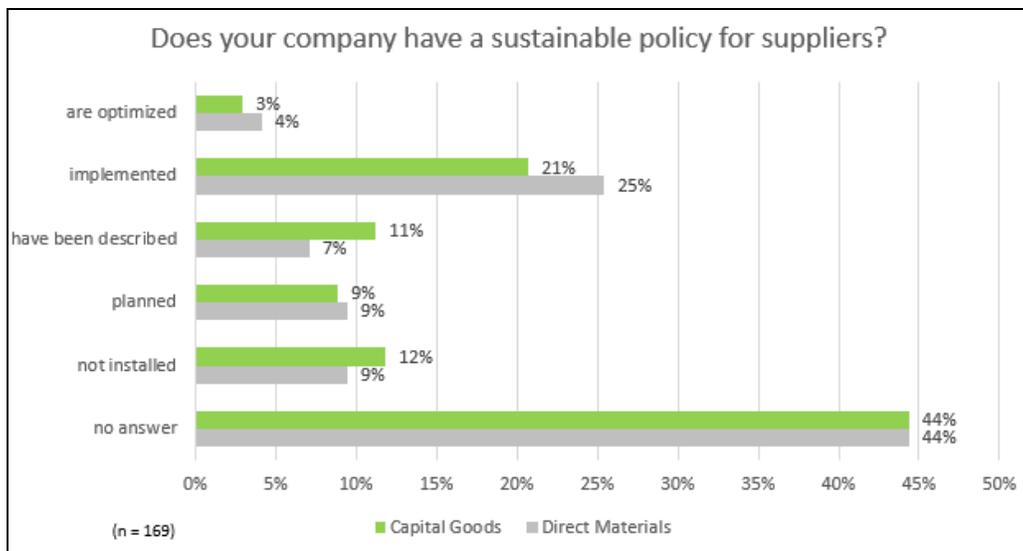
According to Cohen, the classification is used to interpret the strength of expression correctly. The interpretation was based on the effect size (Scribber, 2020). The "Cohen" evaluation in this study has a range of

- ± 0 – 0.1 = low correlation (effect)
- ± 0.1 – 0.5 = medium correlation (effect)
- ± 0.5 – 1 = strong correlation (effect)

**4. Results and discussion**

The EU member states must transpose the new guidelines from the Green Deal and the national supply chain law into national law. This is included in the European Green Deal goals as a target for 2030 (Deutscher Nachhaltigkeits Kodex, 2023 & Akzente kommunikation und beratung GmbH, 2022 & European Commission, 2023).

The survey focuses on the sustainability of the automotive industry and whether the companies have already fulfilled this obligation. Figure 2 contains the survey results and shows the level of readiness that companies have achieved in the supply chain in 2022.



**Figure 2.** Does your company have a sustainable policy for suppliers?

Source: Own Survey 2022

In both categories (Capital Goods & Direct Materials), more than 50% of the companies still need to implement a sustainability policy for suppliers. Approximately 20 % of the companies are in the planning or description stage. About 25% of the participants have installed or optimised the approach.

The next question asks about the compliance policy that the companies have integrated. Figure 3 summarises the different categories and the responses.

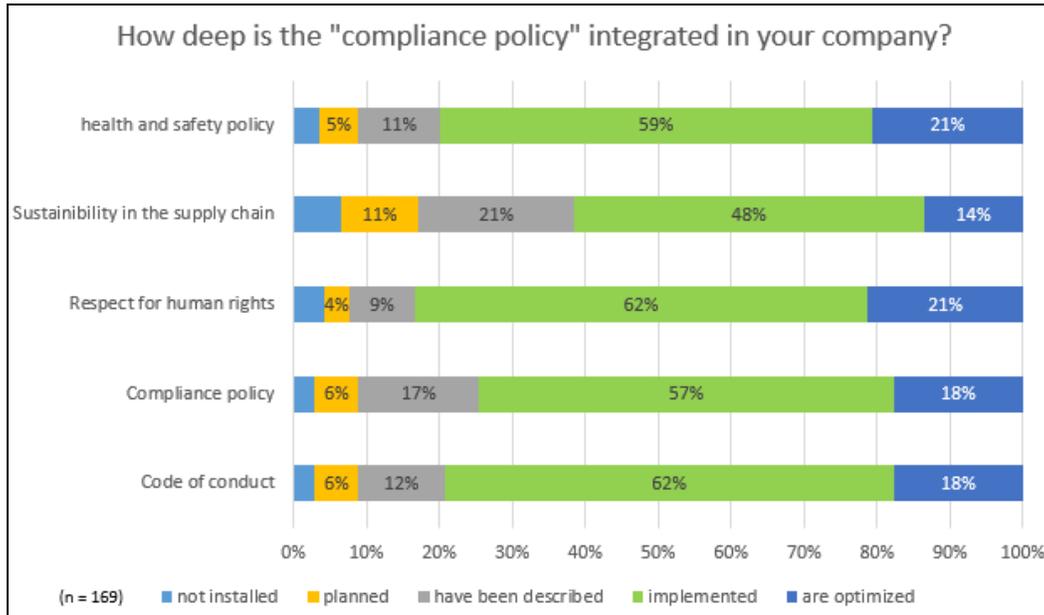


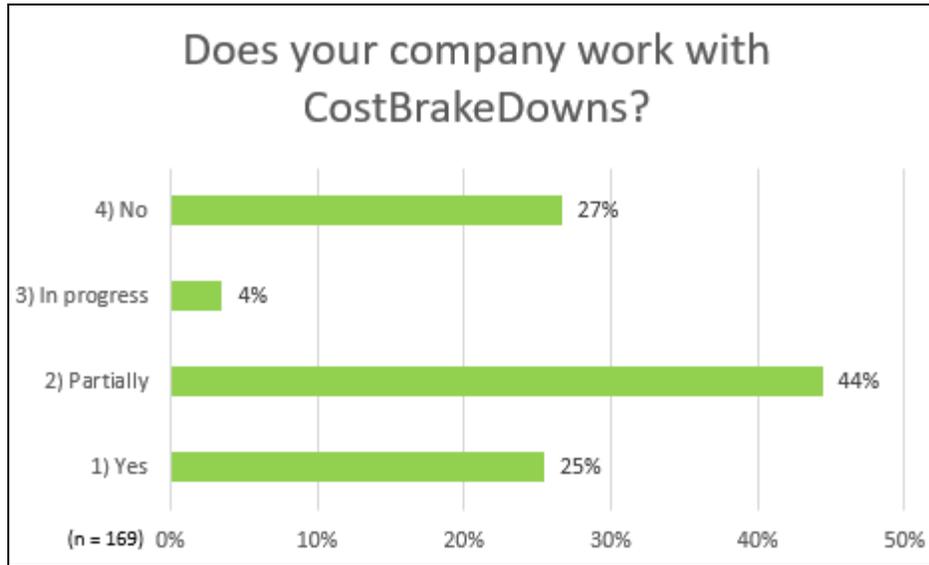
Figure 3. How deep is the “compliance policy” integrated in your company?

Source: Own Survey 2022

In all categories, the participants indicated that 60 - 80% have already implemented a compliance policy or are already in the process of optimising it. In particular, the category "Sustainability in the supply chain" was rated highly with 62% compared to Figure 6. The high degree of fulfilment shows that the requirements from the EU taxonomy (European Commission, 2023) have arrived in the supply chain and are being focussed on.

One element of Purchasing 4.0 describes the data and information created by digitising and connecting internal data and external data from the IoT. Internal data still has to be made "available" in some cases. The literature refers to this as Dark-Data, i.e. unused data and information in the company (unused knowledge). All information together creates transparency in the supply chain. One way to use the sustainability information is to combine them in a CBD.

Regarding value, the product-related CBD is focused on resource protection in the supply chain. For this reason, the companies were asked whether they work with CBD. The result of the survey is shown in Figure 4.



**Figure 4.** Does your company work with CostBrakeDowns?

*Source:* Own Survey 2022

It can be noted that 69% of the respondents are using CBD. A high level of agreement, which is now part of the rules for sourcing decisions in the automotive industry. The basis for the decision is the total cost of ownership, which is made transparent by cost analysis (Sanz, Semmler, Walther, 2007). The CBD represents a tool used to analyse all positions in the value creation in detail and standardised in its different areas, such as material, production process, tools or machines used or shipment cost. Based on the information in the CBD it is possible to compare the CBD from the supplier and find the best opportunity for saving all resources. That is one impact to have impact on sustainable purchasing. Use our global resources like material (reduce waste), optimal use of human power, transfer technology in "poor" countries and helps to the education of people. At this point, it is essential to note that the CBD has created transparency to highlight further opportunities for sustainable purchasing.

Digitalisation, in combination with the CBD tool, creates a high level of transparency in the value chain. The survey asked the participants how high the competitive advantages result from Purchasing 4.0. Figure 5 summarises the results. 66% of the respondents see a significant advantage here and rated > 6 on a scale of 1-10. The average of 6.1 confirmed that there is a significant advantage here. The experts in the interview rated the resulting advantage at 7.9, as shown in Table 6.

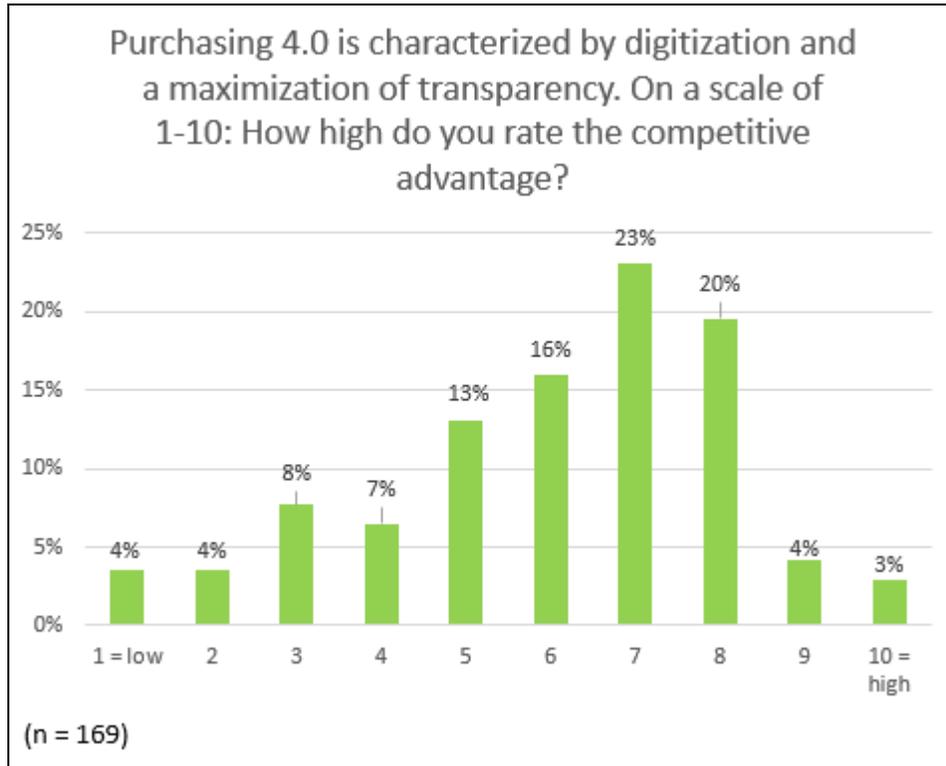


Figure 5. Benefits of Purchasing 4.0 by digitalisation

Source: Own Survey 2022

The extract of questions from the survey represents a derivation of the need for transparency. With transparency, the possibilities for interaction in the protection of resources are unlimited. In order to show further dependencies, questions were compared with each other.

Table 3 compares the question from Figure 3 based on the responses of the category "Sustainability in the supply chain" with the question from Figure 2 based on the response behaviour of the category "Direct Materials".  $H_0$  and  $H_1$  are assumed as follows:

**$H_0$ :** There is NO dependency on integrating compliance policy and implementing a sustainability policy for suppliers.

**$H_1$ :** There is a direct dependency on the integration of compliance policy and the implementation of a sustainability policy for suppliers

**Table 3.** Comparison Compliance - Sustainability vs. Direct Materials

	Reference	Result	Comment
<p><u>Sustainability</u>: How deep is the "compliance policy" integrated into your company? Vs. <u>Direct Materials</u>: Does your company have a sustainable policy for suppliers?</p>	[df]	3	
	[α]	0,05	P – Value < α
	[p-value]	0,0001	H <sub>1</sub> is accepted
	[χ <sup>2</sup> - Cross Table]	44,340	7,814 critical value
	[H <sub>0</sub> ]	$\chi^2 > \chi^2_{1-\frac{\alpha}{2}}$	H <sub>0</sub> is rejected
	[r-value]	0,996	Positive Strong Correlation

Source: Own Table

It has been proven that there is a dependency between the compliance policy "sustainability in the supply chain" and the sustainable policy for suppliers' "direct materials". With an r-value rate of 0,996 the value has a positive strong correlation. If the company has a compliance policy in place, there is a sustainable policy for suppliers, too.

Table 4 compares the question from Figure 3 based on the responses of the category "Sustainability in the supply chain" with the question from Figure 2 based on the response behaviour of "Indirect Materials". H<sub>0</sub> and H<sub>1</sub> are assumed as follows:

**H<sub>0</sub>**: There is NO dependency on integrating compliance policy and implementing a sustainability policy for suppliers.

**H<sub>1</sub>**: There is a direct dependency on the integration of compliance policy and the implementation of a sustainability policy for suppliers

**Table 4.** Comparison Compliance – Sustainability vs Capital Goods

	Reference	Result	Comment
<p><u>Sustainability</u>: How deep is the "compliance policy" integrated into your company? Vs. <u>Capital Goods</u>: Does your company have a sustainable policy for suppliers?</p>	[df]	4	
	[α]	0,05	P – Value < α
	[p-value]	0,0001	H <sub>1</sub> is accepted
	[χ <sup>2</sup> - Cross Table]	37,931	9,478 critical value
	[H <sub>0</sub> ]	$\chi^2 > \chi^2_{1-\frac{\alpha}{2}}$	H <sub>0</sub> is rejected
	[r-value]	0,994	Positive Strong Correlation

Source: Own Table

It has been proven that there is a dependency between the compliance policy "sustainability in the supply chain" and the existence of sustainable policy for suppliers "capital goods". With an r-value rate of 0,994 the value has a positive strong correlation. If there is a compliance policy in the company in place, there is a sustainable policy for suppliers, too.

Table 5 compares the question from Figure 4 with the question from Figure 5 based on estimating the competitive advantage generated by transparency through digitalisation. The Figure 7 responses were combined for the calculation so that all “Yes” and Partially responses were assumed true, and the other categories were scored as no.  $H_0$  and  $H_1$  are assumed as follows:

**$H_0$ :** There is NO dependency between the use of CBD and a high competitive advantage through transparency created by digitisation

**$H_1$ :** There is a significant dependency between the use of CBD and a high competitive advantage through transparency created by digitisation

**Table 5.** Cost Breake Down vs Purchasing 4.0 – Competitive Advantages

	Reference	Result	Comment
Does your company work with CostBrakeDowns? Vs. Purchasing 4.0 is characterised by digitisation and maximisation of transparency. On a scale of 1-10: How high do you rate the competitive advantage?	[df]	9	
	[ $\alpha$ ]	0,05	P – Value < $\alpha$
	[p-value]	0,153	$H_0$ is accepted
	[ $\chi^2$ - Cross Table]	13,221	16,918 critical value
	[ $H_0$ ]	$\chi^2 < \chi^2_{\frac{\alpha}{2}}$	$H_1$ is rejected
	[r-value]	0,847	Positive Strong Correlation

Source: Own Table

No dependency can be proven between the use of the CBD and the competitive advantages of digitisation in Purchasing 4.0. With the confirmation of the  $H_0$  hypothesis, the questions are independent. Even if the r-value can be calculated as 0,847, these positive strong correlations are random.

The expert Interviews are used to have a much stronger confirmation of the survey questions. A part of the asked questions are used in this study. Table 6 compares the question of the survey with the answers of the experts in the automotive industry.

**Table 6.** Extract Expert Interview: Comparison Survey vs. Interviews

Question Survey: n = 169 Expert Interviews: n = 10	Questionnaire Survey [ $\bar{X}$ ]	Expert Interview [ $\bar{X}$ ]
Purchasing: How high is the level of digital transformation in your business? Scale 1 (low) – 5 (high)	3,7	2,7
Does your company work with CBDs?	70 %	90 %
How does transparency help to analyse optimisation potentials?	Better Position by Negotiations & Price Reduction	19 %
	Detail Discussions are possible	5 %
	High impact to use resources optimally	38 %
	Process Optimisation	24 %

Question Survey: n = 169 Expert Interviews: n = 10		Questionnaire Survey [ $\bar{X}$ ]	Expert Interview [ $\bar{X}$ ]
	No impact	14 %	x
Does your company have a sustainable policy for suppliers?		30 %	60 %
Purchasing 4.0 is characterised by digitalisation and the maximisation of transparency. On a scale of 1-10: How high do you rate the competitive advantage?		6,1	7,9
Do you see a competitive advantage through digitalisation in purchasing? Here: YES answers		62 %	100 %
What influence does purchasing have on sustainable procurement?	Nomination criteria	80 %	33 %
	High impact		24 %
	Company Strategy		14 %
	Supply Chain Act		10 %
	Transparency makes it possible		10 %
	Code of conduct		10 %

Source: Own Table

To summarise, the survey and the expert interviews provided empirical evidence that digitalisation creates transparency and directly impacts sustainable purchasing. The most significant impact is attributed to the nomination criterion, already being implemented in practice by the OEMs.

## Conclusions

This study continued the indicated studies. On the one hand, it was proven that the level of digitalisation in purchasing has increased. The BME's pre-study from 2016 described the transfer of the 4.0 idea to purchasing and the need and the opportunities that arise (Frauenhofer Institute for Material Flow and Logistics IML, Bundesverband Materialwirtschaft und Logistik IML e.V., 2016). The BME studies from 2019 and 2020 have shown the continuation of digitalisation in purchasing by empirically proving the necessity of e-tools. The chronological development could be continued with the own study from March 2022. The readiness of digitisation in the business units of the companies was verified empirically (Figure 1). Pearson correlation analysis proved that companies with a compliance policy also have a sustainability policy for suppliers. Figure 5 provides empirical evidence that digitisation results in more transparency, which is a significant competitive advantage. However, it could not be demonstrated that CBD companies also see this as an instrument for creating competitive advantages through digitalisation.

With reference to Figure 5, it was empirically proven that digitisation significantly impacts transparency. The experts surveyed rate the impact even higher than the study indicates. Digitisation in purchasing is based on transferring the 4.0 idea to purchasing and is an element of Purchasing 4.0. Within the scope of intensive literature research in the context of the dissertation on Purchasing 4.0, the different purchasing levels could be identified and summarised in the core elements of Purchasing 4.0 in Figure 6.

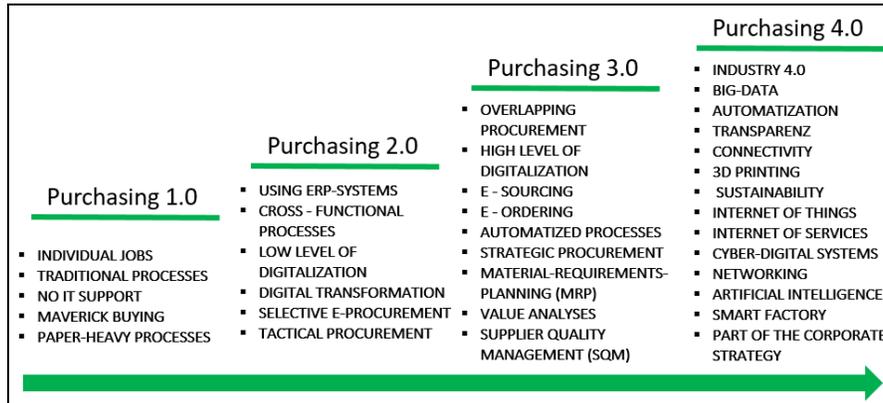


Figure 6. Levels of Purchasing

Source: Own Figure

By using the 4.0 idea in purchasing, Purchasing 4.0 can be identified with its elements. Significant parts still need to be researched, and a scientific definition is unavailable (Zafari, F., Teuteberg, F. 2018). This study focuses not on a detailed analysis of Purchasing 4.0, but on demonstrating the added value in connection with sustainable purchasing.

At the same time, digitalisation means that data is generated that must be made available. The demand to reduce emissions requires finding tools that create transparency and put the buyer in a position to reduce emissions. The transfer of the cost-related CBD represents an existing and proven tool. All items of a CBD can be transferred with CO<sub>2</sub> emission values so that CO<sub>2</sub> transparency instead of cost transparency is created. Figure 7 shows an example of a CO<sub>2</sub> CBD that can be used similarly as an essential factor in nominations criteria (see Table 6). The example used was generated with a test version of the company Calc4XL. The challenge is to receive the data for the CO<sub>2</sub> emissions generated during production for all positions in the CBD (along the value chain).

Databases are already available today that can be accessed. However, the data are still relatively general and need to be specified.

Rohmaterial											Rohmaterial						
Sort	Beschreibung	Werkstoff	Einheit	Netto Gewicht	Brutto Gewicht	Anzahl (optional)	Preis/Einheit [EUR]	Rückvergütung [EUR/Einheit]	Frit in [%]	Ausschuss [%]	Total [EUR/1 Stck]	Carbon Equivalent [kgCO2eq/Unit]	Recycling & Waste [kgCO2eq/Unit]	CO2 [kgCO2eq /1Stck]			
1	Granulat	PA66 GF30	kg	0,016	0,016		4,163			1,5%	0,068	18,0%	8,9148	0,1448			
2																	
3																	
4																	
Einkaufsteile (& Externe Prozesse)											Einkaufsteile (& Externe Prozesse)						
Sort	Beschreibung	Sachnummer	Einheit	Zulieferer	Anzahl	Preis/Einheit [EUR]	Frit in [%]	Ausschuss [%]	Total [EUR/1 Stck]	Weight [kg/pc]	Carbon Equivalent [kgCO2eq/kg]	CO2 [kgCO2eq /1Stck]					
1																	
2																	
3																	
4																	
Gemeinkosten Material & Einkaufsteile											Indir. Mat. Emissio						
% auf Sektion 2.1.2.2											2,28 %		0,002	0,4%			
Produktion											Produktion						
Sort	Prozess Beschreibung	Maschinenp	Zykluszeit [min]	Kavitäten/Zyklus	Maschine [EUR/Stk]	Bediener [EUR/Stk]	Anz. Bediener	Setup [Std]	Rüstkosten [EUR/Los]	Losgröße	Werkzeugwartung [EUR/Bauteil]	Ausschuss [%]	Total [EUR/1 Stck]	Fix Carbon Hour Rate [kgCO2eq/h]	Var Carbon Hour Rate [kgCO2eq/h]	Setup [kgCO2eq/batch]	CO2 [kgCO2eq /1Stck]
1	Spritzguss		0,66	2	10,01	11,40	0,5	2,00	42,82	1,900		1,0%	0,110	0,2176	8,1585	0,4352	0,0468
2																	
3																	
4																	
Fertigungsgemeinkosten											Indirect emissions from production:						
Basis: Direct Labour											33,38 %		0,010	2,8%			
Ausschuss (Material & Produktion)											zusätzl. Anzeige der Beträge von oben		0,002	0,5%			
													0,189	50%			
Overheads & Gewinne											Total Manufacture [kgCO2eq /1Stck]:						
													0,187	50%			
Basis Value Added											2,04 %		0,013	3,4%			
Basis Value Added											8,76 %		0,004	1,0%			
Betrag [EUR]											3,000		0,158	42,0%			
Betrag [EUR]											19,000						
Gewinn (auf Material & Teile)											Gewinn gesplittet: FALSCH						
Gewinn (auf Produktion)																	
Gewinn (auf Material & Teile & Produktion)																	
Grundpreis [EUR/1 Stck]													0,376	100%			
													0,2173				
											Indirect SG&A emissions		0,0111				
											Sales		2,57%	0,0018			
											Administration		11,38%	0,0078			
											R&D		2,21%	0,0015			
											TOTAL:		0,2284 kgCO2eq /1Stck				

Figure 7. Example Product CO<sub>2</sub>CBD

Source: Calc4XL Testversion, April 2023

The example in Figure 7 was generated with a test version of the company Calc4XL. Next to the manufacturing price, the value of 0.2284 kgCO<sub>2</sub>eq/1pcs can be calculated for this product. The challenge is to receive the data for the CO<sub>2</sub> emissions generated during production for all positions in the CBD (along the value chain). Databases are already available today that can be accessed. However, the data are still relatively general and need to be specified. Calc4XL refers to databases such as ProBas, DStatist, DEFRA, USEEIO, Climatepartner, Pe-Gabi, SimaPro-Pre, and Ecoinvent integrated today.

The association Catena-X Automotive Network (Catena-X) was founded to close the gaps in the databases. Founding members are automotive manufacturers and suppliers such as BMW AG, Deutsche Telekom AG, Robert Bosch GmbH, SAP SE, Siemens AG and ZF Friedrichshafen AG. The goal is to provide transparency in supply chains and to build up databases from which, among other things, CO<sub>2</sub> values can be derived and provide a basis for CO<sub>2</sub> reduction. Manufacturers worldwide along the supply chain should provide their information in the collaborative database to create a common standard for data and information flows along the automotive supply chain (Catena-X Automotive Network, 2023).

The result of this study is that Purchasing 4.0 will make a significant impact on sustainability through the element of digitalisation. The requirement for nomination as a decision criterion is the key to the most critical possible implications. Digitisation generates the data needed to create the necessary transparency. Using the company's data with data from the IoT represents a significant step forward in increasing transparency if the data is used in a systematic and standardised manner. In the future, data will be a crucial element of competitiveness.

**References**

- Adams, J, Khan, H.T.A., Raeside, R., White, D. (2007). *Research Methods for Graduate Business and Social Science Students*. B-42, Panchsheel Enclave, New Delhi 110 017 India: SAGE Publications India Pvt Ltd. [viewed 15. November 2022]. ISBN 978-0-7619-3589-6. Available from: <https://doi.org/10.4135/9788132108498>
- Adhi Santharm, B., Ramanathan, U. (2022). Supply chain transparency for sustainability – an intervention-based research approach, *International Journal of Operations & Production Management*, 42(7), 995-1021. <https://doi.org/10.1108/IJOPM-11-2021-0684>
- Akzente kommunikation und beratung GmbH. (2022). *CSR Berichtspflicht*. Retrieved March 27<sup>th</sup>, 2023, from <https://www.csr-berichtspflicht.de/eu-roadmap>
- Baur, N., Blasius, J. (2014). *Handbuch Methoden der empirischen Sozialforschung*. Wiesbaden: Springer Fachmedien, p. 970. <https://doi.org/10.1007/978-3-531-18939-0>
- BMW. (2023). *CO2 Reduction*. München: BMW Group. Retrieved March 27<sup>th</sup>, 2023, from <https://www.bmwgroup.com/en/sustainability/our-focus/co2-reduction.html>
- Bogaschewsky, R., Müller, H. (2020). *BME-BAROMETER „ELEKTRONISCHE BESCHAFFUNG 2020*. Würzburg: Lehrstuhl für Industriebetriebslehre der Universität Würzburg. Leipzig: Professur Betriebswirtschaftslehre, insbesondere Supply Chain Management, Hochschule für Technik, Wirtschaft und Kultur. Retrieved April 3<sup>rd</sup>, 2023, from [http://downloads.cfsm.de/Studien/2020/Barometer\\_2020\\_komplett.pdf](http://downloads.cfsm.de/Studien/2020/Barometer_2020_komplett.pdf)
- Bogaschewsky, R., Müller, H. (2021). *Fortgeschrittene digitale Lösung zur Unterstützung von Einkauf und SCM 2021*. Würzburg: Lehrstuhl für Industriebetriebslehre der Universität Würzburg. Leipzig: Professur Betriebswirtschaftslehre, insbesondere Supply Chain Management, Hochschule für Technik, Wirtschaft und Kultur. Retrieved April 2<sup>nd</sup>, 2023, from [http://downloads.cfsm.de/Studien/2021/Digi-Studie\\_2021.pdf](http://downloads.cfsm.de/Studien/2021/Digi-Studie_2021.pdf)
- Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung. (2015). Berlin: BMZ. *Klimaabkommen von Paris*. Retrieved March 21<sup>th</sup>, 2023, from <https://www.bmz.de/de/service/lexikon/klimaabkommen-von-paris-14602>
- Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung. (2019). Berlin: BMZ *European Green Deal*. Retrieved March 21<sup>th</sup>, 2023, from <https://www.bmz.de/de/service/lexikon/european-green-deal-118284>
- Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung. (2023). Berlin: BMZ. *Nachhaltigkeit (nachhaltige Entwicklung)*. Retrieved April 1<sup>st</sup>, 2023, from <https://www.bmz.de/de/service/lexikon/nachhaltigkeit-nachhaltige-entwicklung-14700#:~:text=Nachhaltigkeit%20oder%20nachhaltige%20Entwicklung%20bedeutet.zuk%C3%BCnftiger%20Generationen%20nicht%20ingeschr%C3%A4nkt%20werden.>
- Carbon Disclosure Projekt. (2014). *Die Zukunft der globalen Wertschöpfung*. Retrieved April 27<sup>nd</sup>, 2023, from [https://systain.com/wp-content/uploads/2022/08/Systain\\_Studie\\_Die-Zukunft-der-globalen-Wertschopfung\\_Scope3-2-1.pdf](https://systain.com/wp-content/uploads/2022/08/Systain_Studie_Die-Zukunft-der-globalen-Wertschopfung_Scope3-2-1.pdf)
- Catena-X Automotive Network. (2023). *Unsere Stärken im Überblick*. Berlin: Catena-X Automotive Network e.V. Retrieved April 5<sup>th</sup>, 2023, from <https://catena-x.net/de/mehrwerte>
- Climate Extender. (2023). *CO2 kompensieren und klimaneutral werden*. Retrieved March 21<sup>th</sup>, 2023, from [https://climate-extender.de/klimaneutrales-unternehmen/co2-kompensieren?gclid=EAIaIQobChMI3c-lo9eF\\_gIVsI0DBx3pxgByEAAYASAAEgLTbfD\\_BwE](https://climate-extender.de/klimaneutrales-unternehmen/co2-kompensieren?gclid=EAIaIQobChMI3c-lo9eF_gIVsI0DBx3pxgByEAAYASAAEgLTbfD_BwE)
- Deutscher Bundestag. (2016). Berlin: Deutscher Bundestag. Wissenschaftliche Dienste. *Aktueller Begriff Industrie 4.0*. Retrieved March 24<sup>th</sup>, 2023, from <https://www.bundestag.de/resource/blob/474528/%20cae2bfac57f1bf797c8a6e13394b5e70/industrie-4-0-data.pdf>
- Deutscher Nachhaltigkeitskodex (2023). *Der Nachhaltigkeitskodex*. Retrieved March 27<sup>th</sup>, 2023, from <https://www.deutscher-nachhaltigkeitskodex.de/de-DE/Home/DNK/DNK-Overview>

- Die Bundesregierung. (2023). *EU-Umweltrat: Nur noch CO2-frei fahren*. Retrieved March 31<sup>th</sup>, 2023, from <https://www.bundesregierung.de/breg-de/themen/europa/verbrennermotoren-2058450>
- European Commission. (2023). *EU-Taxonomie für nachhaltige Aktivitäten*. Retrieved March 27<sup>th</sup>, 2023, from [https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities\\_en](https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en)
- Eurpäische Kommission. (2003). *SME definition*. Brussels: European Commission. Retrieved March 21<sup>th</sup>, 2023, from [https://single-market-economy.ec.europa.eu/smes/sme-definition\\_de](https://single-market-economy.ec.europa.eu/smes/sme-definition_de)
- Europäisches Parlament. (2022). *Was versteht man unter Klimaneutralität und wie kann diese bis 2050 erreicht werden?* Retrieved March 31<sup>th</sup>, 2023, from <https://www.europarl.europa.eu/news/de/headlines/society/20190926STO62270/was-versteht-man-unter-klimaneutralitat>
- Fraunhofer-Institut für Materialfluss und Logistik IML & Bundesverband Materialwirtschaft und Logistik IML e.V. (2016). *Vorstudie - Einkauf 4.0: Digitalisierung des Einkaufs*. Retrieved March 27<sup>th</sup>, 2023, from <https://www.iml.fraunhofer.de/content/dam/iml/de/documents/OE260/vorstudie-einkauf-4-0-fraunhofer-iml-bme.pdf>
- Ganda, F., Milondzo, K. (2018). *The Impact of Carbon Emissions on Corporate Financial Performance: Evidence from the South African Firms*. <https://doi.org/10.3390/su10072398>
- Gažová, A., Papulová, Z., Smolka, D. (2022.) *Effect of Business Process Management on Level of Automation and Technologies Connected to Industry 4.0*, *Procedia Computer Science*, Volume 200, 1498-1507, ISSN 1877-0509, <https://doi.org/10.1016/j.procs.2022.01.351>
- General Motors. (2023). *General Motors, the Largest U.S. Automaker, Plans to be Carbon Neutral by 2040*. © General Motors. Retrieved March 27<sup>th</sup>, 2023, from <https://news.gm.com/newsroom.detail.html/Pages/news/us/en/2021/jan/0128-carbon.html>
- Gubiniová, K., Bartáková, G.P., Brtková, J. (2019) *Green Markets and Their Role in the Sustainable Marketing Management*. In: Cagáňová, D., Balog, M., Knapčíková, L., Soviar, J., Mezarciöz, S. (eds) *Smart Technology Trends in Industrial and Business Management*. EAI/Springer Innovations in Communication and Computing. Springer, Cham. [https://doi.org/10.1007/978-3-319-76998-1\\_19](https://doi.org/10.1007/978-3-319-76998-1_19)
- Greenhouse Gas Protocol. (2004). *The Greenhouse Gas Protocol*. Washington: World Resources Institute and World Business Council for Sustainable Development, Chapter 4 Setting Operational Boundaries, p.25., ISBN 1-56973-568-9, Retrieved March 31<sup>th</sup>, 2023, from <https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>
- Hertwich, E., Wood, R. (2018). *Environ. Auflösung Lette*. 13 104013. *The growing importance of scope 3 greenhouse gas emissions from industry*, pp 2-5, <https://doi.org/10.1088/1748-9326/aae19a> or Retrieved March 21<sup>th</sup>, 2023 from URL
- Hillenber, K. (2017). *Entwicklung der Anforderungen im Einkauf und die Notwendigkeit von Projektmanagement*. In: *Projektmanagement im Einkauf*, Wiesbaden: Springer Fachmedien Wiesbaden, pp 21-26, from [https://doi.org/10.1007/978-3-658-12221-8\\_3](https://doi.org/10.1007/978-3-658-12221-8_3) or Retrieved March 21<sup>th</sup>, 2023 from URL
- Holotová, M., Nagyová, L., Holota, T., Cagáňová, D. (2023). *Sustainable Urban Mobility–Multimodality as a Chance for Greener Cities: Evidence from Slovakia*. In: Cagáňová, D., Horňáková, N. (eds) *Industry 4.0 Challenges in Smart Cities*. EAI/Springer Innovations in Communication and Computing. Springer, Cham. [https://doi.org/10.1007/978-3-030-92968-8\\_7](https://doi.org/10.1007/978-3-030-92968-8_7)
- Huaccho Huatuco, L., Ball, P.D. (2019). The quest for achieving United Nations sustainability development goals (SDGs): Infrastructure and innovation for responsible production and consumption, *RAUSP Management Journal*, 54(3), 357-362. <https://doi.org/10.1108/RAUSP-04-2019-0068>
- Iqbal, T., Ahmad, S. (2022). Transparency in humanitarian logistics and supply chain: the moderating role of digitalisation, *Journal of Humanitarian Logistics and Supply Chain Management*, 12(3), 425-448. <https://doi.org/10.1108/JHLSCM-04-2021-0029>
- Kohnová, L., Salajová, N. (2023). Impact of Industry 4.0 on Companies: Value Chain Model Analysis. *Administrative Sciences*, 13(2), 35. <https://doi.org/10.3390/admsci13020035>
- Kohnová, L., Salajová, N. (2023). Re-Thinking Industry 4.0 Effect on Competitive Forces: Empirical Study on Innovation. *Sustainability*, 15(3), 2637. <https://doi.org/10.3390/su15032637>

- Lauffer, S. (2022). Mercedes-Benz Supplier Portal. *V052022\_Responsible Sourcing Standards\_DE.pdf*. (o. J.). Stuttgart: Mercedes - Benz Group AG. Retrieved March 20<sup>th</sup>, 2023, from <https://supplier.mercedes-benz.com/docs/DOC-2672>
- Lorincova, S., Hitka, M., Novotna, A., Durian, J., Štarchoň, P. (2022). Value preferences supporting company competitiveness in the field of corporate culture. *Polish Journal of Management Studies*, 26(1), 172-188. <https://doi.org/10.17512/pjms.2022.26.1.11>
- Ma, P., Lu, Y. (2023). Operational decisions of low-carbon supply chains with triple bottom line under carbon tax policy. *Kybernetes*, <https://doi.org/10.1108/K-07-2022-1055>
- Marcysiak, A. (2020). The scope of diversification of the warehouse space market in a regional configuration. *Entrepreneurship and Sustainability Issues*, 8(1), 10-23. [http://doi.org/10.9770/jesi.2020.8.1\(1\)](http://doi.org/10.9770/jesi.2020.8.1(1))
- Mercedes Benz Group. (2023). *Ambition 2039. A core element of our sustainable business strategy*. Stuttgart: Mercedes-Benz Group AG. Retrieved March 27<sup>th</sup>, 2023, from <https://group.mercedes-benz.com/sustainability/climate/ambition-2039-our-path-to-co2-neutrality.html>
- Miklosik, A., Starchon, P., Hitka, M. (2021) Environmental sustainability disclosures in annual reports of ASX Industrials List companies. *Environ Dev Sustain* 23, 16227-16245. <https://doi.org/10.1007/s10668-021-01338-8>
- Mishra, S., Singh, S.P. (2021). Carbon management framework for sustainable manufacturing using life cycle assessment, IoT and carbon sequestration. *Benchmarking: An International Journal*, 28(5), 1396-1409. <https://doi.org/10.1108/BIJ-01-2019-0044>
- Nature Office. (2022). *Carbon Footprint Kayser Automotive Systems GmbH*. Retrieved March 21<sup>th</sup>, 2023, from not published – internal document
- Meissner, Dr. H.-R. (2012). *Preisdruck auf die Automobilindustrie*. Hans-Böckler-Stiftung. Endbericht zum HBS-Projekt Nr. 2012-562-1, p 3, from: [https://www.boeckler.de/pdf\\_fof/91385.pdf](https://www.boeckler.de/pdf_fof/91385.pdf) or Retrieved March 21<sup>th</sup>, 2023 from URL
- Qamar, A., Hall, M.A., Collinson, S. (2018). Lean versus agile production: flexibility trade-offs within the automotive supply chain, *International Journal of Production Research*, 56(11), 3974-3993. <http://doi.org/10.1080/00207543.2018.1463109>
- Peráček, T. (2020). The perspectives of European society and the European cooperative as a form of entrepreneurship in the context of the impact of European economic policy. *On-line Journal Modelling the New Europe*, 38-56. <http://doi.org/10.24193/OJMNE.2020.34.02>
- Rebane, K., Reihan, A. (2016). Promoting building materials that have lower embodied carbon and energy in public procurements: Experience from Estonia. *Management of Environmental Quality*, 27(6), 722-739. <https://doi.org/10.1108/MEQ-07-2015-0154>
- Raji, I.O., Shevtshenko, E., Rossi, T., Strozzi, F. (2021). Industry 4.0 technologies as enablers of lean and agile supply chain strategies: an exploratory investigation. *The International Journal of Logistics Management*, 32(4), 1150-1189. <https://doi.org/10.1108/IJLM-04-2020-0157>
- Sanz, G., F., J. & Semmler, K. & Walther, J. (2007). *Die Automobilindustrie auf dem Weg zur globalen Netzwerkkompetenz*. Springer Berlin Heidelberg New York, V, pp. 18-22, ISBN 978-3-540-70783-7, from [https://doi.org/10.1007/978-3-540-70787-5\\_1](https://doi.org/10.1007/978-3-540-70787-5_1)
- Saunders, M., Lewis, P., Thornhill, A. (2009). *Research methods for business students*. Financial Times Prentice Hall, 5. Ed, pp. 256-257 from ISBN 978-0-273-71686-0
- Singh, N. (2015), Commentary: what's behind the price tag: understanding cost transparency? *European Journal of Marketing*, 49, 11/12, pp. 1987-1991. <https://doi.org/10.1108/EJM-07-2015-0454>
- Scribber. (2020). *Korrelationskoeffizient nach Pearson*. Retrieved March 21<sup>th</sup>, 2023, from <https://www.scribbr.de/statistik/korrelationskoeffizient/>
- Spieske, A., Gebhardt, M., Kopyto, M., Birkel, H., Hartmann, E. (2022). How did supply chain networks handle the COVID-19 pandemic? Empirical evidence from an automotive case study. *International Journal of Physical Distribution & Logistics Management*, 52(7), 567-601. <https://doi.org/10.1108/IJPDLM-06-2021-0231>
- Stacho, Z., Stachová, K., Lukáč, M., Kupec, V., & Petrů, N. (2023). Management Reflections on Innovations in Digitalization, with an Emphasis on Degree of Work Autonomy. *Business Administration and Management*, 26(1), 78-93. [10.15240/tul/001/2023-1-005](https://doi.org/10.15240/tul/001/2023-1-005)

Statista. (2022). *Anzahl der Betriebe in der Automobilindustrie in Deutschland von 2011 bis 2021*. Retrieved March 27<sup>th</sup>, 2023, from <https://de.statista.com/statistik/daten/studie/253827/umfrage/anzahl-der-betriebe-in-der-automobilindustrie/#:~:text=Im%20Jahr%202021%20waren%20laut,in%20der%20deutschen%20Automobilindustrie%20t%C3%A4tig.>

Questionstar. (2023). *Stichprobenrechner: Umfang der Stichprobe einfach berechnen*. Retrieved March 27<sup>th</sup>, 2023, from <https://www.questionstar.de/blog/stichprobenrechner-umfang-der-stichprobe-einfach-berechnen/>

Umweltbundesamt. (2020). *Treibhausgase und Treibhauseffekt*. Retrieved March 31<sup>th</sup>, 2023, from <https://www.umweltbundesamt.de/themen/klima-energie/klimaschutz-energiepolitik-in-deutschland/treibhausgas-emissionen/die-treibhausgase>

VDI Nachrichten. (2011). Düsseldorf: VDI Verlag. *Industrie 4.0: Mit dem Internet der Dinge auf dem Weg zur 4. industriellen Revolution*. Retrieved March 24<sup>th</sup>, 2023, from [https://www-live.dfki.de/fileadmin/user\\_upload/DFKI/Medien/News\\_Media/Presse/Presse-Highlights/vdinach2011a13-ind4.0-Internet-Dinge.pdf](https://www-live.dfki.de/fileadmin/user_upload/DFKI/Medien/News_Media/Presse/Presse-Highlights/vdinach2011a13-ind4.0-Internet-Dinge.pdf)

Volkswagen Group. (2023). How Volkswagen is becoming a climate-neutral company. Wolfsburg: Volkswagen Group. Retrieved March 27<sup>th</sup>, 2023, from <https://www.volkswagenag.com/en/news/stories/2021/02/how-volkswagen-is-becoming-a-climate-neutral-company.html>

Volvo. (2023). *Klimastrategie*. Copyright AB Volvo 2023 Retrieved March 27<sup>th</sup>, 2023, from <https://www.volvo-group.com/de/sustainability/climate-goals-strategy.html>

Werner, E. (2021). *Klimaneutral, CO<sub>2</sub>-neutral - nicht egal*. Tagesschau. Retrieved March 31<sup>th</sup>, 2023, from <https://www.tagesschau.de/wissen/klima/klimaneutralitaet-107.html>

Yousaf, A.U., Hussain, M., Schoenherr, T. (2023). Achieving carbon neutrality with smart supply chain management: a CE imperative for the petroleum industry, *Industrial Management & Data Systems*. <https://doi.org/10.1108/IMDS-11-2022-0726>

Zafari, F., Teuteberg, F. (2018). *Der Weg zum Einkauf 4.0: Herausforderungen bei der Automatisierung und Digitalisierung im Einkauf – Eine multi-methodische Analyse am Beispiel der Logistikbranche*. Leuphana Universität Lüneburg, Band 5. May 11<sup>th</sup> 2023, ISBN 978-3-935786-72-0

**Funding:** Comenius University Faculty of Management, Bratislava, Slovakia. Research grant VEGA 1/0614/23 The readiness of enterprises for the challenges associated with Industry 4.0 from the point of view of business processes and process management.

**Data Availability Statement:** More information can be obtained from the authors on a reasonable request.

**Author Contributions:** Conceptualization: *S.B., J.P.*; methodology: *S.B., J.P.*; data analysis: *S.B., J.P.*, writing—original draft preparation: *S.B., J.P.*, writing; review and editing: *S.B., J.P.*; visualization: *S.B., J.P.* All authors have read and agreed to the published version of the manuscript.

**Sebastian BUNZENDAHL** is an external PhD student at Comenius University in Bratislava. He has been working in the automotive industry in various responsibilities since 1997. Since 2017 he is global purchasing director of A. Kayser Automotive Group and managing director of AES Technology GmbH with global responsibility.

**ORCID:** <https://orcid.org/0000-0002-5963-5428>

**Jan PAPULA** is a professor on the Department of Strategy and Entrepreneurship, where he works in both pedagogical and scientific research fields. He is the Vice-Dean for Quality and Public Relations, a member of the Scientific Council of FM UK, and the Chairman of the Quality Council of FM UK. In practical fields, he has worked on several projects involving process mapping, analysis and optimisation, and accounts receivable valuation. He has collaborated with various consulting firms. At the Department of Strategy and Entrepreneurship, he established and leads the Research Lab on Industry 4.0 and Management Transformation, which oversees research projects and inspires doctoral students and young researchers in the department. He collaborates with experts from industry and scientific researchers from other universities in Slovakia and the Czech Republic.

**ORCID ID:** <https://orcid.org/0000-0002-5761-9213>

---

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VSI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



## THE APPLICATION OF CSR IN MARKETING COMMUNICATION AND ITS POTENTIAL IMPACT ON CUSTOMER PERCEIVED VALUE\*

Michal Ruschak<sup>1</sup>, Zdeněk Caha<sup>2</sup>, Milan Talíř<sup>3</sup>, Michal Konečný<sup>4</sup>

<sup>1</sup> Pan-European University, College of Entrepreneurship and Law, Spálená 76/14, 110 00 Praha, Czech Republic

<sup>2,4</sup> Faculty of Corporate Strategy, Institute of Technology and Business in České Budějovice, Okružní, 517/10, 370 01 České Budějovice, Czech Republic

<sup>3</sup> Brno University of Technology, Faculty of Business and Management, Kolejní 2906/4, 612 00 Brno, Czech Republic

E-mails: <sup>1</sup>[xruschak.michal@peuni.cz](mailto:xruschak.michal@peuni.cz); <sup>2</sup>[caha@mail.vstecb.cz](mailto:caha@mail.vstecb.cz); <sup>3</sup>[252620@vutbr.cz](mailto:252620@vutbr.cz); <sup>4</sup>[michal.konecny@mail.vstecb.cz](mailto:michal.konecny@mail.vstecb.cz)

Received 12 February 2023; accepted 15 May 2023; published 30 June 2023

**Abstract.** The research aims to determine whether companies using CSR in their marketing communication believe this approach has a positive effect on CPV and what forms of communication mix they most often use for this purpose. To achieve this goal, the method of online questionnaire survey was selected for data collection. The methods of correlation and regression analysis and structural equation modelling were used for data processing. Results obtained by interviewing business representatives show that companies often need to realize these are CSR principles to implement CSR activities. The most commonly used CSR communication tools include "Public relations & publicity" and "Internet marketing"; however, no statistically important correlation between these tools has been confirmed. The research results confirm that companies using CSR for marketing communication are aware of its importance concerning the brand's positive perception; on the other hand, from the perspective of the interviewed companies, no link between CSR, its communication, and the company's reputation has been confirmed. Companies might not be aware of the benefits the implementation of CSR and CSR communication may bring. Based on the research results, it can also be confirmed that the communication tools most commonly used by the companies that perceive the connection between CSR and CVP are online, i.e., digital marketing. The benefits of the research for practice consist in recommending the application of CSR-related marketing communication tools regularly and appropriately in the long run. Another recommendation is the targeted working with companies' reputation and promoting the good name of the brand. It shows that CSR communication can effectively build a brand's reputation, image, and identity. The results show that business representatives might need to be aware of all these benefits, including the potential impact on CPV.

**Keywords:** corporate social responsibility (CSR), customer perceived value (CPV); marketing communication; marketing; value; reputation; performance

**Reference** to this paper should be made as follows: Ruschak, M., Caha, Z., Talíř, M., Konečný, M. 2023. The application of CSR in marketing communication and its potential impact on customer perceived value. *Entrepreneurship and Sustainability Issues, automotive industry. Entrepreneurship and Sustainability Issues*, 10(4), 223-244. [http://doi.org/10.9770/jesi.2023.10.4\(14\)](http://doi.org/10.9770/jesi.2023.10.4(14))

**JEL Classifications:** M3

\* This research was funded by the Institute of Technology and Business in České Budějovice, grant numbers IVSUPS005 and IVSUPS003.

## 1. Introduction

Competitiveness is one of the crucial capabilities of firms to increase their performance (Civelek et al., 2023), including export activities (Civelek & Krajčák, 2022). In this regard, many businesses realize that the implementation of Corporate social responsibility principles can be a crucial factor in stimulating their competitiveness (Metzker et al., 2021; Metzker & Zvarikovai 2021), as their customers are increasingly more aware of the importance of companies for the development of the society and communities (Vavrova, 2022). The role of companies in this field is perceived, and the part of companies in this field is perceived and evaluated from the consumers' perspective (Nguyen, 2022; Belas et al., 2022). Although the implementation of CSR initially aimed at protecting consumer rights, environmental issues, and philanthropy (Bhaduri & Selarka, 2016), this is not the only motivator nowadays. The relationship between CRS and company performance has been confirmed by many researchers, where, e.g. Vishwanathan et al. (2020) proved the existence of a positive correlation between CSR and the financial performance of companies based on the synthesis of 344 conducted studies. They identified several basic mechanisms that explain the positive influence of CSR on corporate financial performance, specifically enhancing the company's reputation, increasing stakeholder reciprocation, risk mitigation, and strengthening innovation capacity. Innovativeness also makes businesses more competitive against their opponents (Ključnikov et al., 2021).

The implementation of CSR is currently carried out in customer-oriented, employee-oriented, environment-oriented, or philanthropy-oriented domains (Schaefer et al., 2020; Belas et al., 2020; Kabir, 2021). Companies tend to implement CSR processes when the risks of external exposure to corporate social irresponsible behaviour are high or the additional costs associated with implementing socially responsible practices are low (Bian et al., 2021). Another motivator, regardless of risks or costs, is enhancing reputation both at the external and internal levels. Enhancing reputation is also related to the company's performance and employees' loyalty and job satisfaction (Přivara et al., 2019a, 2019b; Tangngisalu et al., 2020; Gavurova et al., 2022). The relationship between CSR, corporate reputation and performance is also confirmed by Singh & Misra (2021). Unlike Tangngisalu et al. (2020), they state that employee-oriented CSR does not have any significant impact on performance or reputation; on the other hand, they demonstrated that the application of CSR towards external stakeholders is an important predictor to improve firm performance. According to Alshammari (2015), a company can benefit from the implementation of CSR in case it has a good reputation among stakeholders. A company needs marketing to build its reputation, especially in a robust competitive environment. The competitive environment, marketing, and CSR interaction significantly influence corporate performance (Kemper et al., 2013). The positive impact of social responsibility on corporate value was also confirmed by Xu et al. (2020) or Sheikh (2019), again in the case of a robust competitive environment, where CSR can be used as an effective tool to increase the effectiveness of marketing activities (Androniceanu, 2019).

The interest of stakeholders in the social and environmental impacts of business has been increasing in the last decades (Pan et al., 2022, Wang et al., 2021, Přivara et al., 2019; Streimikiene et al., 2021). These include both positive and negative impacts; business behaviour can lead to stronger relationships with stakeholders or their distancing, which results in higher investments in CSR aimed at increasing the engagement of stakeholders and enhancing the reputation through building a positive image (Přivara et al., 2018; Habek, Bialy, Livenskaya, 2019; Ajayi & Mmutle, 2021; Tai, 2022; Skare et al., 2023). A positive image can be built when the implementation of CSR is also communicated to stakeholders; what matters then is thus the content as well as the tools of communication. Kim & Ferguson (2014) divide communication channels into two broader categories, controlled media (advertisements, brochures, corporate websites) and uncontrolled media (e.g. blogs and social networks in general).

If a company is engaged in implementing management in line with CSR principles, it needs to communicate this to stakeholders using marketing communication tools. Thanks to the communication mix, the image of the

socially responsible company can be strengthened (Jahdi & Acikdilli, 2009; Sahoo & Pradhan, 2021; Quezado et al., 2022). There are doubts concerning the suitability and efficiency of CSR in marketing communication, as it may cause scepticism. Therefore, Salmones & Perez (2018) consider actual activities and reputation based on an ethical approach to business to be essential. Suppose CSR principles are declared and observed and, at the same time, appropriately communicated to stakeholders. In that case, they represent an effective tool for promoting and increasing reputation and may even increase the customer perceived value (CPV). Satar et al. (2019) describe CPV as very important and argue that businesses must not neglect customer expectations towards them; these expectations should be analyzed and met. Companies should adapt their products and services to be customer-oriented and meet customer needs (Přivara et al., 2020; Tkacova et al. 2017; Gavurova et al. 2022b). CPV increases with the growth of the total benefits for customers. According to Kodua et al. (2022), CSR improves all aspects of the brand, its quality, and brand loyalty, which results in increased CPV and reputation.

## **2. Research objectives**

The objective of the research is to determine whether businesses that implement and use CSR in their marketing communication believe that this approach has a positive impact on the value of their products perceived by customers (CPV - Customer perceived value) and which forms of communication mix they use most often for this purpose.

Effective CSR communication requires using suitable communication strategies and individual communication channels based on the dynamics and perceptions of individual stakeholders. It is necessary to find a balance between individual communication tools and the frequency of their use (Ajayi & Mmutle, 2021). This leads to the formulation of the first research question:

*RQ1: Which forms of communication mix are most often used by companies for the communication of CSR activities?*

According to many studies conducted, CSR communication is perceived from various perspectives, one of them being marketing and the role of CSR in marketing communication. Approaches to CSR communication can be divided into four groups, with two of them concerning external stakeholders, specifically CSR identity and CSR image (Crane & Glozer, 2016). This leads to the formulation of the second research question:

*RQ2: Do businesses that apply CSR in their marketing communication towards external stakeholders use CSR communication to strengthen the brand's good name or improve the company's reputation?*

The research shows that CSR improves brand reputation, which may be related to increased CPV (Kodua et al., 2022) if the company applies and uses CSR principles in communication. This leads to the formulation of the following research questions:

*RQ3: Are businesses that implement and use CSR in their marketing communication convinced that this approach positively impacts CPV (customer perceived value) of their product?*

*RQ4: Which forms of communication mix are most commonly used by businesses that perceive CSR as a tool to increase CPV?*

### 3. Theoretical background

The positive effects of CSR communication factors on consumer knowledge, trust and perception of business reputation were demonstrated, e.g., by Kim (2019), who analyzed the role of the specific factor of customer identification with the company within the CSR communication process by conducting a survey of consumers in the USA. The findings suggest that the positive effects of CSR awareness are permanent and independent of the level of customer identification with a given company. Avis et al. (2022) state that consumers behave differently and point to the need for better planning of the content of communication, as the correct setting of communication, can influence the knowledge of consumers and, thus, their purchasing behaviours. Kim (2019) adds that although self-promoting CSR communication of a company harms consumer trust and the company's reputation, these negative effects are not evident in the case of consumers with a high level of identification with a given company. In such a case, CSR communication improves consumer knowledge and positively impacts business reputation. Based on two representative surveys conducted in Beijing and Hong Kong, Kim (2022) empirically confirmed the existence of a CSR model based on the communication process in the USA where the perceived presence of individual CSR pillars of communication led to an increase in cognitive, affective, and behavioural responses of consumers, which positively affected the perception of business reputation. Kim, Yin & Lee (2020) argue that with the expansion of the social influence of companies, CSR activities are considered a critical factor for business management and consider customer perception of CSR activities essential for the company's future profitability and reputation. The relationship between CSR and corporate performance from the perspective of European multinational companies was empirically examined by Singh & Misra (2021) using a survey including 340 respondents, creating a theoretical model, and hierarchical regression analysis (including managers and senior executives). Their research also dealt with the efficiency focused on the effectiveness of business reputation as a mediator of CSR impact on business reputation. According to the results, applying CSR to external stakeholders influences organizational performance. Bian et al. (2021) argue that the issue of CSR is gaining importance. From the perspective of operations management, traditional non-CSR-compliant operations are less costly than the operations carried out following CSR but bring the risk of being exposed to third parties, which may negatively affect the company's market share due to customer concerns. Increased costs and a decrease in profitability in relation to China's mandatory CSR disclosure were confirmed by Chen, Hung & Wang (2018), who examined the impact of mandatory CSR disclosure on business profitability and social externalities. However, they also noticed a decrease in the levels of industrial wastewater and SO<sub>2</sub> emissions in the case of reporting companies. Mandatory CSR disclosure can thus alter the behaviour of companies and create positive externalities but at the expense of stakeholders. A decrease in profitability and increased costs in connection with the implementation of CSR are pointed out by Zhuang et al. (2021), who conducted a questionnaire survey to determine the effects of CSR for Smart cities and analyzed purchasing behaviour of consumers. However, according to other research conducted, CSR increases all aspects of brand value, which may compensate for this loss (Kodua et al., 2022). Due to pressure from stakeholders related to the implementation of CSR, Iglesias et al. (2020) investigated the impact of CSR on customer loyalty using the relationship between the co-creation of value and customer trust. They conducted an online questionnaire survey responded to by 1 101 clients of health insurance companies. Iglesias et al. (2020) used structural equation modelling to test the hypothesized relationships. The results show that CSR, directly and indirectly, influences customer loyalty through the co-creation of values and customer trust. The relationship between CSR and customer loyalty at the level of developing countries was addressed by Islam et al. (2021), who assume that sustainable competitive advantage is based on scarce and irreplaceable resources and stakeholder theory, thus developing the premise that CSR, together with business reputation, customer satisfaction and trust, affects customer loyalty. The research was based on the data on telecommunications users and confirmed that CSR initiatives are significantly and positively associated with business reputation, customer satisfaction and trust. In the context of the COVID-19 pandemic, He & Harris (2020) dealt with its impact on the development of CSR and marketing. According to the authors, the pandemic allowed companies to implement original and authentic CSR and thus contribute to solving urgent global social and environmental issues. These findings are also confirmed by research conducted by Mahmud,

Ding & Hasan (2021), who analyzed the responses to the COVID-19 pandemic through CSR initiatives to support important stakeholders, such as employees, customers, communities, and society as a whole. The research was based on press releases, newsletters, and annual reports. According to its results, companies were engaged in CSR initiatives during the pandemic and communicated them to their stakeholders. In the business community, COVID-19 thus stimulated a discussion about the inevitability of CSR and the forms of communication (Androniceanu & Marton, 2021). The issue of integrating CSR into communication was also addressed by Wu & Zhu (2021). Regarding the global economic downturn caused by the pandemic, the authors investigated whether the implementation of CSR in social media can help a company survive this crisis. A theoretical model developed for the description of hypothetical relationships was tested through an online questionnaire using the method of structural equations modelling. According to Wu & Zhu (2021), there is a positive correlation between the implementation of CSR on the social platform WeChat, the identification of customers with a given company, and customer behaviour, e.g. in the form of purchase intentions, brand loyalty, or eWOM (e-word of mouth). The COVID-19 pandemic and its impact on customers, tourism (Skare et al., 2021; Vorobeva & Dana, 2021; Estiri et al., 2022; Bhowmik et al., 2021; Přívara, 2022) employees, and organizations were also addressed in research conducted by Nayal, Pandey & Paul (2022), who, based on the review of the existing literature and the content analysis of responses obtained through semi-structured interviews with top managers and senior executives from various industries, formulated specific steps to manage the crisis. One of the basic recommendations for companies in relation to marketing and CSR is to build a positive image by implementing CSR activities that society could benefit from. However, despite the willingness of companies to carry out and promote their CSR activities, the setting of communication tools remains a challenge (Salmones & Perez, 2018). With the spread and expansion of the Internet, the potential for a broader use of social media in communication arises, also as a solution for the financial problems of SMEs (Civelek et al., 2022). Chen & Lin (2019) used a questionnaire survey including 502 social network users to examine the effect of their use. In their research, the authors proved that marketing activities on social networks indirectly influence customer satisfaction through social identification and customer perceived value, while CPV directly influences satisfaction and the intention to continue, participate, and purchase (Androniceanu et al., 2022). There is also a relationship between the value creation process at the strategic thinking level and the value required by customers (Strakova et al., 2021). In addition to social media, Dwivedi et al. (2021) also mention the role of digital marketing in general, artificial intelligence, augmented reality, digital content management, mobile marketing, and Advertisement, or e-WOM in connection with influencing the expected value. Digital marketing tools can thus be suitable tools for promoting CSR activities. Trends in e-marketing using bibliographic analysis through VOS Viewer software were also examined by Gao et al. (2021).

An online questionnaire survey was selected for data collection to achieve the research goal based on the research of other authors' approaches. The data will be processed using the methods of correlation and regression analysis and structural equations modelling.

#### **4. Methodology and data**

##### **Data collection**

Based on the literature review, an online questionnaire survey was selected as a data collection method. Based on the formulated research questions, several questions will be created that will be included in a broader questionnaire survey aimed at social responsibility and ethical management. The questionnaire will be divided into four parts. The first will consist of identification questions, and the remaining parts will deal with corporate social responsibility, pillars of corporate social responsibility, code of ethics, and CSR and reporting. These parts will primarily include questions aimed at answering the formulated research questions. The data will be collected in the Czech Republic from October 2022 to December 2022. The survey will include companies of all size categories (companies from 0 to 250 and more employees) as this is the initial phase of the research, following the study conducted by many other authors (Ali et al., 2017; de Klerk et al., 2018; Hamid et al., 2021; Pabreja et al.,

2022), a non-probability sampling method, namely random sample selection, when the probability of selecting individual samples from the population is not known will be used. The data will be collected using an online form available to respondents from Google Forms. The link to the questionnaire will be distributed through the employees of the Faculty of Corporate Strategy of the Institute of Technology and Business and the South Bohemian Agency for Innovation Support (Jihočeská agentura pro podporu inovací, o.p.s.) and their partner organizations and institutions with a nationwide scope. The following questions will be formulated to respond the research questions and achieve the research goal:

In terms of RQ1, RQ3, and RQ4, the respondents will answer question 22 "In communication or application of CSR activities, you use these forms of communication mix: Advertisement; Sales support; Direct marketing; Sponsorship; Internet marketing; Public relations and publicity; Personal sale; Event marketing; Point of sale communication; Exhibitions and fairs and Others". The options for answers will be as follows: "very often; often; occasionally; never". Furthermore, the respondents will be asked about the relationship between CSR and CPV in question 21 "In your opinion, can the implementation of CSR activities and their subsequent communication towards customers increase CPV, i.e., customer perceived value of your product?" with the possible answers "Definitely yes; Rather yeas; Rather no; Definitely no; I can't say". The literature review pointed to the existence between CSR, the brand's value, reputation, and CPV (Kodua et al., 2022; Singh & Misra, 2021). Question 12 will thus concern the benefits of CSR for an organization: "How do you perceive the benefits of implementing CSR activities for your organization?" Here specific examples will be given here: "Strengthening of the good name of the brand – brand building" and "Improving company's reputation and its perception by stakeholders". The respondents will choose from the following options: "1= significant impact; 2 = rather significant impact; 3 = neither significant or insignificant impact 4 = rather insignificant impact; 5 = no impact".

In order to answer RQ2, the respondents will answer the aforementioned Question 12 and Question 20 "When implementing CSR activities, you also decide on the way of their communication towards customers and other collaborating entities and information about them regularly". Possible answers are "Yes (All CSR activities are communicated to the public)"; "Partially (Only selected CSR activities are communicated towards the public)", "No (The public is not informed about the implemented CSR activities)".

### **Formulation of hypotheses**

For the statistical evaluation of some of the research questions, it is necessary to formulate hypotheses (see below):

*RQ2: Do businesses that apply CSR in their marketing communication towards external stakeholders use CSR communication to strengthen the brand's good name or improve the company's reputation?*

As stated by Crane & Glozer (2016), regarding CSR communication towards stakeholders, there are two possible approaches: CSR identity and CSR image. In line with this finding, two hypotheses are formulated:

RQ2 H1: Companies that apply CSR use CSR activities in their marketing communication to strengthen the brand's good name.

RQ2 H01: Companies that apply CSR do not use CSR activities in their marketing communication to strengthen the brand's good name.

RQ2 H2: Companies that apply CSR use CSR activities in their marketing communication to improve the company's reputation.

RQ2 H02: Companies that apply CSR do not use CSR activities in their marketing communication to improve the company's reputation.

*RQ3: Are businesses that implement and use CSR in their marketing communication convinced that this approach positively impacts CPV (customer perceived value) of their product?*

According to Kodua et al. (2022), CSR enhances brand reputation, which may have an impact on increasing CPV, which is also stated by Salmones & Perez (2018). According to Satar et al. (2019), companies must pay attention to customer expectations, analyze them and meet them. To answer the research question, the following hypothesis is formulated:

RQ3 H1: Companies that implement and use CSR in marketing communication are convinced that this approach positively impacts CPV.

RQ3 H0: Companies that implement and use CSR in marketing communication must be convinced that this approach positively impacts CPV.

### Data processing

Data transformation – there are many ways to transform data. For data transformation, functions independent of the analyzed data and constants are used. Data transformation (e.g., multiplication of the values of a variable by a constant) does not change the analysis results in the analysis of the relationship between variables (e.g., correlation). If the absolute value of the variable is significant, its significance in the research is weighted. For data transformation, it is thus possible to use parameters such as the median compared to the mean value, where the standard deviation should be monitored with a specification for the normality of the sample (Hamasha, 2022).

**Bibliographic analysis** – analysis of keywords using the VoS Viewer program enables the creation of a bibliographic map, which helps identify the gaps in the current literature. The first step is to create search parameters that will be entered into Web of Science. After searching for matching articles, the data for the first 1000 articles must be exported (export limit). The data are then entered into the VoS Viewer program, creating a corresponding bibliographic map according to the specified criteria (number of occurrences, etc.). Individual words are marked with bubbles and divided into categories (clusters) according to different colours. Other factors are the size and distance of the bubbles, where the size indicates the number of occurrences and the size is the number of common occurrences between individual words (van Eck and Waltman, 2010).

**Correlation analysis** shows the statistical dependence between the selected variables using correlation coefficient  $r$ , whose value ranges between -1 and 1. The result of the correlation analysis close to 1 indicates direct dependence, while the resulting value of -1 indicates indirect dependence. The last variant is independence if the value  $r$  is 0 (Dwiyanti et al., 2021; Katthi & Ganapathy, 2021).

**One-way analysis of variance ANOVA** is a mathematical model used to test hypotheses when one factor is set. The goal is to define the dependence of a quantitative variable on a given factor. The output of this analysis is a table containing the parameters of p-value. The hypothesis is further examined only if the p-value exceeds 0.05 (Akabay et al., 2019; Kim, 2022).

### Formula 1. ANOVA

$y_{ij} = \bar{A}\mu + \bar{I} \pm_i + \bar{I}\mu_{ij}$ ; where:

$y_{ij}$ = measured value;  $\mu$ = average value;  $a_i$ = change in the measured value caused by a factor;

$\epsilon_{ij}$ = experimental error

**Chi-square** – another method used is the statistical hypothesis test using the chi-squared, which is used to test the goodness of fit between the expected and observed values. The application of Chi-squared is recommended from a specified frequency of data; otherwise, the data could be inaccurate. As with the ANOVA method, the

hypothesis is further examined only if the p-value > 0.05 (Berrett and Samworth, 2021; Xu, Zhang and Wei, 2019)

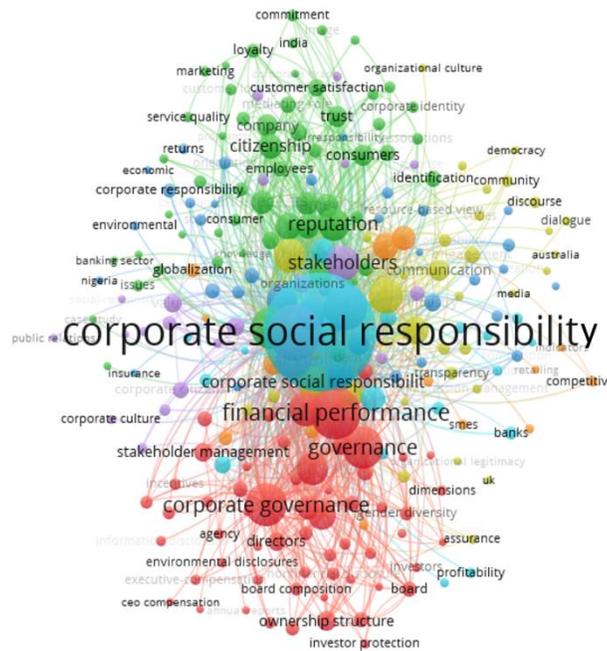
**Formula 2.** Pearson's goodness-of-fit test

$$\chi^2 = \sum_{i=1}^k \frac{n_{ei} - n_{oi}}{n_{oi}}$$

Where:  $n_{ei}$  = experimental frequency;  $n_{oi}$  = theoretical frequency

**Results**

To identify the gaps in CSR research, the VoS Viewer program was used for this paper. The first step was a search for **Corporate Social Responsibility in the Web of Science** in the categories of Management and Business, which found 19 847 publications. The next step was exporting data from the first 1 000 articles (sorted by relevance), based on which a bibliographic map was created. The parameters of all keywords and the minimum occurrence of at least 5 publications were used for its creation. The output of this analysis was the identification of 241 keywords, which were divided into clusters. The keywords analysis confirmed the assumption that there need to be more publications dealing with the relationship between CSR and CPV.



**Fig. 1.** Results Bibliographic map of Corporate Social Responsibility  
Source: authors

Within the online questionnaire survey, the questions were responded to by 98 respondents from companies operating in the primary, secondary, and tertiary sectors and carrying out their business activities in the Czech Republic. From the marketing perspective, a communication mix is a communication tool towards stakeholders, and it is necessary to find a suitable distribution and intensity of using its tools (Ajayi & Mmutle, 2021). Figure 2

shows 11 monitored forms of communication defined within the communication mix, which companies use in connection with CSR activities. The research was implemented through a survey that monitored the assigned level for each item. In this case, the best rated "very often", followed by "often", "occasionally", and finally "never".

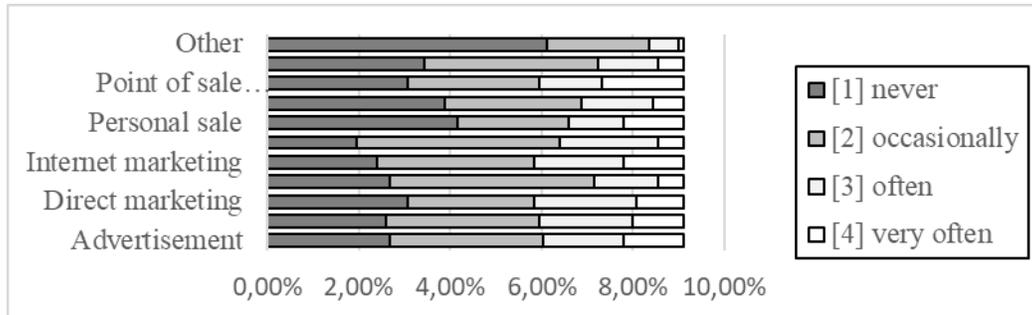


Fig. 2. Share of CSR activities on forms of communication mix used by companies  
Source: authors

In total, the frequency of the responses for all communication tools is as follows: "very often" – 36.09 %; "often" – 36.09 %; "occasionally" – 17.63 %; "never" – 10.20 %. The results suggest that the most commonly used form of CSR communication, i.e., marked as "very often", is "Point of sale communication" (1.76 % of responses), followed by "Internet marketing", "Personal sale" and "Advertisement", all of them occurring in 1.3 % of responses each. Tools marked as "often" used include "Direct marketing" (2.23 % of responses), "Public relations and publicity" (2.13 %), and "Sales support" (2.04 %). The option "occasionally" appears most often in the case of "Sponsorship" and "Public relations and publicity" (4.45 %). The option "never" was most often used for "Others" (6.12 %) and "Personal sale" (4.17 %). The highest percentage of positive responses was detected in the case of "Public relations and publicity" and "Internet marketing" communication tools. These tools will be further analyzed using correlation analysis to better represent the importance of the individual communication mix tools. The results are presented in Table 1.

Table 1. Results of correlation analysis

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
A1	1.000										
A2	0.499	1.000									
A3	<b>0.526</b>	<b>0.605</b>	1.000								
A4	0.234	0.316	0.295	1.000							
A5	<b>0.563</b>	0.476	<b>0.528</b>	0.092	1.000						
A6	0.300	0.271	0.397	0.303	0.345	1.000					
A7	0.315	<b>0.575</b>	0.409	0.045	0.237	0.157	1.000				
A8	0.420	0.344	<b>0.536</b>	0.272	0.487	0.406	0.410	1.000			
A9	0.312	<b>0.538</b>	0.361	0.060	0.132	0.047	<b>0.726</b>	0.288	1.000		
A10	0.267	0.335	0.204	0.180	0.254	0.180	0.235	0.399	0.268	1.000	
A11	0.233	0.131	0.251	-0.021	0.281	0.096	0.250	0.352	0.147	0.274	1.000
Legend:											
A1	Advertisement		A5	Internet marketing			A9	Point of sale communication			
A2	Sales support		A6	Public relations & publicity			A10	Exhibitions and fairs			
A3	Direct marketing		A7	Personal sale			A11	Other			
A4	Sponsorship		A8	Event marketing							

Source: authors

Correlation analysis shows mutual dependence of individual factors of communication mix where the highest significance is calculated between the parameter (A9) "Point of sale communication" and (A7) "Personal sale", with the correlation coefficient value of 0.726. Another important significance value is confirmed between (A3) "Direct marketing" and (A2) "Personal sale" with the value of the reliability level of  $r=0.605$ . The most correlated factors were identified in cluster A2: A3+A7+A9. The research further focuses on structural equation modelling, which requires data transformation from the multi-factor question 22 where the original data (98 rows with 11 columns) need to be transformed into a parameter with 1 column and 98 rows.

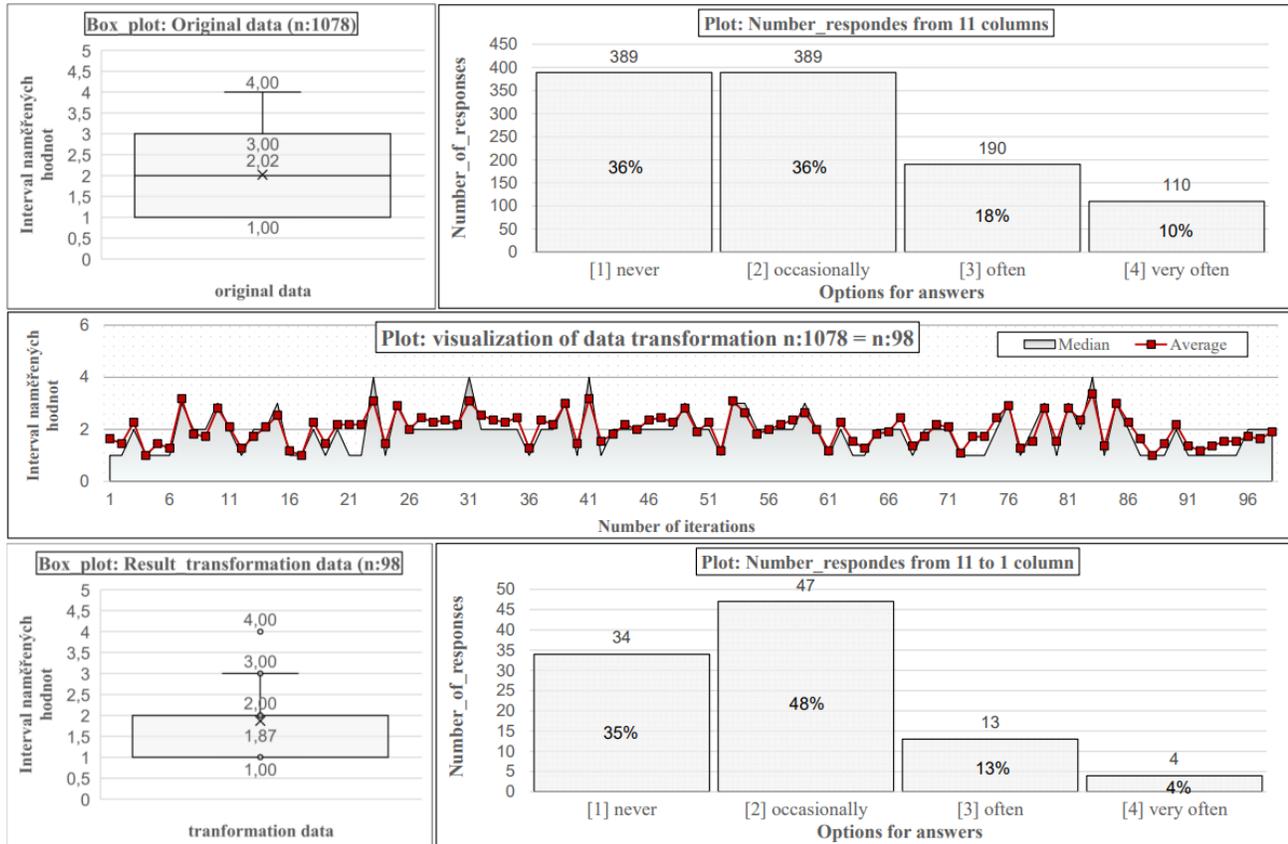


Fig. 3. Transformation of the factors of the dataset 98x11 into 98x1

Source: authors

The dataset before and answer to the transformation can be seen in Figure 3, which also shows the normality of data supplemented with basic descriptive statistics using boxplots and a histogram of categorical variable parameters accompanied by the determination of the median and the weighted average within the respondents. In the first step, all columns are transformed into one row, thus creating a vector 1078x1, which is then analyzed from the perspective of data normality. Next, the arithmetic average is determined in the sum of all columns in each row; this is followed by determining the median, which serves as an indicator for dimensional data reduction. This fact is projected onto a 98x11 data sample in each row. The significance of the occurrence is also within acceptable limits, as the original data set was [36% 36% 18% 10%], while the transformed one [35% 48% 13% 10%].

**Table 2.** Data transformation from 11 columns into 1 column

Original data				Transformation data			
Mean value	2.02	Difference min-max	3.00	Mean value	1.87	Difference min-max	3.00
Mean error	0.03	Minimum	1.00	Mean error	0.08	Minimum	1.00
Median	2.00	Maximum	4.00	Median	2.00	Maximum	4.00
Modus	1.00	Sum	2177.00	Modus	2.00	Sum	183.00
Standard deviation	0.97	Number	1078.00	Standard deviation	0.79	number	98.00
Sample variance	0.95	Highest (1)	4.00	Sample variance	0.63	Highest (1)	4.00
Kurtosis	-0.62	Lowest (1)	1.00	Kurtosis	0.30	Lowest (1)	1.00
Skewness	0.63	Level (95.0%)	0.06	Skewness	0.75	Level (95.0%)	0.16

Source: authors

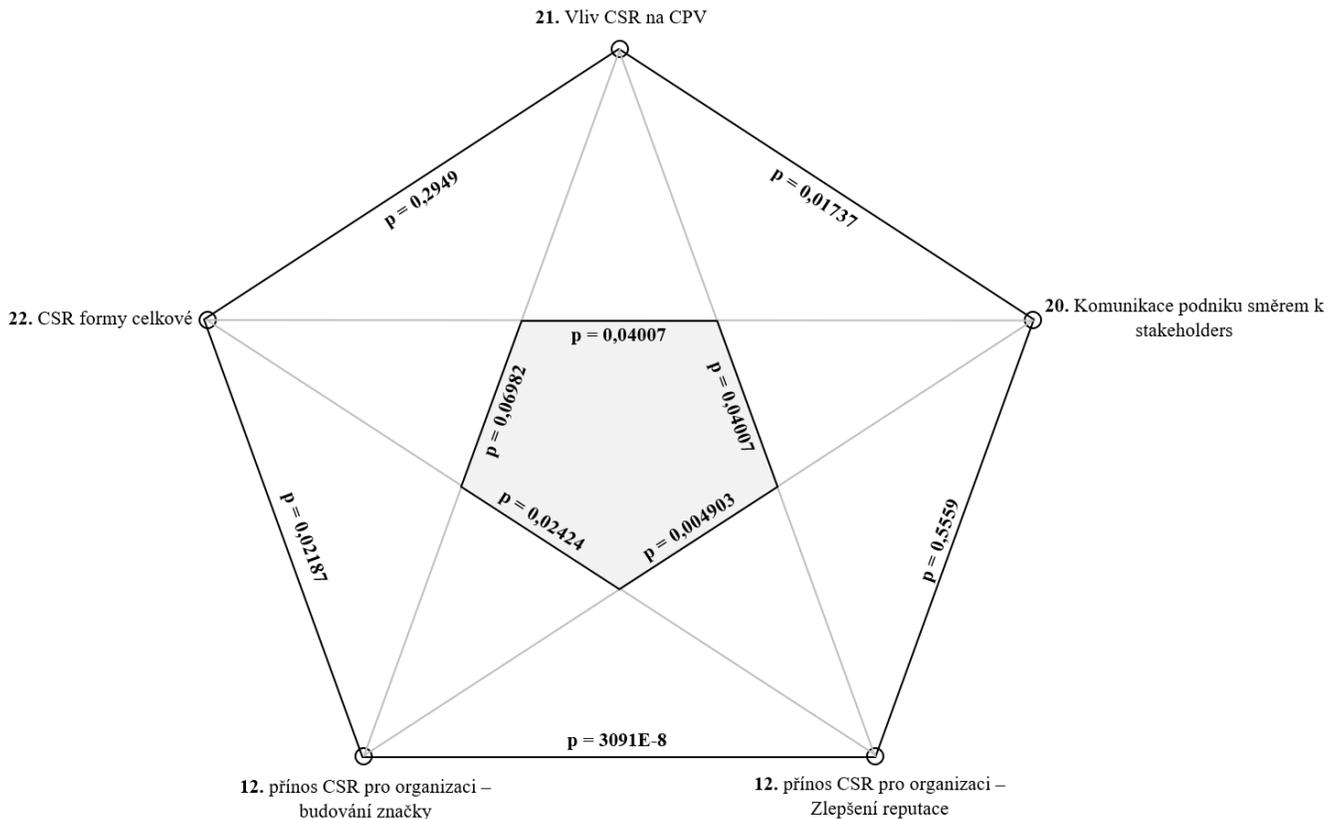
The visualization is supplemented by a table of values (Table 2) which compares the parameters before and after the data transformation. Data approximation of the transformed values reflects that the data normality remains stable. It is specifically the mean value, which was 2.02 in the original data set and 1.87 after the transformation, and the standard deviation, which shows the values of 0.97 and 0.79. The minimum and maximum values range also remains stable; similarly, the median, which is statistically the most significant factor, remains at the value of 2. After successful transformation, structural equation modelling can be carried out in two steps, first for the external and then the internal structure of the model to achieve the integration of the mutual interaction of all observed variables. The results of the analysis are presented in Table 3.

**Table 3.** Results of structural equation modelling – Chi-squared test

External links from structural equation modelling – Chi-squared test			
Question 12: CSR benefits for the organization – brand building	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 12: CSR benefits for the organization – improving reputation	64.705	12	3091E-8**
Question 12: CSR benefits for the organization – improving reputation	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 20: Corporate communication towards stakeholders	18.478	20	0.5559
Question 20: Corporate communication towards stakeholders	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 21: Impact of CSR on CPV	35.549	20	0.01737
Question 21: Impact of CSR on CPV	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 22: CSR forms	14.092	12	0.2949
Question 22: CSR forms	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 12: CSR benefits for the organization – brand building	19.417	9	0.02187
Internal links from structural equation modelling – Chi-squared test			
Question 12: CSR benefits for the organization – improving reputation	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 20: Corporate communication towards stakeholders	32.863	15	0.004903
Question 12: CSR benefits for the organization – improving reputation	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 21: Impact of CSR on CPV	15.243	16	0.5069
Question 20: Corporate communication towards stakeholders	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 22: CSR forms	25.81	15	0.04007
Question 21: Impact of CSR on CPV	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 12: CSR benefits for the organization – brand building	19.858	12	0.06982
Question 22: CSR forms	<b>X-quared</b>	<b>df</b>	<b>p-value</b>
Question 12: CSR benefits for the organization – improving reputation	23.437	12	0.02424

Source: authors

For clarity, Figure 4 is presented below, reflecting the selected supporting statistical method, which considers the main results from the Chi-squared test through the Pearson coefficient.



**Fig. 4.** Diagram of the result of structural equation modelling – Chi-squared  
*Source:* authors

Overall, out of 10 tests performed, only three were not confirmed, with measurement results achieving a level of significance above 0.05. The statistical significance of Question 12 b) reputation, Question 20 Corporate communication towards stakeholders, Question 22 CSR forms, Question 21 Impact of CSR on CPV, and Question 21 Impact of CSR on CPV, and Question 12 a) brand building was not confirmed.

Given the formulated hypotheses for RQ2 and the statistical evaluation results, RQ2 H02 cannot be rejected, and RQ2 H2, according to which companies that implement CSR to improve their company's reputation, cannot be confirmed. On the contrary, it is possible to reject RQ2 H01, which confirms RQ2 H1, i.e., the application of CSR in a marketing communication to strengthen the brand's good name.

The results of the above model confirm the statistical significance between Question 21 Impact of CSR on CPV and Question 20, Corporate communication towards stakeholders. Since the value of 0.01737 is below the significance level, the null hypothesis RQ3 H0 can be rejected. At the same time, RQ3 H1, according to which the companies that implement and use CSR in their marketing communication are convinced about the positive impact on CPV can be confirmed.

To answer the last research question, RQ4, the results in Question 21 are cleaned from the responses "I can't say"; "rather not", and "definitely not". The answer options for Question 22 were assigned numerical values as follows: never = 1, occasionally = 2, often = 3, and very often = 4. The values are then added up and graphically processed.

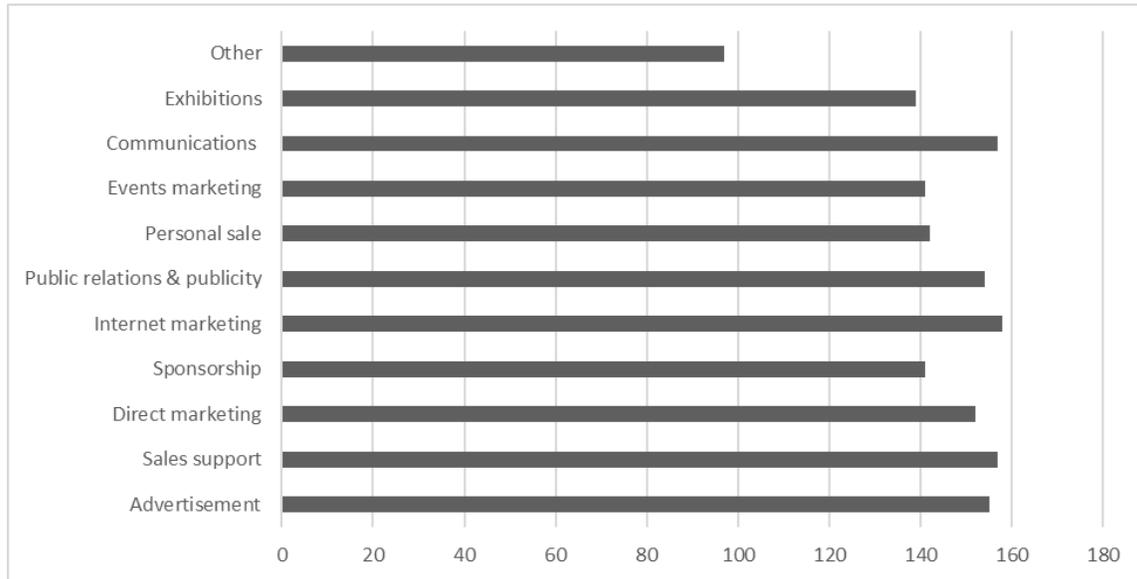


Fig. 5. Forms of communication used by companies perceiving CSR as a tool to increase CPV

Source: authors

After removing the negative answers, the most commonly used communication tools are "Internet marketing", "Sales support", "Point of sale communication", and "Advertisement".

To answer RQ4, one-way analysis of variance (ANOVA) test is performed. Individual tools of communication mix are tested for the companies that perceive the CSR implementation and communication as a tool to increase CPV. The results of the ANOVA test are presented in Table 4.

Table 4. ANOVA test results

ANOVA test	Tested factor: "Influence of CSR on CPV"				
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
<b>Advertisement</b>	<b>1</b>	<b>4.83</b>	<b>4.829</b>	<b>4.375</b>	<b>0.0403 *</b>
Residuals	66	72.86	1.104		
Sales support	1	1.00	0.9978	1.005	0,32
Residuals	66	65.52	0.9927		
<b>Direct marketing</b>	<b>1</b>	<b>2.85</b>	<b>2.852</b>	<b>2.793</b>	<b>0.0994.</b>
Residuals	66	67.38	1.021		
Sponsorship	1	1.22	1.2198	1.698	0.197
Residuals	66	47.41	0.7184		
<b>Internet marketing</b>	<b>1</b>	<b>2.83</b>	<b>2.8263</b>	<b>2.912</b>	<b>0.0926.</b>
Residuals	66	64.06	0.9705		
Public relations & publicity	1	1.59	1.5851	2.107	0.151
Residuals	66	49.65	0.7523		
Personal sale	1	0.26	0.2551	0.218	0,642
Residuals	66	77.22	1.1699		
Events marketing	1	0.35	0.3502	0.349	0.557
Residuals	66	66.28	1.0043		
Communications	1	0.55	0.5514	0.433	0.513
Residuals	66	83.96	1.2722		
Exhibitions	1	0.07	0.0676	0.081	0.776
Residuals	66	54.80	0.8303		
Other	1	0.09	0.0932	0.189	0.665
Residuals	66	32.54	0.4930		

[Signif, codes: 0 '\*\*\*' 0,001 '\*\*' 0,01 '\*' 0,05 '.' 0,1' 1]

Source: authors

However, the ANOVA test confirmed statistical significance only for “Advertisement” ( $p = 0.0403$ ). Another statistical significance, but in the limit interval of acceptance, was recorded in the case of “Direct marketing” ( $p = 0.0994$ ) and “Internet marketing” ( $P = 0.0926$ ).

## Discussion

The results of interviewing representatives from practice indicate that companies often implement CSR activities without realizing these are CSR principles. Thus, they might not primarily aim to increase CPV, or improve their reputation, image, or financial performance. However, according to Ajayi & Mmutle (2021), companies are aware that stakeholders are interested in social and environmental impacts and carry out partial CSR activities. To achieve the paper's goal, four research questions were formulated, out of which two were supplemented with hypotheses.

*RQ1: Which forms of communication mix are most often used by companies to communicate CSR activities?*

The first research question was answered by determining the most commonly used communication tool mentioned by the respondents in the answers to Question 22. The largest share of positive responses was recorded in the case of the tools "Public relations and publicity" and "Internet marketing". This was an expected result in the case of PR and publicity since PR is a tool for building long-term public relations. This finding is also confirmed in the research conducted by Mahmud, Ding & Hasan (2021), who dealt with the support of stakeholders in times of crisis and subsequent communication of this support through PR activities. In the case of internet marketing, the finding is in line with the findings of Wu & Zhu (2021), who investigated the application of CSR on social platforms that are part of Internet/digital marketing. Chen & Lin (2019) also pointed out the use of social media.

Based on the correlation analysis, which examined the dependencies between the communication mix tools, it was found that there is no dependence between the most-commonly tools. The most correlated tools were identified with Sales support, specifically Direct marketing, Personal sale, and point of sale communication.

*RQ2: Do businesses that apply CSR in their marketing communication towards external stakeholders use CSR communication to strengthen the brand's good name or improve the company's reputation?*

RQ2 H1 was accepted, which confirms that the interviewed companies applying CSR use these activities in their marketing communication where one of the aims is to enhance the good name of the brand. This finding also confirms the possible link to CPV; this is in line with Kodu et al. (2022), who also identified this link. The research thus confirms that companies using CSR in their marketing communication are aware of the importance of socially responsible activities in relation to brand perception, customer loyalty, and brand quality. In contrast, the results did not confirm RQ2 H2; therefore, it cannot be stated that companies that implement CSR and use it in their marketing communication do so also to improve the reputation of the company. The conducted research is thus not in line with the findings by Singh & Misra (2021), who consider this link to be significant. However, as stated, e.g. by Alshammari (2015), companies can benefit from the implementation of CSR and CSR communication mainly if they already have a good reputation among stakeholders.

On the other hand, the results may also demonstrate companies' awareness that self-promoting communication may negatively impact customer trust and corporate reputation, as stated by Kim (2019). Both the confirmation of the first hypothesis and the rejection of the second hypothesis raise the question of whether companies are aware of all benefits the implementation of CSR and CSR communication may bring and whether the communication of

CSR activities is not random rather than targeted, which may also negatively affect the profitability (Kim, Yin & Lee, 2020). Considering the findings of many other researchers, the RQ2 H2 can demonstrate the research limitations and the application of the non-probability sampling method.

*RQ3: Are businesses that implement and use CSR in their marketing communication convinced that this approach positively impacts CPV (customer perceived value) of their product?*

As RQ3 H1 was confirmed, it can be argued that companies that apply and use CSR in their marketing communication are convinced that this approach positively affects CPV. Therefore, if the interviewed companies deal with a suitable method of communicating CSR activities towards stakeholders and informing them about them regularly, they do so also with the aim of targeted increase of CPV. This is in line with the findings of Kodu et al. (2022) or Salmones & Perez (2018).

*RQ4: Which forms of communication mix are most commonly used by businesses that perceive CSR as a tool to increase CPV?*

Many researchers deal with suitable CSR communication tools. Salmones & Perez (2018) state that setting up communication tools is challenging. Chen & Lin (2019) mention social networking as an efficient tool, while Dwivedi et al. (2021) mention digital marketing in general. Based on the research results, the most commonly used communication tools include the internet, i.e., digital marketing. In addition to digital communication, other commonly mentioned tools include Sales support, Point of sale communication, or Advertisement. The answer to the research question thus partially supports the findings presented in other studies; however, the performed tests confirmed the statistical significance between perceiving CSR as a tool to increase CPV and communication tools only in the case of the Advertisement tool. Other researchers also mention Internet marketing but in the limited interval of acceptability, which means that it cannot be ambiguously identified as one of the most frequently used tools in relation to CPV and CSR.

### **Benefits of the research**

Recent years have shown the necessity to consider socially responsible behaviour, sustainability, ethics, and implementation of CSR not only in connection with the fulfilment of legislative requirements and regulations but also in relation to increasing the competitiveness of companies. Many companies implement CSR principles mainly with regard to rules and legislation, but mainly large companies also perceive their role in the development of society and communities. Within the literature review, it was mentioned that the implementation of CSR is often associated with higher costs and reduced profitability of companies; however, companies are not always able to fully use the potential of CSR in their marketing communication and are often unaware of the relationship between CSR and the increase in the reputation or performance of the company. Thus, the research focused on finding the connection between CSR, its communication, and its impact on CPV where CPV can be a tool to increase corporate profitability and its positive influence may compensate for the higher costs.

To use the potential of CSR, companies primarily need to be aware that they are implementing CSR-related activities if they are not doing so intentionally. Furthermore, it is necessary to identify and communicate them to stakeholders. As for communication, it is also necessary to deal with suitable tools for marketing communication and the intensity of such communication. In the current digital age, information is highly available using digital technologies. Therefore, one of the most frequently used CSR communication tools is digital marketing, followed by public relations and publicity, which can also be communicated using digital tools. PR is a long-term process of building relations with the public, which makes it a very suitable tool for communicating socially responsible behaviour. This communication can have a long-term positive impact on stakeholders. The benefit of the practice is thus a recommendation to use these tools and pay attention to active work with social networks. Another

suggestion for companies is targeted work with the company's reputation and improving the brand's good name. CSR communication can be an effective tool for building reputation, image, and identity. The research results indicate that company representatives may be unaware of these possibilities.

The targeted communication of the application of CSR principles may enable influencing positively CPV. This means that customers can expect a growth in the value of the product they are purchasing, e.g. the willingness to pay more, make more effort to obtain such a product, or the reduction of other customer benefits while maintaining the same resulting value. Companies that implement and use CSR in communication are aware of its positive effect on CPV; however, the question remains whether they really make full use of its potential and whether the marketing communication tools they use are suitable and effective.

## **Conclusion**

The goal of the research was to determine whether companies that implement and use CSR in their marketing communication are convinced that this approach has a positive impact on the value of their products towards customers, i.e., customer perceived value (CPV) and what forms of communication mix they use most often for this purpose.

The results show that public relations and publicity and Internet/Digital marketing are the most frequently used marketing tools for communicating CSR activities. The companies are aware of the connection between CSR communication and a positive brand perception but must be fully aware of the link to the company's reputation. This indicates that companies need to use the potential of CSR communication fully. However, this assumption would have to be confirmed by other research, including a more prominent and representative sample of respondents. Further research should also deal with the issue of improving the reputation and good name of the brand from the perspective of stakeholders, which was different from the subject of the presented research. The interviewed companies that use CSR in their marketing communication realize that this positively affects CPV. These companies' most frequently used communication tools are internet/digital marketing. Nevertheless, the issue of a suitable CSR communication tool to increase CPV should be further addressed from the perspective of companies and external stakeholders. Based on these results, the goal of the research was achieved.

Research limitations include the selected non-probability sampling method in the form of random sampling. This means that the results achieved can only be generalized for some companies' population. However, this method was intentionally selected for this research since this paper represents a pilot study that will be further developed based on this research's findings.

Suppose companies want to fully use the potential of CSR not only with regard to legal requirements but primarily. In that case, they need to realize that the implementation of socially responsible activities and CSR principles must be intentional, targeted, long-term, and appropriately and effectively communicated to their stakeholders.

## **References**

Ajayi, O. A., & Mmutle, T. 2021. Corporate reputation through strategic communication of corporate social responsibility. *Corporate Communications: An International Journal*, 26(5), 1-15. <https://doi.org/10.1108/CCIJ-02-2020-0047>

Akbay, L. et al. 2019. Inadvertent Use of ANOVA in Educational Research: ANOVA is not A Surrogate for MANOVA. *Eğitimde ve Psikolojide Ölçme ve Değerlendirme Dergisi*, 10(3), 302-314. <https://doi.org/10.21031/epod.524511>

- Ali, A., Bentley, Y., Cao, G., & Habib, F. 2016. Green supply chain management – food for thought? *International Journal of Logistics Research and Applications*, 20(1), 22-38. <https://doi.org/10.1080/13675567.2016.1226788>
- Alshammari, M. 2015. Corporate Social Responsibility and Firm Performance: The Moderating Role of Reputation and Institutional Investors. *International Journal of Business and Management*, 10(6), unpagged. <http://doi.org/10.5539/ijbm.v10n6p15>
- Androniceanu, A. 2019. Social responsibility, an Essential Strategic Option for a Sustainable Development in the Field of Bio-Economy, *Amfiteatru Economic*, 21(52), 503-519.
- Androniceanu, A., Georgescu, I. & Mirică (Dumitrescu), C. O. 2022. Social Protection in Europe, a Comparative and Correlative Research. *Administratie si Management Public*, 38, 31-45. <http://doi.org/10.24818/amp/2022.38-02>
- Androniceanu, A., & Marton, D.-M.. 2021. The Psychosocial Impact of the Romanian Government measures on the population during the COVID-19 Pandemic. *Central European Public Administration Review*, 19(1), 7-32. <https://doi.org/10.17573/cepar.2021.1.05>
- Avis, M., Konopka, R., Gregory-Smith, D., & Palakshappa, N. 2022. Disentangling Consumers' CSR Knowledge Types and Effects. *Sustainability*, 14(19). <https://doi.org/10.3390/su141911946>
- Belas, J., Gavurova, B., Čepel, M., & Kubák, M. 2020. Evaluation of economic potential of business environment development by comparing sector differences: Perspective of SMEs in the Czech Republic and Slovakia. *Oeconomia Copernicana*, 11(1), 135-159. <https://doi.org/10.24136/oc.2020.006>
- Belas, J., Škare, M., Gavurova, B., Dvorsky, J., & Kotaskova, A. 2022. The impact of ethical and CSR factors on engineers' attitudes towards SMEs sustainability. *Journal of Business Research*, 149, 589–598. <https://doi.org/10.1016/j.jbusres.2022.05.056>
- Berrett, T.B., & Samworth, R.J. 2021. USP: An Independence Test That Improves on Pearson's Chi-Squared and the G-Test. *Proceedings of the Royal Society A-Mathematical Physical and Engineering Sciences*. A477(20210549). <https://doi.org/10.1098/rspa.2021.0549>
- Bhaduri, S. N., & Selarka, E. 2016. Corporate Social Responsibility around the World – An Overview of Theoretical Framework, *Corporate Governance and Corporate Social Responsibility of Indian Companies*, 11-32. Springer Singapore. [https://doi.org/10.1007/978-981-10-0925-9\\_2](https://doi.org/10.1007/978-981-10-0925-9_2)
- Bhowmik, R., Debnath, G.C., Zafar, R. F., & Lormon, B.L. 2021. Creative industry in terms of covid-2019 pandemic: European countries responsive measures. *Pressburg Economic Review*, 1(1), 9-17.
- Bian, J., Liao, Y., Wang, Y.-Y., & Tao, F. 2021. Analysis of firm CSR strategies. *European Journal of Operational Research*, 290(3), 914-926. <https://doi.org/10.1016/j.ejor.2020.03.046>
- Chen, S.-C. & Lin, C.-P. 2019. Understanding the effect of social media marketing activities: The mediation of social identification, perceived value, and satisfaction. *Technological Forecasting and Social Change*, 140, 22-32. <https://doi.org/10.1016/j.techfore.2018.11.025>
- Chen, Y.C., Hung, M., & Wang, Y. 2018. The effect of mandatory CSR disclosure on firm profitability and social externalities: Evidence from China. *Journal of Accounting and Economics*, 65(1), 169-190. <https://doi.org/10.1016/j.jacceco.2017.11.009>
- Civelek, M., Kasarda, M., Hajduk, L., & Szomolányi, A. 2022. Social Media Usage as a solution for financial problems of European SMEs: International Comparison of Firms in Iron and Mining Industries. *Acta Montanistica Slovaca*, 27(4), 982-993. <https://doi.org/10.46544/AMS.v27i4.12>
- civelek, M., & Krajčík, V. 2022. How do SMEs from different countries perceive export impediments depending on their firm-level characteristics? System approach. *Oeconomia Copernicana*, 13(1), 55-78. <https://doi.org/10.24136/oc.2022.002>
- Civelek, M., Krajčík, V., & Fialova, V. 2023. The impacts of innovative and competitive abilities of SMEs on their different financial risk concerns: System approach. *Oeconomia Copernicana*, 14(1), 327–354. <https://doi.org/10.24136/oc.2023.009>
- Crane, A., & Glozer, S. 2016. Researching Corporate Social Responsibility Communication: Themes, Opportunities And Challenges. *Journal of Management Studies*, 53(7), 1223-1252. <https://doi.org/10.1111/joms.12196>
- De Klerk, H.M., Kearns, M., & Redwood, M. 2019. Controversial fashion, ethical concerns and environmentally significant behaviour. *International Journal of Retail & Distribution Management*, 47(1), 19-38. <https://doi.org/10.1108/IJRDM-05-2017-0106>

- Del Mar García-De Los Salmones, M., & Perez, A. 2018. Effectiveness of CSR Advertisement: The Role of Reputation, Consumer Attributions, and Emotions. *Corporate Social Responsibility and Environmental Management*, 25(2), 194-208. <https://doi.org/10.1002/csr.1453>
- Dwivedi, Y.K., Ismagilova, E., Hughes, D.L. 2021. Setting the future of digital and social media marketing research: Perspectives and research propositions. *International Journal of Information Management*, 59. <https://doi.org/10.1016/j.ijinfomgt.2020.102168>
- Dwiyanti, L. et al., 2021, Correlation Analysis on Big Data for Legislative Election. *2021 International Conference on Data and Software Engineering (ICoDSE)*, 1-5. <https://doi.org/doi:10.1109/ICoDSE53690.2021.9648457>
- Estiri, M., Dahooie, J.H., & Skare, M. (2022). COVID-19 crisis and resilience of tourism SME's: a focus on policy responses, *Economic Research-Ekonomska Istraživanja*, 35(1), 5556-5580. [10.1080/1331677X.2022.2032245](https://doi.org/10.1080/1331677X.2022.2032245)
- Gavurova, B., Schönfeld, J., Bilan, Y., & Dudáš, T. (2022a). Study of the differences in the perception of the use of the principles of corporate social responsibility in micro, small and medium-sized enterprises in the V4 countries. *Journal of Competitiveness*, 14(2), 23-40. <https://doi.org/10.7441/joc.2022.02.02>
- Gavurova, B., Jencova, S., Bačík, R., Miskufova, M., & Letkovský, S. (2022b). Artificial intelligence in predicting the bankruptcy of non-financial corporations. *Oeconomia Copernicana*, 13(4), 1215-1251. <https://doi.org/10.24136/oc.2022.035>
- Gao, P., Fang, M., Mata, M.N., et al. Trends and Future Research in Electronic Marketing: A Bibliometric Analysis of Twenty Years. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(5), 1667-1679. <https://doi.org/10.3390/jtaer16050094>
- Hąbek, P., Biały, W. & Livenskaya, G. 2019. Stakeholder engagement in corporate social responsibility reporting. The case of mining companies. *Acta Montanistica Slovaca*, 24(1), 25-34.
- Hamasha, M. M., Ali, H., Hamasha, S., & Ahmed, A. 2022. Ultra-fine transformation of data for normality. *Heliyon*, 8(5), e09370. <https://doi.org/10.1016/j.heliyon.2022.e09370>
- Hamid, A.A., Yousif, A.B.A.N., Rahman, N.S.F.A., & Alshareef, S.D.K. 2021. Supplier Relationship Management Quality and Marketing Performance: Does Strategy Matter? *Polish Journal of Management Studies*, 24(2), 136-155. <https://doi.org/10.17512/pjms.2021.24.2.09>
- he, H., & Harris, L. 2020. The impact of Covid-19 pandemic on corporate social responsibility and marketing philosophy. *Journal of Business Research*, 116, 176-182. <https://doi.org/10.1016/j.jbusres.2020.05.030>
- Ho, T.H. et al. 2021, Efficiency in Vietnamese Banking: A Meta-Regression Analysis Approach. *International Journal of Financial Studies*. 9(3), pp. 15. <https://doi.org/10.3390/ijfs9030041>
- Iglesias, O., Markovic, S., Bagherzadeh, M., & Singh, J.J., 2020. Co-creation: A Key Link between Corporate Social Responsibility, Customer Trust, and Customer Loyalty. *Journal of Business Ethics*, 163(1), 151-166. <https://doi.org/10.1007/s10551-018-4015-y>
- Islam, T.R., Islam, A.H., Pitafi, X., Liang, M., Rehmani, M., Irfan, & Mubarak, M.S. 2021. The impact of corporate social responsibility on customer loyalty: The mediating role of corporate reputation, customer satisfaction, and trust. *Sustainable Production and Consumption*, 25, 123-135. <https://doi.org/10.1016/j.spc.2020.07.019>
- Jahdi, K.S., & Acikdilli, G. 2009. Marketing Communications and Corporate Social Responsibility (CSR): Marriage of Convenience or Shotgun Wedding? *Journal of Business Ethics*, 88(1), 103-113. <https://doi.org/10.1007/s10551-009-0113-1>
- Kabir, H. (2021). Notion of belonging in the nation-state: gendered construction of international migration aspirations among university students in Bangladesh. *Migration Letters*, 18(4), 463-476. <http://dx.doi.org/10.33182/ml.v18i4.1158>
- Katthi, J.R. & Ganapathy, S. 2021. Deep Correlation Analysis for Audio-EEG Decoding. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 29, 2742-2753. <https://doi.org/10.1109/TNSRE.2021.3129790>
- Kemper, J., Schilke, O., Reimann, M., Wang, X., & Brettel, M. 2013. Competition-motivated corporate social responsibility. *Journal of Business Research*, 66(10), 1954-1963. <https://doi.org/10.1016/j.jbusres.2013.02.018>
- Kim, M., 2022, Application of functional ANOVA and functional MANOVA. *Korean Journal of Applied Statistics*, 35(5), 579-591. <https://doi.org/10.5351/KJAS.2022.35.5.579>

- Kim, M., Lee S. & Kim, J. 2020. A Wide & Deep Learning Sharing Input Data for Regression Analysis. In: *2020 IEEE International Conference on Big Data and Smart Computing (BigComp)*, 8-12. <https://doi.org/10.1109/BigComp48618.2020.0-108>
- Kim, M., Yin, X., & Lee, G., 2020. The effect of CSR on corporate image, customer citizenship behaviour, and customers' long-term relationship orientation. *International Journal of Hospitality Management*, 88. <https://doi.org/10.1016/j.ijhm.2020.102520>
- kim, S. 2019. The Process Model of Corporate Social Responsibility (CSR) Communication: CSR Communication and its Relationship with Consumers' CSR Knowledge, Trust, and Corporate Reputation Perception. *Journal of Business Ethics*, 154(4), 1143-1159. <http://dx.doi.org/10.1007/s10551-017-3433-6>
- Kim, S. 2022. The Process of CSR Communication–Culture-Specific or Universal? Focusing on Mainland China and Hong Kong Consumers. *International Journal of Business Communication*, 59, 56-82. <https://doi.org/10.1177/2329488418805523>
- Kim, S. & Ferguson, M.T. 2014. Public Expectations of CSR Communication: What and How to Communicate CSR. *Public Relations Journal*, 8(3)
- Ključníkov, A., Civelek, M., Fialova, V., & Folvarčná, A. 2021. Organizational, local, and global innovativeness of family-owned SMEs depending on firm-individual level characteristics: evidence from the Czech Republic. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 16(1), 169–184. <https://doi.org/10.24136/eq.2021.006>
- Kodua, P., Blankson, C., Panda, S., Nguyen, T., Hinson, R. E., & Narteh, B. 2022. The Relationship between CSR and CBBE in Sub-Saharan Africa: The Moderating Role of Customer Perceived Value. *Journal of African Business*, 23(4), 1088-1108. <https://doi.org/10.1080/15228916.2021.2015835>
- Mahmud, A., Ding, D., & Hasan, M. 2021. Corporate Social Responsibility: Business Responses to Coronavirus (COVID-19) Pandemic. *Sage Open*, 11(1) <https://doi.org/10.1177/2158244020988710>
- Metzker, Z., Marousek, J., Zvarikova, K., & Hlawiczka, R. 2021. The perception of SMEs bankruptcy concerning CSR implementation. *International Journal of Entrepreneurial Knowledge*, 9(2), 85-95. <https://doi.org/10.37335/ijek.v9i2.133>
- Metzker, Z., & Zvarikova, K. 2021. The perception of company employees by SMEs with csr concept implementation. *International Journal of Entrepreneurial Knowledge*, 9(1), 81-96. <https://doi.org/10.37335/ijek.v9i1.128>
- Nayal, P., Pandey, P., & Paul, J. 2022. Covid-19 pandemic and consumer-employee-organization wellbeing: A dynamic capability theory approach. *Journal of Consumer Affairs*, 56(1), 359-390. <https://doi.org/10.1111/joca.12399>
- Nguyen, K.Q.T., 2022. Corporate Social Responsibility and Bank's Performance under the Mediating Role of Customer Satisfaction and Bank Reputation. *Emerging Science Journal*, 6(6), 1409-1429. <https://doi.org/10.28991/esj-2022-06-06-012>
- Orlitzky, M., Schmidt, F. L., & Rynes, S. L. 2003. Corporate Social and Financial Performance: A Meta-Analysis. *Organization Studies*, 24(3), 403–441. <https://doi-org.ezproxy.techlib.cz/10.1177/0170840603024003910>
- Pabreja, K., Singh, A., Singh, R., Agnihotri, R., Kaushik, S., & Malhotra, T. 2022. Prediction of Stress Level on Indian Working Professionals Using Machine Learning. *International Journal of Human Capital and Information Technology Professionals*, 13(1), 1-26. <https://doi.org/10.4018/ijhctip.293232>
- Pan, L., Xu, Z. & Skare, M. 2023. Sustainable Business Model Innovation Literature: a Bibliometrics Analysis. *Review of Managerial Science* 17, 757-785. <https://doi.org/10.1007/s11846-022-00548-2>
- Přivara, A. 2019a. Citizenship-for-sale schemes in Bulgaria, Cyprus, and Malta. *Migration Letters*, 16(2), 245-254. <http://dx.doi.org/10.33182/ml.v16i2.735>
- Přivara, A. (2019b). Explaining Emigration Patterns in Estonia, Lithuania, Slovenia and Slovakia. *Geografický časopis*, 161-180. <http://dx.doi.org/10.31577/geogrcas.2019.71.2.09>
- Přivara, A. 2022. Economic growth and labour market in the European Union: lessons from COVID-19. *Oeconomia Copernicana*, 13(2), 355-377. <http://dx.doi.org/10.24136/oc.2022.011>

- Prívarová, A., Rievajová, E., & Barbulescu, A. 2020. Attracting high skilled individuals in the EU: The Finnish experience. *Migration letters*, 17(2), 369-377. <http://dx.doi.org/10.33182/ml.v17i2.927>
- Prívarová, a., Rievajová, e., & Dziura, B. 2018. Unemployment aspects of regional development (The cases of the Czech and Slovak Republics). *Advanced Science Letters*, 24(9), 6320-6322. <http://dx.doi.org/10.1166/asl.2018.13042>
- Prívarová, A., Rievajová, E., & Yüceşahin, M. M. (2019). Labour market disadvantages faced by migrant workers from Czech Republic, Hungary, and Slovakia in Britain. *Migration Letters*, 16(4), 585-594. <http://dx.doi.org/10.33182/ml.v16i4.720>
- Quezado, T.C.C., Cavalcante, W.Q. F., Fortes, N., & Ramos, R.F. 2022. Corporate Social Responsibility and Marketing: A Bibliometric and Visualization Analysis of the Literature between the Years 1994 and 2020. *Sustainability*, 14(3) <https://doi.org/10.3390/su14031694>
- Ryu, K., Lee, H.-R., & Kim, W. G. 2012. The influence of the quality of the physical environment, food, and service on restaurant image, customer perceived value, customer satisfaction, and behavioural intentions. *International Journal of Contemporary Hospitality Management*, 24(2), 200-223.
- Sahoo, M., & Pradhan, J. 2021. Adaptation and acculturation: Resettling displaced tribal communities from wildlife sanctuaries in India. *Migration Letters*, 18(3), 237-259. <http://dx.doi.org/10.33182/ml.v18i3.877>
- Satar, N. S. M., Dastane, O., & Yusnorizam, M. 2019. Customer Value Proposition for E-Commerce: A Case Study Approach. *International Journal of Advanced Computer Science and Applications*, 10(2)
- Schaefer, S.D., Terlutter, R. & Diehl, S. 2020. Talking about CSR matters: employees' perception of and reaction to their company's CSR communication in four different CSR domains. *International Journal of Advertisement*, 39(2), 191-212. <https://doi.org/10.1080/02650487.2019.1593736>
- Sheikh, S., 2019. Corporate social responsibility and firm leverage: The impact of market competition. *Research in International Business and Finance*, 48, 496-510. <https://doi.org/10.1016/j.jbef.2018.11.002>
- Singh, K. & Misra, M. 2021. Linking Corporate Social Responsibility (CSR) and Organizational Performance: the moderating effect of corporate reputation. *European Research on Management and Business Economics*, 27(1) <https://doi.org/10.1016/j.iedeen.2020.100139>
- Škare, M., Soriano, D. R., & Porada-Rochoń, M. 2021. Impact of COVID-19 on the travel and tourism industry. *Technological Forecasting and Social Change*, 163, 120469. <https://doi.org/10.1016/j.techfore.2020.120469>
- Skare, M., Gavurova, B., & Rigelsky, M. 2023. Innovation activity and the outcomes of B2C, B2B, and B2G E-Commerce in EU countries. *Journal of Business Research*, 163, 113874. <https://doi.org/10.1016/j.jbusres.2023.113874>
- Streimikiene, D, Lasickaite, K, Skare, M, Kyriakopoulos, G, Dapkus, R, & Duc, P.A. (2021). The impact of Corporate Social Responsibility on Corporate Image: Evidence of budget airlines in Europe. *Corporate Social Responsibility and Environmental Management*. 28: 925– 935. <https://doi.org/10.1002/csr.2099>
- Straková, J., Talíř, M., Kollmann, J., Pártlová, P., & Váchal, J. 2021. An Integrated Model of Corporate Environment, Including Value Chain, as a Competitiveness Tool for Small and Medium Enterprises. *Polish Journal of Management Studies*, 23(1), 370-384. <https://doi.org/10.17512/pjms>
- Tangngisalu, J., Mappaming, M., Andayani, W., Yusuf, M., & Putra, A.H.P.K. 2020. CSR and Firm Reputation from Employee Perspective. *The Journal of Asian Finance. Economics and Business*, 7(10), 171-182. <https://doi.org/10.13106/jafeb.2020.vol7.no10.171>
- Tai, T.D. 2022. Impact of corporate social responsibility on social and economic sustainability. *Economic Research-Ekonomiska Istráživanja*, 35(1), 6085-6104. <https://doi.org/10.1080/1331677X.2022.2046480>
- Tkacova, A., Gavurova, B., Danko, J., & Cepel, M. 2017. The importance of evaluation of economic determinants in public procurement processes in Slovakia in 2010–2016. *Oeconomia Copernicana*, 8(3), 367-382. <https://doi.org/10.24136/oc.v8i3.23>
- Van Eck, N.J. & Waltman, L. 2010. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 84, 523-538. <https://doi.org/10.1007/s11192-009-0146-3>
- Vavrova, J. 2022. Effects of the COVID-19 Pandemic on corporate social responsibility in the hotel industry –Case of the Czech Republic. *Journal of Tourism and Services*, 25(13), 213-229. <https://doi.org/10.29036/jots.v13i25.414>

Vorobeva, E., & Dana, L.P. 2021. The COVID-19 pandemic and migrant entrepreneurship: Responses to the market shock. *Migration Letters*, 18(4), 477-485. <http://dx.doi.org/10.33182/ml.v18i4.1400>

Vishwanathan, P., Van Oosterhout, H.J., Heugens, P. P. M. A. R., Duran, P., & Essen, M. 2020. Strategic CSR: A Concept Building Meta-Analysis. *Journal of Management Studies*, 57(2), 314-350. <https://doi.org/10.1111/joms.12514>

Wang, X., Xu, Z., Qin, Y., & Skare, M. 2021. Service networks for sustainable business: A dynamic evolution analysis over half a century. *Journal of Business Research*, 136, 543-557. <https://doi.org/10.1016/j.jbusres.2021.07.062>

Wu, Y., & Zhu, W. 2021. The Role of CSR Engagement in Customer-Company Identification and Behavioral Intention During the COVID-19 Pandemic. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.721410>

Xu, F., Ma, L., Liunata, L., Najaf, I. & Streimikiene, D. 2020. Does Social Responsibility Increase Corporate Value of China's Coal Enterprises? The Mediating Effect of Capital Enrichment Based on the Generalized Moment Estimation. *Acta Montanistica Slovaca*, 25(3), 274-288. <https://doi.org/10.46544/AMS.v25i3.2>

Xu, M.Y., Zhang, D.N. & Wei, B.W. 2019 Pearson's chi-squared statistics: approximation theory and beyond. *Biometrika*, 106(3), 716-723. <https://doi.org/10.1093/biomet/asz020>

Zhuang, M.W.Z., Huang, L., & Pan, W.-T. 2021. Research of influence mechanism of corporate social responsibility for smart cities on consumers' purchasing intention. *Library Hi Tech*, 40(5), 1147-1158. <https://doi.org/10.1108/LHT-11-2020-0290>

**Funding:** This research was funded by the Institute of Technology and Business in České Budějovice, grant numbers IVSUPS005 and IVSUPS003.

**Data Availability Statement:** More data may be obtained from the authors on a reasonable request.

**Author Contributions:** Conceptualization: *Ruschak*; methodology: *Ruschak, Caha, Talíř*; data analysis: *Ruschak, Talíř*; writing—original draft preparation: *Ruschak*; writing; review and editing: *Ruschak, Caha, Talíř, Konečný*; visualization: *Ruschak, Talíř*. All authors have read and agreed to the published version of the manuscript.

**Michal RUSCHAK**, PhD student at the College of Entrepreneurship and Law, Pan-European University, Prague. Fields of scientific interests: marketing, communication, business, CSR, corporate reputation in the context of its sustainable development.

**ORCID ID:** <https://orcid.org/0000-0002-8896-4765>

**Zdeněk CAHA**, Associate Professor at the Faculty of Corporate Strategy, Department of Human Resources Management, Institute of Technology and Business in České Budějovice. Fields of scientific interests: human resource management, personnel management, CSR.

**ORCID ID:** <https://orcid.org/0000-0003-2363-034X>

**Milan TALÍŘ**, PhD student at the Faculty of Business and Management, Brno University of Technology. Fields of scientific interests: strategic management and business strategy.

**ORCID ID:** <https://orcid.org/0000-0002-6510-1297>

**Michal KONEČNÝ**, Assistant at the Faculty of Corporate Strategy, Department of Tourism and Marketing, Institute of Technology and Business in České Budějovice. Fields of scientific interests: corporate reputation in the context of its sustainable development.

**ORCID ID:** <https://orcid.org/0000-0001-7926-257X>

## ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES

ISSN 2345-0282 (online) <http://jssidoi.org/jesi/>

2023 Volume 10 Number 4 (June)

[http://doi.org/10.9770/jesi.2023.10.4\(14\)](http://doi.org/10.9770/jesi.2023.10.4(14))

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

**SOCIALLY RESPONSIBLE INVESTING (SRI) AS A FACTOR OF COMPETITIVENESS AND SUSTAINABLE DEVELOPMENT OF ORGANIZATIONS IN YOUNG CONSUMERS' OPINION<sup>†\*</sup>**

**Agnieszka Majewska<sup>1\*</sup>, Patrycja Beltowska<sup>2</sup>**

<sup>1</sup>*Department of Sustainable Finance and Capital Markets, Institute of Economics and Finance,  
University of Szczecin, 71-101 Szczecin, Poland*

<sup>2</sup>*Doctoral School of the University of Szczecin, Institute of Economics and Finance,  
University of Szczecin, 71-101 Szczecin, Poland*

E-mails: <sup>1</sup>[agnieszka.majewska@usz.edu.pl](mailto:agnieszka.majewska@usz.edu.pl) (Corresponding author); <sup>2</sup>[patrycja.beltowska@phd.usz.edu.pl](mailto:patrycja.beltowska@phd.usz.edu.pl)

Received 17 February 2023; accepted 23 May 2023; published 30 June 2023

**Abstract.** Young consumers belonging to Generation Z stand out from previous generations of consumers. The authors are interested in whether its representatives are familiar with the assumptions of corporate social responsibility and identify CSR activities implemented within the organisation. It is because CSR practices and activities undertaken by the companies influence the decision about SRI. The main objective of the paper is to analyse of use the SRI in organisations to build their competitive advantage in the market. This objective has been achieved by analysing and interpreting the results of our own research, conducted using the CAWI technique, among Polish representatives of Generation Z (n = 642). There were formulated hypotheses that the implementation of CSR in an organisation determines the decision about socially responsible investing and that socially responsible investing supports the building of a company's competitive advantage in the market. The hypotheses were verified on the basis of data obtained during the own questionnaire. There are used the correlation analysis using the chi-square independence test and Tschuprow's T- coefficient. The obtained results indicated that the Polish Z generation is a group knowledgeable about the CSR concept and aware of its importance in terms of influencing an organisation's positive reputation. The study has lasting value for the academic discussion on the impact of CSR and SRI on building an organisation's competitive advantage.

**Keywords:** CSR theory; SRI concept; competitive advantage; Generation Z

**Reference** to this paper should be made as follows: Majewska, A., Beltowska, P. 2023. Socially responsible investing (SRI) as a factor of competitiveness and sustainable development of organizations in young consumers' opinion. *Entrepreneurship and Sustainability Issues*, 10(4), 245-262. [http://doi.org/10.9770/jesi.2023.10.4\(15\)](http://doi.org/10.9770/jesi.2023.10.4(15))

**JEL Classifications:** G10, G11, M10, M14

---

<sup>†</sup> *The project is financed within the framework of the program of the Minister of Science and Higher Education under the name "Regional Excellence Initiative" for the years 2019-2022, project number 001/RID/2018/19, the amount of financing: PLN 10,684,000.00.*

## 1. Introduction

The growing number of organisations implementing the assumptions of the Corporate Social Responsibility (CSR) concept indicates an increasing interest of the business sector in environmental, social, ethical, and corporate governance activities. Organisations' embrace of the CSR concept is characterised by a more comprehensive approach to organisational management and the setting of objectives of functioning other than solely profit maximisation (*Raport „Odpowiedzialny Biznes w Polsce 2021. Dobre Praktyki” - Forum Odpowiedzialnego Biznesu*, n.d.). Corporate socially responsible engagement is also increasingly of interest to a variety of groups of their stakeholders relevant to building competitive advantage in the marketplace, which include consumers, shareholders, and investors. The relevance of CSR has been pointed out from the perspective of seeking competitive advantage (Gómez-Bezares et al., 2017), especially in the context of improving an organisation's image (Famiyeh et al., 2016; Sánchez et al., 2015; Streimikiene & Ahmed, 2021). In the context of growing awareness and social interest in CSR issues, it becomes important to verify whether the implementation of the concept of corporate social responsibility in organisations provides an impulse to undertake socially responsible investments in these entities and results in building their competitive advantage in the market.

The goal of this paper is to analyse and evaluate the use of socially responsible investment (SRI) in terms of its application to building an organisation's competitive advantage. In the context of the defined research gap, it is important to recognise that the research objective adopted in this study fulfills the purpose of identifying new knowledge on the topic under discussion.

## 2. Theoretical background

Socially Responsible Investing (SRI) is an alternative to traditional forms of investment. It is characterised by its multi-faceted dimension, including economic, environmental, social, and institutional factors that are more and more taken into account in investment decision-making processes (del Carmen Valls Martínez et al., 2022; Gangi & Varrone, 2018; García et al., 2019). The concept of socially responsible investing is closely related to corporate social responsibility (León-Gómez et al., 2022; Czerwonka, 2011; Zaleśkiewicz, 2020). The CSR concept is a view from the perspective of companies, while SRI is a view from the perspective of market participants investing their capital in securities of socially responsible companies (Cheah et al., 2011). Therefore, socially responsible investments cannot be considered without taking into account social responsibility at organisational level. And on the other hand, the concept of CSR cannot be analysed without looking at it more broadly from the point of view of socially responsible investment (Borek, 2014). The SRI takes into account the CSR practices and activities undertaken by the companies in which investors invest capital. Analysing the SRI in the context of the implications of the CSR concept it is found that socially responsible investors focus their attention on sustainability-oriented and socially responsible companies. This entails choosing these companies for investment portfolios. Hence, socially responsible investing can be considered as investing in the assets of companies that operate based on the CSR concept (Matuszewska-Pierzynka, 2021, Czerwonka, 2013). From this perspective, socially responsible investing is one of the instruments for implementing the assumptions of socially responsible business (Jedynak, 2017), which may also include ethical programmes, social campaigns, corporate governance, socially engaged marketing, eco-labelling and social labelling, as well as social reports (Łukasiewicz-Kamińska, 2011). According to the point of view outlined above, a responsible investor will invest capital in companies whose policies are in line with personal views oriented towards social goals in addition to achieving certain financial returns. If the policy carried out by the company differs from the investor's convictions, then the investor will decline to allocate the capital and invest in another socially responsible company (Rogowski & Ulianiuk, 2012). The study in this area shows that an increasing number of investors are using negative screening to eliminate from their portfolio companies operating in contradiction to the CSR concept (Arribas et al., 2019).

As mentioned above, organisations are increasingly incorporating factors related to the concept of corporate social responsibility into their management strategies (Wilburn & Wilburn, 2014; Hejduk, 2014; Grudzewski et al., 2010). There is extensive evidence pointing to the advantages of implementing the CSR concept in companies. The most important are:

- a source of creating competitive advantage in the market (Apospori et al., 2012; Battaglia et al., 2014; Bernal-Conesa et al., 2017; Boulouta & Pitelis, 2014; Charucka, 2015; Mohtsham Saeed & Arshad, 2012; Torugsa et al., 2012; Saeed, Arshad, 2012; Torugsa et al., 2013)
- higher recognition of the organisation from its competitors (Gupta et al., 2013; Marín et al., 2012),
- maximisation of corporate value (Luo & Bhattacharya, 2006; Orlitzky et al., 2003),
- increasing long-term returns (Jedynak, 2017; Hediger, 2010; Almeida Abreu et al., 2017).

The implementation of a social responsibility strategy in companies, in addition to the above advantages, generates benefits in the form of more interest from investors. More than 90% of the SRI studies did not indicate a negative impact of applying ESG criteria on companies' financial performance (Friede et al., 2015). It can be assumed that corporate social responsibility can be a strong and sustainable source of competitive advantage assuming that the organisation's CSR activities are implemented in a feasible manner and are an integral part of the company's business strategy (Cegliński & Wiśniewska, 2017).

Corporate social responsibility is also defined through the stakeholder concept by Freeman (1984). It refers to respecting and taking into account the interests of all parties in and around the organisation. It means that stakeholders are groups or individuals that are influenced or affected by an organisation (Freeman, 1984), creating a relationship that is reciprocal in nature and important for a company's existence in the market (Friedman & Miles, 2006). Stakeholder theory clarifies the fundamentals of doing business as building transparent, long-term relationships with all stakeholders, including owners, customers, employees, suppliers, communities, creditors, NGOs, subsidiaries, and the media. In the context of CSR and SRI it seems particularly important to create and maintain relationships with consumers of goods and services, as well as investors. They are two stakeholder groups essential to the functioning of companies and creating an organisation's competitive advantage in the marketplace (Freeman, 1994). Building relationships with stakeholders through socially responsible actions and a green corporate image is a profile that consumers are becoming more and more likely to seek (Çera et al., 2022; Goh, Lee, 2018). Building relationships with stakeholders through socially responsible actions and a green corporate image is a profile that consumers are becoming more and more likely to seek (Goh, Lee, 2018). It is particularly noticeable in Generation Z customers (Bedard & Tolmie, 2018). According to most researchers, these are young market participants born after 1995 (Koulopoulos, Keldsen, 2014; Chaney et al., 2017; Williams, Page, 2015), although some authors point to those born after 1997 (Tulgan, 2013) or after 1998 (Tapscott, 2008). Generation Z, compared to others, is more knowledgeable about environmental issues, tends to be more concerned about the environment and considers pro-environmentalism as a positive, valuable social norm (Nikolić et al., 2022; Kanchanapibul et al., 2014). They have more trust in brands that declare engagement to CSR (Uche, 2018) and positively perceive the activities of such companies (Ariker & Toksoy, 2017).

With regard to SRI market participants, there is still the dominance of institutional investors. Nowadays, from a global perspective, the SRI market gathers 75% institutional investors and 25% individual investors. Although between 2012 and 2020 institutional investors have consistently been the largest segment of the SRI market participants, this trend is, however, slowly changing and individual investors are beginning to play an increasingly important role (Global Sustainable Investment Review 2014; Global Sustainable Investment Review 2020). The reasons for this change are mainly attributed to an increase in public awareness of climate change and environmental protection. The environmental aspect is pointed out as one of the most important determinants of SRI (Dorfleitner & Nguyen, 2016), as well as a key element in the identification of companies as CSR organisations (Berry, Junkus, 2013). Research on participants in the SRI market shows that they are usually younger, have a better education, are more likely to be women with their own families, have higher income levels, come from larger cities, are involved in volunteering, and are characterised by pro-social attitudes, trust in investing funds operating in line with CSR policies, and a belief in the relevance of pro-environmental activities

(Williams, 2007; Dorfleitner & Nguyen, 2016; Cheah et al, 2011; Wins, Zwergel, 2016). The motivations for undertaking SRI, besides achieving a certain rate of return on investment, include contributing to social change, achieving personal satisfaction, as well as being concerned about the image and sense of worth of investors (Benabou & Tirole, 2010).

A global survey of investors, conducted on a group of 23,000 people, indicates that 78% of Polish market participants would not undertake an investment contrary to their beliefs. This result ranked Poland in 15th place among the surveyed countries. The highest percentage was noted for China (90%). Among European countries, Italy and Portugal were the best with 82% each. An overwhelming majority of survey participants indicated that activities of companies in the area of CSR are very important and will have a positive impact on the future performance of organisations (Globalne Badanie Inwestorów, 2020). A study of the views of entities listed on the Warsaw Stock Exchange regarding SRI found that 17 of the 21 entities participating in the study noted the relationship between undertaking CSR activities and the creation of value for these companies. In terms of the impact of the implementation of the CSR concept on the interest of investors, the largest number of respondents indicated that CSR strongly influences the interest of institutional and foreign investors. According to the respondents, compliance with the CSR concept by listed companies does not influence or is difficult to assess whether it influences individual and domestic investors. The most frequently mentioned factor by respondents to motivate organisations to implement the concept of corporate social responsibility was building a competitive advantage (Kłobukowska, 2019). Based on the research results, research gaps can be observed regarding the insufficient analysis of the impact of implementing CSR concepts in organisations on the motivation of current and future market participants to decide about socially responsible investing. In particular, it relates to the value-creating potential and competitive advantage of companies whose activity is in line with sustainable development.

### **3. Research objective and methodology**

The aim of this study is to analyse and evaluate socially responsible investing in terms of its application to building an organisation's competitive advantage. The theoretical aspect of the research relates to the analysis of the literature, the identification of the research gap and the attempt to fill it, while the practical part covers the applicability of the research results for organisations to create value and competitive advantage.

Based on the literature analysis, the following research questions were set:

1. Does the implementation of the CSR concept in an organisation affect the decision about socially responsible investment?
2. Can socially responsible investment be a means of building a company's competitive advantage in the marketplace?

Therefore, during the research process, the following hypotheses were set:

1. The implementation of CSR in the organisation determines the decision about socially responsible investing.
2. Socially responsible investing supports building a company's competitive advantage in the market.

A diagnostic survey method was used to achieve the objectives of a research. A questionnaire was the survey technique. The survey took the form of an online survey, carried out using the CAWI (Computer-Assisted Web Interviewing) technique. The survey was anonymous and included closed-ended questions, most of which were multi-variant (so-called cafeteria questions). The questions asked to respondents were both conjunctive, allowing several possible answers to be selected, as well as disjunctive, allowing only one answer to be marked. The intention of the survey authors was to create questions that were unambiguous and understandable to the respondents, not suggesting a scale of importance of the answers, which would provide information for the verification of the adopted research hypotheses. Non-random sampling was used. Participation in the study was voluntary and anonymous. Respondents took part in the survey between April and September 2022.

The general population in the study was based on persons over 18 years old, who were of working and post-working age according to the classification of Statistics Poland. It was assumed that the research population consists of people of Polish origin. According to Statistics Poland, the size of the general population was determined to be 81.8% of the total Polish population in 2020, which totaled 38 265 013 persons. Therefore, the size of the general population was assumed to be 31 300 781 persons, among which the population of the Polish Z generation aged 18-27 was identified, comprising 4 063 682 persons (Table 1).

**Table 1.** Population by age group in Poland in 2020

	Age 18-27 Generation Z	Age 28-44 Millennial (Generation Y)	Age 45-57 Generation X	Age 58-76 Baby Boomer	Age over 76 Silent Generation
Number of people	4 063 682	10 148 752	6 349 595	8 484 618	2 254 134
% of general population*	13.0%	32.4%	20.3%	27.1%	7.2%

\*General population = 31 300 781

Source: own study based on: Local Data Bank - Population by single age and sex, GUS, 2020, <https://bdl.stat.gov.pl/bdl/dane/podgrup/tablica> [accessed: 07.06.2022].

The sample size was determined in the next stage of the study. Taro Yamane's (Yamane, 1967) calculation method was used to estimate the sample size of the population according to the formula:

$$n = \frac{N}{1 + N(e)^2}$$

where:

n – the sample size,

N – the population size,

e – the acceptable sampling error.

We assumed the error tolerance of 0.05, so this means a 95% confidence that our data are going to be reflective of the population. Finally, by approximation, minimum sample size is 400. The participants of the sample were 642 people aged between 18 and 27, representing the Polish generation Z. The sample is considered representative because its participants reflect the structure of the general population in terms of the gender criterion in the survey (the structure of survey respondents has to include approximately 52% female and 48% male). The actual survey participant structure was 51.4% female and 48.6% male.

The first part of the survey included metric questions of a demographic-social nature. They allowed the identification of the characteristics of the research sample in terms of gender, education, place of residence, professional situation, self-assessment of material situation, and monthly income. The overall demographic and social data of the research sample are shown in Table 2.

**Table 2.** Demographic and social characteristics of the research sample

Gender:	Female			Male		
% of respondents	51.4%			48.6%		
No of respondents	330			312		
Education level:	Primary	Lower secondary	Secondary	Vocational	Post-secondary	Higher
% of respondents	0.8%	0.0%	42.5%	0.2%	1.2%	55.3%
No of respondents	5	0	273	1	8	355
Place of residence:	Village	City up to 50,000 inhabitants	City 50,000-150,000 inhabitants	City 150,000-500,000 inhabitants	City above 500,000 inhabitants	
% of respondents	14.3%	12.2%	8.9%	25.2%	39.4%	
No of respondents	92	78	57	162	253	
Work situation:	Employment contract	Civil law contract	Business contract	Agricultural household	Not working (student)	Not working (unemployed)
% of respondents	30.5%	27.3%	3.6%	0.6%	37.1%	0.9%

No of respondents	196	175	23	4	238	6
Self-assessment of financial situation:	Good	Rather good	Average	Rahher bad	Bad	
% of respondents	20.1%	42.5%	30.4%	6.2%	0.8%	
No of respondents	129	273	195	40	5	
Monthly income (net amount):	< 2 363.56 PLN	2 363.56 - 4240.00 PLN	4240.00 zł - 8 000.00 PLN		> 8 000.00 PLN	
% of respondents	43.3%	43.0%	13.2%		0.5%	
No of respondents	278	276	85		3	

n = 642 respondents

Source: own study

In order to verify the research hypotheses, there was conducted analysis of survey questions that derive young customer opinions. Moreover, statistical analyses were carried out by using a correlation measure (Tschuprow's T- coefficient) and Inference statistic. The level of significance was set to be  $\alpha = 0.05$ . There was used independence test  $\chi^2$  which allowed for examining whether the indicated variables from the research questions are dependent on the knowledge of the SRI. This made it possible to answer whether SRI can be considered a factor for building competitive advantage and sustainable development of organisations in the opinion of Generation Z.

#### 4. Results and Discussion

In line with the research questions, first, there will be presented the results concerning the impact of an organisation's CSR implementation on its decision about socially responsible investment.

In relation to the first research question, respondents answered the following five questions:

1. How do you assess the impact of implementing CSR concepts by organisation on investors' opinion of this organisation?
2. Does the implementation of the CSR concept in an organisation have a positive impact on the valuation of its shares/bonds?
3. Does the implementation of the CSR concept in the organisation affect the investor's decision to buy its shares/bonds?
4. Would the implementation of the CSR concept in an organisation be a significant factor in the decision to invest your capital in this organisation?
5. Would you give up your investment in an organisation if it were operating inconsistently with the CSR concept or unethically?

Those survey questions were disjunctive in nature. Respondents selected one answer from a five-point scale ranging from 'definitely not'/'definitely insignificant' to 'definitely yes'/'definitely significant' and were included also a neutral response of 'difficult to say'. The results of the responses are presented in Figures 1-5.

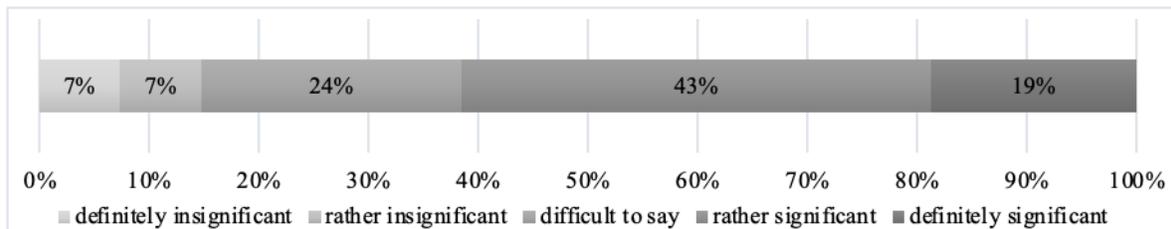
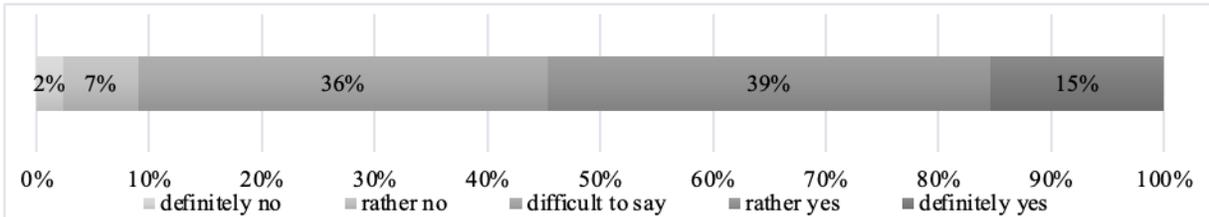


Figure 1. How do you assess the impact of implementing CSR concepts by organisation on investors' opinion of this organisation?

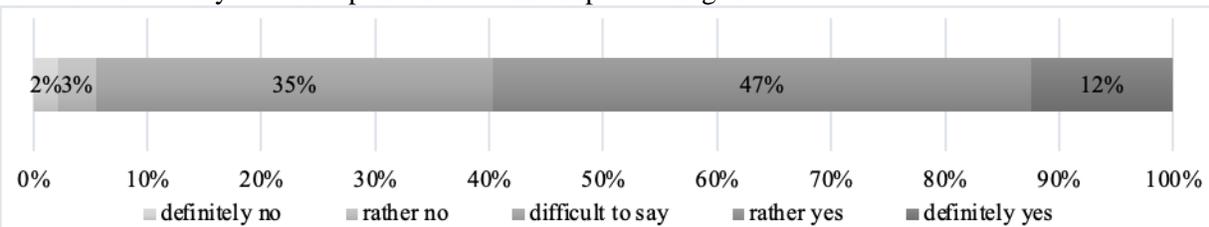
Source: own study.

In the opinion of more than 60.0% of respondents, the implementation of the CSR concept in an organisation has an impact on investors' opinions of companies. Almost one in four respondents had no opinion on this issue. The reasons for this lack of opinion can be explained by the young age of the respondents and their insufficient knowledge of the subject.



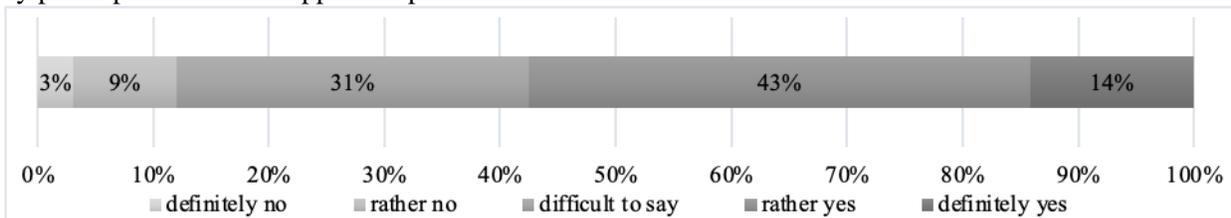
**Figure 2.** Does the implementation of the CSR concept in an organisation have a positive impact on the valuation of its shares/bonds?  
 Source: own study.

More undecided respondents were in the assessment of the detailed impact of the CSR concept on the organisation (questions/figures 2-5). On average it was every third respondent. More than half of the respondents are of the opinion that the implementation of the CSR concept in an organisation has a positive impact on the valuation of its shares or bonds. Only 9% of respondents see this impact as negative.



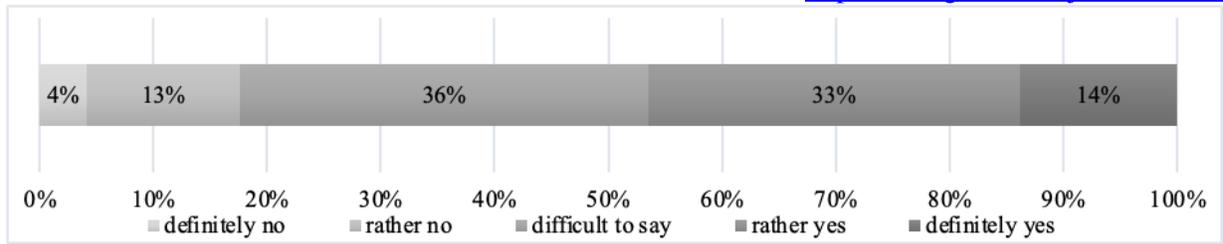
**Figure 3.** Does the implementation of the CSR concept in the organisation affect the investor's decision to buy its shares/bonds?  
 Source: own study.

Regarding the impact of the implementation of the CSR concept in an organisation on the decision of investors to buy its shares or bonds, almost 60.0% of the respondents considered that such an impact exists. Only 5% of the survey participants have the opposite opinion.



**Figure 4.** Would the implementation of the CSR concept in an organisation be an important factor in the decision to invest your capital in this organisation?  
 Source: own study.

More respondents (57%) have indicated the implementation of the CSR concept in an organisation is an important factor in the decision to invest capital in it. Almost one in three respondents had no opinion on this issue.



**Figure 5.** Would you give up your investment in an organisation if it were operating inconsistently with the CSR concept or unethically?  
 Source: own study.

The highest number of respondents (36%) had no opinion on the question of abandoning investment in an organisation due to its unethical operation or functioning not in line with the assumptions of the CSR concept. Nearly half of respondents would give up investment and 17% of individuals would nevertheless make this investment.

The obtained results indicate that the implementation of CSR in an organisation influences the decision of Generation Z about SRI. Confirmation of this finding is provided by the results of the independence test  $\chi^2$  presented in Table 3. The analysis of the relationship between the categorical variables was carried out using the results of the questionnaire on the five questions discussed above and the question on awareness of the SRI concept. Awareness of the SRI concept was declared by 37% of respondents, while the remaining respondents indicated not knowing this concept.

**Table 3.** CSR implementation in the organisation and its impact on investment versus awareness of the SRI concept

H <sub>0</sub> : two categorical variables are independent H <sub>1</sub> : two categorical variables are dependent			
Awareness of the SRI concept versus ...	Tschuprow's T-coefficient	Test $\chi^2$	Inferences
1. Existence of the impact of implementing CSR concepts by organisation on investors' opinion of this organisation	T = 0.261	$\chi^2 = 21.945 > \chi^2_{0,05} = 9.488$	H <sub>1</sub> : variables are dependent
2. Positive perception of the impact of the implementation of CSR concepts in an organisation on the valuation of its shares/bonds	T = 0.251	$\chi^2 = 20.267 > \chi^2_{0,05} = 9.488$	H <sub>1</sub> : variables are dependent
3. Existence of the impact of the implementation of the CSR concept in the organisation on the decision to buy its shares/bonds by investors	T = 0.303	$\chi^2 = 29.375 > \chi^2_{0,05} = 9.488$	H <sub>1</sub> : variables are dependent
4. Perception of the implementation of the CSR concept in an organisation as an important factor in the decision to invest capital in this organisation	T = 0.304	$\chi^2 = 29.719 > \chi^2_{0,05} = 9.488$	H <sub>1</sub> : variables are dependent
5. Abandonment of investment in an organisation if it were operating inconsistently with the CSR concept or unethically	Not applicable	$\chi^2 = 3.751 < \chi^2_{0,05} = 9.488$	Failure to reject H <sub>0</sub>

Source: own study.

The results of  $\chi^2$  test indicate that only once the null hypothesis was not rejected (awareness of the SRI vs abandonment of investment). There was a relationship between awareness of the SRI concept and the other four variables. Although the correlation was weak in all cases studied (T value were from the interval 0.251-0.304).

The second research question investigated respondents' opinions regarding the following issues:

- The understanding and characteristics of the SRI phenomenon (conjunctive questions allowing the selection of several possible answers),
- Opportunities for SRI development on the Polish capital market and determinants of socially responsible investment decisions (disjunctive questions).
- The undertaking of socially responsible investment (alternative questions, allowing selection among yes/no answers, and filtering questions, aimed at identifying survey participants who made socially responsible investments). This group was also asked about the types and investment strategies used by them (conjunctive questions).

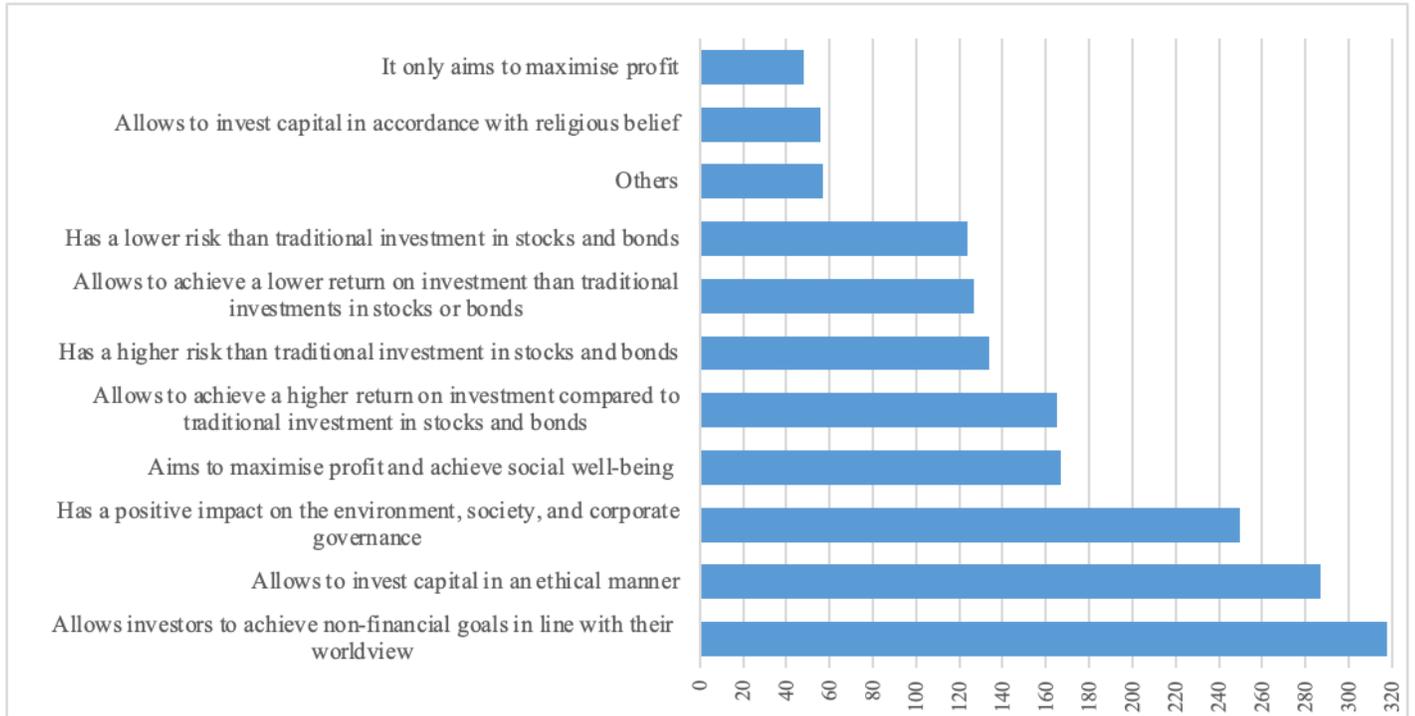
Regarding the first issue, the results are shown in Figures 6-7.



**Figure 6.** With which statements do you identify the term SRI? (multiple choice)

*Source:* own study.

There were a total of 1552 responses to the above question. SRI is most often considered to be investing in organisations that operate in accordance with the CSR concept (366 responses). This finding also confirms the first research hypothesis. Respondents also frequently identified SRI as investing that integrates financial analysis with environmental, social, and corporate governance (226 responses), as well as eliminating unethical organisations from investments (199 responses) and investing in funds that use SRI strategies (169 responses).



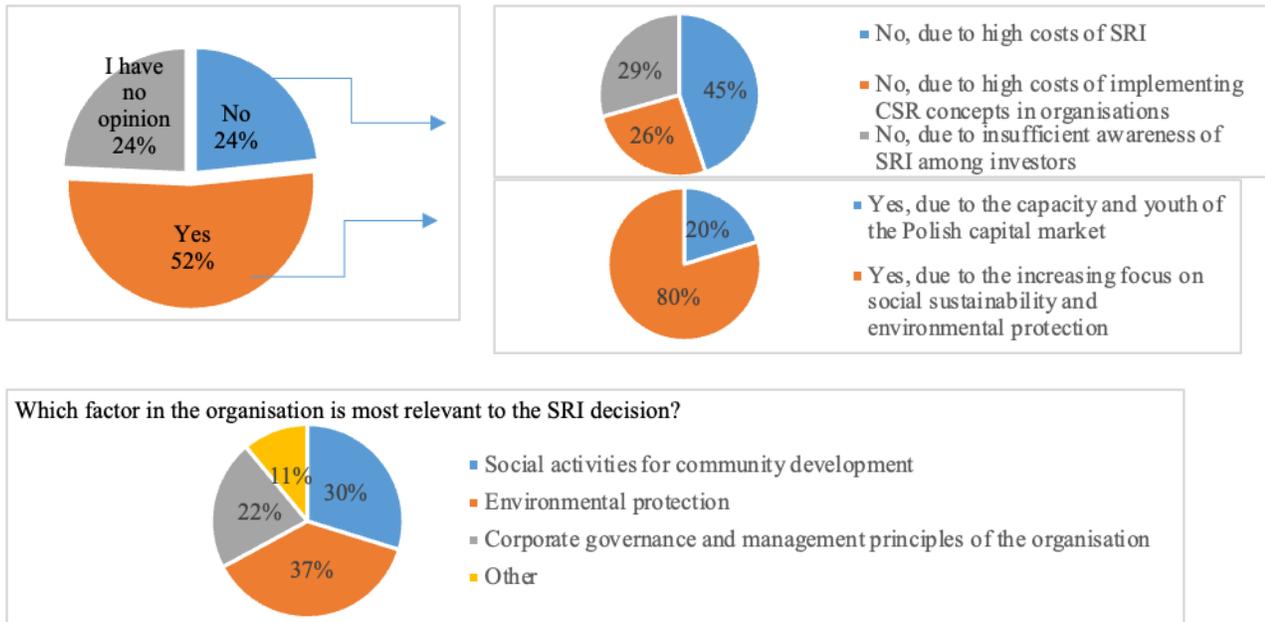
**Figure 7.** Which statements characterise SRI? (multiple choice)

*Source:* own study.

There were 1,733 responses on the characteristics of the SRI phenomenon. According to the largest group of respondents, SRI allows investors to pursue non-financial goals that are in line with their worldview (322 responses). Nearly 45.0% of the respondents consider that SRI allows capital to be invested ethically. According to almost 39.0% of them, SRI has a positive impact on the environment, society, and corporate governance.

The SRI concept was least characterised as a strictly financial activity undertaken to maximise profit (48 responses). A relatively small number of respondents also identified SRI with investing capital in accordance with religious beliefs (56 responses).

The opinion of Generation Z about opportunities for SRI development and factors in the organisation determining SRI decision-making is shown in Figure 8.



**Figure 8.** Does SRI get a chance to succeed and develop in the Polish capital market?

Source: own study.

More than half (52.0%) of the survey participants considered that SRI has a chance of success and development in the Polish capital market. The majority of respondents who answered positively are of the opinion that the growing popularity of social equity and environmental issues will be the reason for the development of the SRI in Poland. Those who responded negatively consider the high costs of such investments and the high costs of implementing CSR concepts in organisations to be the major obstacles to the development of SRI in the Polish capital market.

Almost 70.0% of the whole respondents considered that the most important factors determining decision about SRI are related to environmental and social nature.

In the question about the personal motivations for undertaking the SRI decision, respondents indicated minimisation of investment risk, achieving financial profit, and caring for the natural environment and ethical standards as key factors.

Table 4 shows the key factors that characterise investments and influence the decision to undertake SRI.

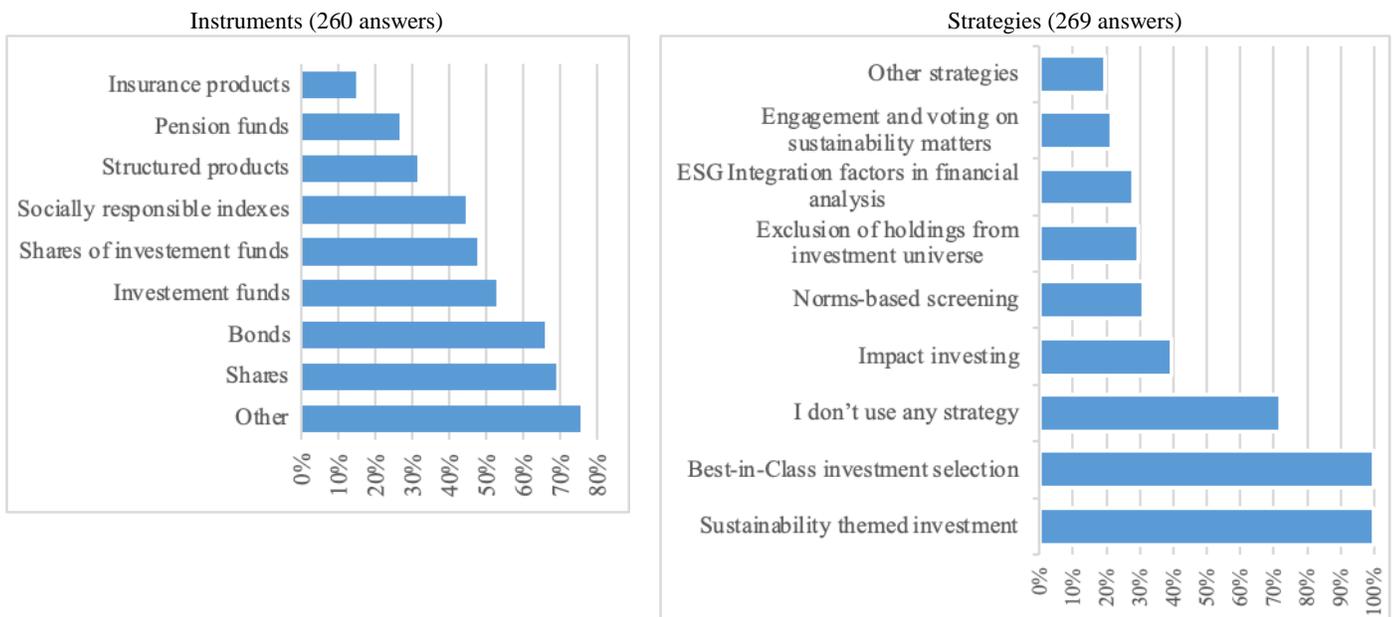
**Table 4.** Key factors that determine the decision to undertake SRI

Factor	% of respondents (multiple choice: 2774 answers)
Minimisation of investment risk	55%
Achieving a financial profit	48%
Concern for the environment	39%
Concern for ethical standards	35%
Concern for the well-being of society	33%
Inflation protection	33%
Long-term investment growth potential	27%
Caring for future generations	25%
Satisfaction with the ethical and moral action	24%

Diversification	20%
Sense of 'mission' in taking care of society and the environment	20%
Balancing between economic return and non-financial motives	18%
Concern for corporate governance and management	17%
Pursuing private goals related to one's beliefs	12%
Absolute rate of return	9%
Volatility management/low correlation	7%
Respecting religious norms	6%
Other	6%

Source: own study.

The last issue was investigating the survey participants who have made SRI. Only 10% of respondents (61) indicated that they have made SRIs. This is mainly due to the age of the research sample, which consisted of young people with limited funds to invest (see Table 2). A summary of the instruments and investment strategies they use is shown in Figures 9 and 10.



**Figure 9.** Instruments and investment strategies used by respondents (multiple choice).

Source: own study.

The results of the survey indicate that respondents declaring to undertake SRI investments most often chose shares (42 responses), and bonds (40 responses). The least used in socially responsible investing were insurance products (9 responses), pension funds (16 responses), and structured products (19 responses).

All respondents used a 'best-in-class' investment selection and a sustainability thematic investment strategy in their SRI. The least frequently used strategies were related to engagement and voting on sustainability matters (13 responses) and other strategies (12 responses).

The final view of Generation Z about SRI as a part of CSR which builds competitive advantage is presented in Figure 10.

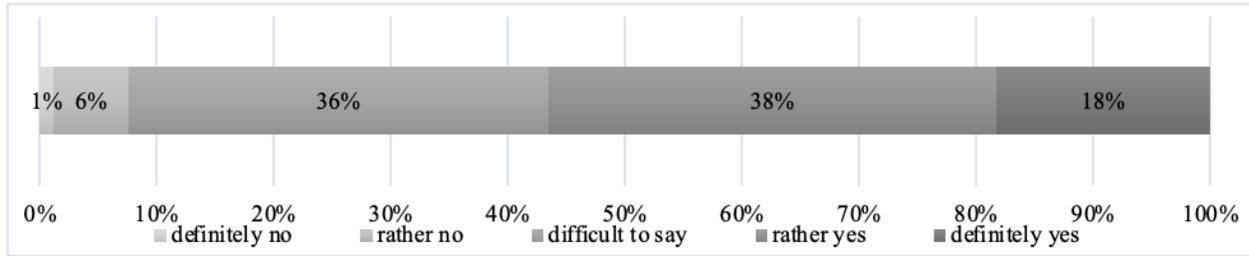


Figure 9. Does investing in organisations operating according to the CSR concept increase their competitive advantage?

Source: own study.

More than half of the respondents (56.0%) consider that investing capital in socially responsible enterprises increases their competitive advantage. Only 7.0% of all respondents stated that there was no link between investing in CSR organisations and an increase in their competitive advantage in the market. The remaining respondents had no opinion on this issue.

The last step was verifying the hypotheses related to the research questions. Therefore, correlation analysis was carried out and it was verified by using  $\chi^2$  independence test. This made it possible to answer whether SRI can be considered a factor for building competitive advantage and organisational sustainability in the opinion of representatives of Generation Z. Correlation analysis and inference statistics could only be conducted for single-choice indications. Therefore, they covered only three categorical variables. The results are presented in Table 4.

Table 4. Relationship between selected variables describing SRI and awareness of the SRI concept

H <sub>0</sub> : two categorical variables are independent H <sub>1</sub> : two categorical variables are dependent			
Awareness of the SRI concept versus ....	Tschuprow's T-coefficient	Test $\chi^2$	Inferences
1. Succeed and develop of SRI in the Polish capital market	T = 0.433	$\chi^2 = 53.763 > \chi^2_{0,05} = 11.070$	H <sub>1</sub> : variables are dependent
2. The factor in the organisation that is most relevant to the decision to SRI	T = 0.224	$\chi^2 = 18.621 > \chi^2_{0,05} = 7.815$	H <sub>1</sub> : variables are dependent
3. Investing in organisations that operate according to the CSR concept increases the competitive advantage of these organisations	T = 0.281	$\chi^2 = 25.393 > \chi^2_{0,05} = 9.488$	H <sub>1</sub> : variables are dependent

Source: own study.

The results of  $\chi^2$  independence test indicate that the null hypothesis should be rejected in favor of the alternative hypothesis. This means that the relationship between the analysed variables is significant. There was a weak correlation (T = 0.224, T = 0.281) and a moderate correlation (T = 0.433).

## 5. Conclusions

Based on the results of the survey, it can be concluded that the Polish Z generation is a group knowledgeable about the CSR concept and aware of its importance in terms of influencing an organisation's positive reputation. The majority of respondents considered that the implementation of the CSR concept in an organisation influences the opinion of investors about that company, positively affects the valuation of its shares and bonds and determines the decision of investors to purchase its shares and bonds. The most respondents also stated that the implementation of the CSR concept in an organisation is an important factor in deciding whether to invest capital. They also confirmed the abandonment of the investment in the organisation due to its unethical operation or

functioning contrary to the CS concept. It should be noted that from 24.0% to 36.0% of survey participants had no opinion on the examined issues. The smallest group of respondents expressed the opinion that the examined issues do not affect the opinion and actions of investors towards the organisation.

With regard to SRI, more than half of the survey participants considered that it has a chance of success and development in the Polish capital market. In their opinion, this is because of the growing popularity of issues related to social equality and environmental protection. The majority of respondents also considered environmental and social factors to be the most important in an organisation for socially responsible investing. An important finding of this study is that more than half of the respondents were of the opinion that investing capital in socially responsible companies increases their competitive advantage. All the opinions of the Polish generation Z, excluding the issue of abandoning the investment in case of unethical or contrary to CSR activities of the organisation, depend on their knowledge of the SRI phenomenon. The obtained results indicate the hypothesis has been positively verified. It means that the implementation of CSR in an organisation determines the decision about socially responsible investment and that SRI supports the building of a company's competitive advantage in the market.

Concluding the SRI takes into account the CSR practices and activities undertaken by the companies in which investors allocate their capital. There is a focus on ethical programmes, social reports, corporate governance, and social marketing. Therefore, the SRI is one of the instruments for implementing the assumptions of the CSR concept. According to the view presented above, a responsible investor will not invest capital in companies whose policy is not in line with CSR theory.

The results obtained in this study are in line with the other examination of this issue. Generation Z's behaviour appears to differ from the behaviour of older generations, which may lead to changes in consumer behaviour (Casalegno et al., 2022). They appear to be more sensitive to environmental and social issues compared to previous generations (Nikolić et al., 2022; Kanchanapibul et al., 2014; Puiiu, 2016). Seemiller & Grace (2017) also report that they want to contribute to social goals. Widening common information access has fostered to gain knowledge among Generation Z about CSR activities undertaken by different organisations. This has an impact on their perception of CSR activities as an important factor when choosing a brand (Pencarelli et al., 2020). This also results in their greater trust in organisations that declare a focus on CSR issues (Uche, 2018).

In the framework of current knowledge, the conducted survey confirmed the high awareness and understanding of CSR assumptions by young market participants in Poland. It also proved the positive assessment of socially responsible companies on the market. The study provided a new view on the opinion of the Polish Generation Z on the impact of CSR implementation in organizations on investment decisions, as well as on the increase in the competitive advantage of these companies on the market. The study also identified the attitudes of young consumers in Poland to the concept of socially responsible investing (SRI), its features and importance, and also opportunities for development in the Polish capital market. The Polish SRI market is at an early stage of development, and the SRI concept is not sufficiently known among Polish investors. It is because of the perception of the stock exchange by Polish investors mainly in the category of achieving financial profit. Despite the growing awareness of sustainable investing, most investors still consider profit as the most important, and achieving long-term benefits as a result of business ethics, company reputation or brand management is further down the line. Therefore, SRI as a young, innovative, and still developing concept needs to be introduced to more participants in the financial market. The enhancement of SRI at the global level can lead to the improvement of well-being for future generations.

Like other studies, this research has some limitations. One of them is using an original research questionnaire. Another one was that the survey covered one geographical area (the sample was limited to representatives of Generation Z in Poland). In further studies, it seems desirable to extend the research to young consumers from other geographical areas. Cross-cultural research can facilitate the identification of differences in opinion, as well

as provide a more comprehensive understanding of different approaches to SRI. It also seems interesting to extend questionnaires to other generations for future research. This will allow for a better understanding of the differences in opinions and approaches to CSR and SRI depending on the belonging of a particular generation of consumers.

## References

- Almeida, R. (2017). Corporate social responsibility and performance: Evidence from the water industry. *New Trends and Issues Proceedings on Humanities and Social Sciences*, 4(10). <https://doi.org/10.18844/prosoc.v4i10.3091>
- Apospori, E., Zografos, K. G., & Magrizos, S. (2012). SME corporate social responsibility and competitiveness: A literature review. In *International Journal of Technology Management* (Vol. 58, Issues 1–2). <https://doi.org/10.1504/IJTM.2012.045786>
- Ariker, Ç., & Toksoy, A. (2017). Generation Z And Csr: Antecedents Of Purchasing Intention Of University Students. *Kafkas Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 8(16).
- Arribas, I., Espinós-Vañó, M. D., García, F., & Tamosiuniene, R. (2019). Negative screening and sustainable portfolio diversification. *Entrepreneurship and Sustainability Issues*, 6(4). [https://doi.org/10.9770/jesi.2019.6.4\(2\)](https://doi.org/10.9770/jesi.2019.6.4(2))
- Battaglia, M., Testa, F., Bianchi, L., Iraldo, F., & Frey, M. (2014). Corporate social responsibility and competitiveness within SMEs of the fashion industry: Evidence from Italy and France. *Sustainability (Switzerland)*, 6(2). <https://doi.org/10.3390/su6020872>
- Bedard, S. A. N., & Tolmie, C. R. (2018). Millennials' green consumption behaviour: Exploring the role of social media. *Corporate Social Responsibility and Environmental Management*, 25(6). <https://doi.org/10.1002/csr.1654>
- Benabou, R., & Tirole, J. (2010). Individual and corporate social responsibility. *Economica*, 77(305). <https://doi.org/10.1111/j.1468-0335.2009.00843.x>
- Bernal-Conesa, J. A., de Nieves Nieto, C., & Briones-Peñalver, A. J. (2017). CSR Strategy in Technology Companies: Its Influence on Performance, Competitiveness and Sustainability. *Corporate Social Responsibility and Environmental Management*, 24(2). <https://doi.org/10.1002/csr.1393>
- Berry, T. C., & Junkus, J. C. (2013). Socially Responsible Investing: An Investor Perspective. *Journal of Business Ethics*, 112(4). <https://doi.org/10.1007/s10551-012-1567-0>
- Borek, R. (2014). *Oplacalność inwestowania w spółki przestrzegające zasad społecznej odpowiedzialności biznesu*. W: *Inwestowanie emocjonalne i techniczne*, red. A. Adamska, A. Fierla, Oficyna Wydawnicza SGH w Warszawie, Warszawa, 113-130.
- Boulouta, I., & Pitelis, C. N. (2014). Who Needs CSR? The Impact of Corporate Social Responsibility on National Competitiveness. *Journal of Business Ethics*, 119(3). <https://doi.org/10.1007/s10551-013-1633-2>
- Casalegno, C., Candelo, E., & Santoro, G. (2022). Exploring the antecedents of green and sustainable purchase behaviour: A comparison among different generations. *Psychology and Marketing*, 39(5). <https://doi.org/10.1002/mar.21637>
- Cegliński, P., & Wiśniewska, A. (2017). CSR as a Source of Competitive Advantage: The Case Study of Polpharma Group. *Journal of Corporate Responsibility and Leadership*, 3(4). <https://doi.org/10.12775/jcrl.2016.020>
- Çera, G., Khan, K. A., Bláhová, A., & Belas, J. (2022). Do owner-manager demographics in SMEs matter for corporate social responsibility? *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 17(2). <https://doi.org/10.24136/eq.2022.018>
- Chaney, D., Touzani, M., & Ben Slimane, K. (2017). Marketing to the (new) generations: summary and perspectives. In *Journal of Strategic Marketing* (Vol. 25, Issue 3). <https://doi.org/10.1080/0965254X.2017.1291173>
- Charucka, O. (2015). Znaczenie społecznej odpowiedzialności biznesu w budowaniu przewagi konkurencyjnej przedsiębiorstwa. *Zeszyty Naukowe Uniwersytetu Vistula*, 6(44).
- Cheah, E. T., Jamali, D., Johnson, J. E. V., & Sung, M. C. (2011). Drivers of corporate social responsibility attitudes: The demography of socially responsible investors. *British Journal of Management*, 22(2). <https://doi.org/10.1111/j.1467-8551.2011.00744.x>

- del Carmen Valls Martínez, M., Román, R. S., & Cervantes, P. A. M. (2022). Should risk-averse investors target the portfolios of socially responsible companies? *Oeconomia Copernicana*, 13(2). <https://doi.org/10.24136/oc.2022.014>
- Czerwonka, M. (2011). Inwestycje odpowiedzialne społecznie (SRI) – inwestowanie alternatywne. *Finanse, Czasopismo Komitetu Nauk o Finansach PAN*, nr 1(4), 135-154.
- Czerwonka M. (2013). *Inwestowanie społecznie odpowiedzialne*. Difin, Warszawa.
- Dorfleitner, G., & Nguyen, M. (2016). Which proportion of SR investments is enough? A survey-based approach. *Business Research*, 9(1). <https://doi.org/10.1007/s40685-016-0030-y>
- Dwiggins-Beeler. (2014). The Gen Z Effect: The Six Forces Shaping the Future of Business. In *Journal of Psychological Issues in Organizational Culture*.
- Famiyeh, S., Kwarteng, A., & Dadzie, S. A. (2016). Corporate social responsibility and reputation: some empirical perspectives. *Journal of Global Responsibility*, 7(2), 258–274. <https://doi.org/10.1108/JGR-04-2016-0009>
- Freeman R. (1984). *Strategic management: A stakeholder approach*. Harper Collins, Boston.
- Freeman, R. (1994). The Politics of Stakeholder Theory: Some Future Directions. *Business Ethics Quarterly*, 4(4), 409-421. <https://doi.org/10.2307/3857340>
- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance and Investment*, 5(4). <https://doi.org/10.1080/20430795.2015.1118917>
- Friedman, A.L., Miles S. (2006), *Stakeholders. Theory and Practice*. Oxford University Press, Oxford.
- Gangi, F., & Varrone, N. (2018). Screening activities by socially responsible funds: A matter of agency? *Journal of Cleaner Production*, 197. <https://doi.org/10.1016/j.jclepro.2018.06.228>
- García, F., González-Bueno, J., Oliver, J., & Riley, N. (2019). Selecting socially responsible portfolios: A fuzzy multicriteria approach. *Sustainability (Switzerland)*, 11(9). <https://doi.org/10.3390/su11092496>
- Global Sustainable Investment Review 2014*. [http://www.gsi-alliance.org/wp-content/uploads/2015/02/GSIA\\_Review\\_download.pdf](http://www.gsi-alliance.org/wp-content/uploads/2015/02/GSIA_Review_download.pdf)
- Global Sustainable Investment Review 2020*. <http://www.gsi-alliance.org/wp-content/uploads/2021/08/GSIR-20201.pdf>
- Globalne Badanie Inwestorów. Wzrost znaczenia inwestorów odpowiedzialnych społecznie*. Schroders 2020, [https://www.schroders.com/pl/sysglobalassets/global-shared-blocks/gis-2020/theme2/schrodersgis2020\\_t2](https://www.schroders.com/pl/sysglobalassets/global-shared-blocks/gis-2020/theme2/schrodersgis2020_t2)
- Goh, E., & Lee, C. (2018). A workforce to be reckoned with: The emerging pivotal Generation Z hospitality workforce. *International Journal of Hospitality Management*, 73. <https://doi.org/10.1016/j.ijhm.2018.01.016>
- Gómez-Bezares, F., Przychodzen, W., & Przychodzen, J. (2017). Bridging the gap: How sustainable development can help companies create shareholder value and improve financial performance. *Business Ethics*, 26(1). <https://doi.org/10.1111/beer.12135>
- Grudzewski, W., Hejduk, I., Sankowska, A., Wańtuchowicz M. (2010). *Sustainability w biznesie, czyli przedsiębiorstwo przyszłości. Zmiany paradygmatów i koncepcji zarządzania*. Poltext, Warszawa.
- Gupta, S., Czinkota, M., & Melewar, T. C. (2013). Embedding knowledge and value of a brand into sustainability for differentiation. *Journal of World Business*, 48(3). <https://doi.org/10.1016/j.jwb.2012.07.013>
- Hediger, W. (2010). Welfare and capital-theoretic foundations of corporate social responsibility and corporate sustainability. *Journal of Socio-Economics*, 39(4). <https://doi.org/10.1016/j.socec.2010.02.001>
- Hejduk I.K. (red.), (2014). *Koncepcja sustainability wyzwaniem współczesnego zarządzania*. Oficyna Wydawnicza SGH w Warszawie, Warszawa.
- Jedynak, T. (2017). *Efektywność i ryzyko funduszy inwestycji społecznie odpowiedzialnych*. Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, Kraków.

- Kanchanapibul, M., Lacka, E., Wang, X., & Chan, H. K. (2014). An empirical investigation of green purchase behaviour among the young generation. *Journal of Cleaner Production*, 66. <https://doi.org/10.1016/j.jclepro.2013.10.062>
- Kłobukowska, J. (2019). *Spolecznie odpowiedzialne inwestowanie na rynku kapitałowym w Polsce. Stan i perspektywy rozwoju*. Wydawnictwo Naukowe UMK, Toruń.
- León-Gómez, A., Santos-Jaén, J. M., Ruiz-Palomo, D., & Palacios-Manzano, M. (2022). Disentangling the impact of ICT adoption on SMEs performance: the mediating roles of corporate social responsibility and innovation. *Oeconomia Copernicana*, 13(3). <https://doi.org/10.24136/oc.2022.024>
- Luo, X., & Bhattacharya, C. B. (2006). Corporate social responsibility, customer Satisfaction, and market value. *Journal of Marketing*, 70(4). <https://doi.org/10.1509/jmkg.70.4.1>
- Lukasiewicz-Kamińska, A. (2011). *Spoleczna odpowiedzialność przedsiębiorstwa finansowego*. Difin, Warszawa.
- Marín, L., Rubio, A., & de Maya, S. R. (2012). Competitiveness as a Strategic Outcome of Corporate Social Responsibility. *Corporate Social Responsibility and Environmental Management*, 19(6). <https://doi.org/10.1002/csr.1288>
- Matuszewska-Pierzynka, A. (2021). Relationship between corporate sustainability performance and corporate financial performance: evidence from U.S. companies. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 16(4). <https://doi.org/10.24136/eq.2021.033>
- Mohitsham Saeed, M., & Arshad, F. (2012). Corporate social responsibility as a source of competitive advantage: The mediating role of social capital and reputational capital. *Journal of Database Marketing and Customer Strategy Management*, 19(4). <https://doi.org/10.1057/dbm.2012.19>
- Nikolić, T. M., Paunović, I., Milovanović, M., Lozović, N., & Đurović, M. (2022). Examining Generation Z's Attitudes, Behavior and Awareness Regarding Eco-Products: A Bayesian Approach to Confirmatory Factor Analysis. *Sustainability (Switzerland)*, 14(5). <https://doi.org/10.3390/su14052727>
- Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. *Organization Studies*, 24(3). <https://doi.org/10.1177/0170840603024003910>
- Pencarelli, T., Taha, V. A., Škerhákova, V., Valentiny, T., & Fedorko, R. (2020). Luxury products and sustainability issues from the perspective of young Italian consumers. *Sustainability (Switzerland)*, 12(1). <https://doi.org/10.3390/SU12010245>
- Puiu, S. (2016). Generation Z-A New Type Of Consumers. *Young Economists Journal / Revista Tinerilor Economisti*, 13(27).
- Raport „Odpowiedzialny biznes w Polsce 2021. Dobre praktyki” - Forum Odpowiedzialnego Biznesu. (n.d.). Retrieved February 24, 2023, from <https://odpowiedzialnybiznes.pl/publikacje/raport-2021/>
- Rogowski, W., Ulianiuk, A. (2012). *Spolecznie odpowiedzialne inwestowanie (SRI) – próba charakterystyki*. Część II: Rynek społecznie odpowiedzialnych inwestycji. Studia i Prace Kolegium Zarządzania i Finansów SGH, nr 113, Warszawa, 154-178.
- Sánchez, J. L. F., Sotorrió, L. L., & Díez, E. B. (2015). The relationship between corporate social responsibility and corporate reputation in a turbulent environment: Spanish evidence of the Ibx35 firms. *Corporate Governance (Bingley)*, 15(4). <https://doi.org/10.1108/CG-08-2014-0101>
- Seemiller, C., & Grace, M. (2017). Generation Z: Educating and Engaging the Next Generation of Students. *About Campus: Enriching the Student Learning Experience*, 22(3). <https://doi.org/10.1002/abc.21293>
- Streimikiene, D., & Ahmed, R. R. (2021). The integration of corporate social responsibility and marketing concepts as a business strategy: Evidence from SEM-based multivariate and Toda-Yamamoto causality models. *Oeconomia Copernicana*, 12(1). <https://doi.org/10.24136/oc.2021.006>
- Tapscott D. (2008). *Grown Up Digital: How the Generation is Changing Your World*. McGraw Hill Professional, New York.
- Torugsa, N. A., O'Donohue, W., & Hecker, R. (2012). Capabilities, Proactive CSR and Financial Performance in SMEs: Empirical Evidence from an Australian Manufacturing Industry Sector. *Journal of Business Ethics*, 109(4). <https://doi.org/10.1007/s10551-011-1141-1>

Tulgan, B. (2013). Meet Generation Z: The second generation within the giant " Millennial " cohort. *RainmakerThinking, Inc.*

Uche, S. (2018). Generation Z and Corporate Social Responsibility. Syracuse University, Syracuse.

Wilburn, K., & Wilburn, R. (2014). The double bottom line: Profit and social benefit. In *Business Horizons* (Vol. 57, Issue 1). <https://doi.org/10.1016/j.bushor.2013.10.001>

Williams, G. (2007). Some Determinants of the Socially Responsible Investment Decision: A Cross-Country Study. *Journal of Behavioral Finance*, 8(1). <https://doi.org/10.1080/15427560709337016>

Williams, K. C., & Page, R. A. (2015). Marketing to the Generations. *Journal of Behavioral Studies in Business*.

Yamane, T. (1967). *Elementary Sampling Theory*. Englewood Cliffs. New Jersey, Prentice-Hall, Inc.

Zaleśkiewicz, T. (2020). *Psychologia ekonomiczna*. PWN, Warszawa.

**Funding:** The paper is financed within the framework of the program of the Minister of Science and Higher Education under the name "Regional Excellence Initiative" for the years 2019-2022, project number 001/RID/2018/19, the amount of financing: PLN 10,684,000.00.

**Data Availability Statement:** More information can be obtained from the authors on a reasonable request.

**Author Contributions:** Conceptualization: *AM, PB*; methodology: *AM, PB*; data analysis: *AM, PB*, writing—original draft preparation: *AM, PB*, writing; review and editing: *AM, PB*; visualization: *AM, PB*. All authors have read and agreed to the published version of the manuscript.

**Agnieszka MAJEWSKA**, Ph.D., associated professor at the University of Szczecin. She is an academic at the Institute of Economics and Finances (Department of Sustainable Finance and Capital Markets). Her research interest includes the use of quantitative methods on the financial market, sustainable finance and investments, renewable energy, quantitative analysis of companies, risk management, capital market analysis, derivatives and financial engineering, and investing in the capital market.

**ORCID ID:** <https://orcid.org/0000-0003-2059-7724>

**Patrycja BELTOWSKA Ph.D.** scholar at the Doctoral School of the University of Szczecin in the discipline of economics and finance. Her research interests include alternative investments, behavioral finance, CSR, socially responsible investments and consumer psychology.

**ORCID ID:** <https://orcid.org/0000-0001-5771-6091>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810



Publisher

<http://jssidoi.org/esc/home>



---

RESEARCH AND INNOVATION FOR SUSTAINABILITY TRANSFORMATION – MODERN  
OUTLOOKS AND ACTUAL CHALLENGES

Bogdan Fleacă <sup>1</sup>, Elena Fleacă <sup>2</sup>, Sanda Maiduc <sup>3</sup>, Ionut Marius Croitoru <sup>4</sup>

<sup>1,2,3,4</sup> *University Politehnica of Bucharest, Splaiul Independetei 313, 060042, Bucharest, Romania*

E-mails:<sup>1</sup> [bogdan.fleaca@upb.ro](mailto:bogdan.fleaca@upb.ro); <sup>2</sup> [elena.fleaca@upb.ro](mailto:elena.fleaca@upb.ro); <sup>3</sup> [sanda.maiduc@upb.ro](mailto:sanda.maiduc@upb.ro); <sup>4</sup> [ionut.croitoru0208@upb.ro](mailto:ionut.croitoru0208@upb.ro)

*Received 15 February 2023; accepted 29 May 2023; published 30 June 2023*

**Abstract.** Technology innovations, the expanding digitisation of all sectors and global megatrends are changing how European citizens live, offering huge potential and unique challenges. The concept of innovation has become more general, exceeding the boundaries of research and development, patents, scientific articles and publications. It increasingly includes new business models, social aspects and technical matters for environmental protection. The paper investigates the modern outlooks of research and innovation that represent the ubiquity concerns of Europe facing global competition and striving to maintain its distinctive social model in line with sustainable development. The authors focused on an updated literature review on research and innovation for a sustainability transition. They analysed the political frameworks and strategic initiatives to support certain interventions for promoting the overarching role of innovation toward sustainable development. Through analysing secondary data provided by well-known innovation performance indicators (i.e. Global Innovation Index and European Innovation Scoreboard), different vulnerabilities of the local context (i.e. Romania country) were identified, and relevant improvement measures were emphasised to meet the agenda focused on a transition to sustainability. The findings made a structured contribution to the emerging field of research and innovation for sustainability transformation. They can be valuable for academics, researchers and decisional factors interested in increasing awareness about the EU strategic initiatives in research and innovation as well as some of the challenges of the country's innovation performance.

**Keywords:** innovation; sustainability; competitiveness; research and development; science and technology

**Reference** to this paper should be made as follows: Fleacă, B., Fleacă, E., Maiduc, S., Croitoru, I.M. 2023. Research and innovation for sustainability transformation – modern outlooks and actual challenges *Entrepreneurship and Sustainability Issues*, 10(4), 263-278. [http://doi.org/10.9770/jesi.2023.10.4\(16\)](http://doi.org/10.9770/jesi.2023.10.4(16))

**JEL Classifications:** M14, M48, M19

## 1. Introduction

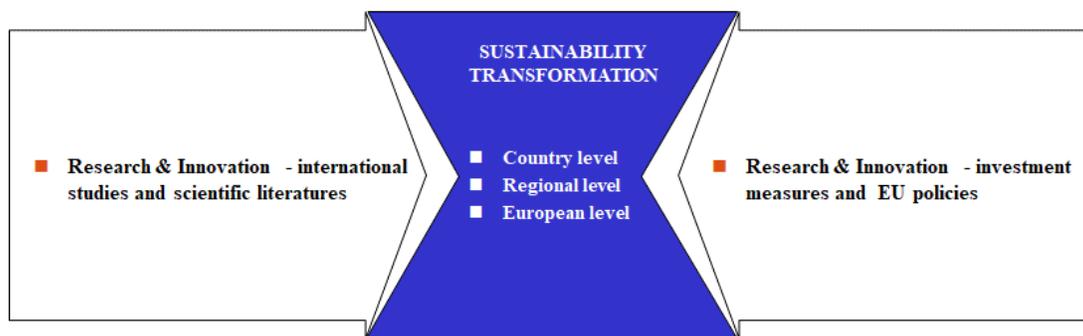
The current challenges of global warming, pollution, biodiversity loss, health pandemic, economic migration and ageing, and technological changes in the industry and artificial intelligence require both technological and social innovation. Science, technology, and innovation play a central role in the transformation toward a sustainable future. To this end, a paradigm shift is required, and research and innovation for sustainability (e.g. trans-disciplinary research) must be actively promoted and supported as a common complement to traditional research and development approaches (OECD, 2020).

As acknowledged by OECD (2021), addressing complex societal challenges is a shared responsibility that requires well-designed measures for research and development systems targeting innovations that either generate public goods or have a high potential for knowledge spillovers. In addition, at the local, regional, and global levels, future levels of government support for science, research and innovation will be shaped by societal preferences and the recognition of innovative research as an essential actor in socio-technical transitions to meet the goals of sustainability, inclusiveness, and resilience.

The paper aims to emphasise significant interventions at the European Union level and subsequent state of play in the local context (i.e. Romania country) to decipher structural vulnerabilities and innovation challenges required to meet an agenda focused on a transition to sustainability. The methodological approach consisted of qualitative research using secondary data sources from relevant scientific literature and public sources of information. In this vein, the study commences with an updated literature review on research and innovation for sustainability transition, followed by the analysis of secondary data provided by two trustworthy innovation performance indicators as monitoring tools having international coverage and large applicability in a wide range of industries and business sectors (i.e. Global Innovation Index and European Innovation Scoreboard). Finally, the main improvement needs related to local context were outlined to address country vulnerabilities and to ensure the progress toward sustainability transition.

## 2. Theoretical background

The concept of innovation has been broadened, exceeding the boundaries of research and development, patents, scientific articles and publications. The understanding has become more general, including new business models, social aspects and technical matters for environmental protection (WIPO, 2022b). In response to global challenges, there is a growing interest in analysing the research and innovation trends focused on sustainable development. Figure 1 depicts the main building blocks enabling research and innovation systems to contribute to transformation for sustainability at the national, regional and European levels.



**Figure 1.** Sustainability transformation and research and innovation systems

*Source:* The authors' elaboration

### 2.1. Research and innovation – a catalyst for change

Using a knowledge-based view on innovation, Yu et al. (2017) argued the key role of knowledge creation and technological innovation capabilities (i.e. product and process innovation capabilities) in the process of creating the organisations' sustainable competitive advantage. The findings emphasised the knowledge creation process's insignificant effect on an organisation's sustainable competitive advantage in the absence of fully operationalised technological innovation capabilities. Consequently, the knowledge creation process favours the development of

technological innovation capabilities for processes and products because processes and products can lead to sustainable competitive advantage.

An inspiring attempt was made to connect the innovation process to the idea of responsibility, which entails a continuous dedication to assess the potential benefits and drawbacks of research and innovation in communication with a wide range of stakeholders to produce responsible outcomes. Based on a meta-synthesis of empirical studies, the findings designated the multiple involvements of stakeholders in the late stage of the innovation process, more precisely during the market launch, and provided recommendations for improvement, including the early involvement of users in the innovation process and the extension of the design phase to enable the involvement of stakeholders in the innovation process for responsible outcomes (Silvia et al., 2019).

Other studies investigated the influence of eco-innovation capability in terms of internal setting, strategies, operations and structure on sustainability-driven innovation that mainstream process, organisational and product practices. The results designated the direct and positive effect of eco-innovation capability in triggering a specific type of innovation practice, i.e., sustainably driven innovation which properly integrates the business's economic, social and environmental aspects (Ceptureanu et al., 2020).

## **2.2. Research and Innovation for Sustainability**

In the attempt to capture the influence of innovation factors embedded in an organisation's sustainable development model, Carro-Suárez et al. (2020) measured the statistical correlation between the sustainable development dimensions, as output factors, and the innovation process, as predictors or inputs factors. The results stressed the critical role of technology, knowledge and business market as dynamic factors outside the organisation and culture and organisation as transfer factors which seem essential to a new sustainable organisational culture. Notably, the human element was the ideal way to connect the innovation process and implement the sustainable model.

The concern for the critical role of innovation in the pursuit of sustainability transformation has gained particular emphasis, and researchers directed their efforts to analyse the factors across economic, environmental, and societal systems.

### **Economic challenges**

The economic concern has been studied by plenty of researchers that emphasise the central role of the research and development process in supporting a green economy and quality of life, primarily through policies promoted at the European Union level (Ionescu et al., 2022). In addition, Lüdeke-Freund (2020) introduced the business models for sustainability innovation and studied how business models mediate between sustainability innovations (e.g. new processes, products or services) and business cases for sustainability (e.g. the creation of ecological, social, and economic value). Notably, three relevant business models were distinguished: new business models employing given technologies, given business models taking up new technologies, and new business models triggered by new technologies.

By looking at the whole spectrum of consequences, the scholars noticed that innovation brings new growth opportunities to navigate sustainability transition and disrupts existing practices leading to new or more profound inequalities (Engwall et al., 2021). Other studies introduced the concept of frugal innovation focused on core functionalities, user-oriented design, lower resource intensity, and overall cost minimisation, which is expected to create new market opportunities. Through stakeholders collaboration (e.g. enterprises, universities, knowledge-intensive business services, and research centres) along all stages of the innovation cycle, from its development to adoption or diffusion, the tendency to drive sustainable development outcomes could be increased to a larger

spectrum of results in terms of social sustainability, depending on the type of actors involved and the business models used for the adoption and implementation of the innovation (De Marchi et al., 2022).

Having a systemic approach which transforms the same types of inputs (e.g. knowledge and financial resources) into the same kinds of positive outcomes (e.g. innovative products and services), Ratner et al. (2023) measured the efficiency of national innovation systems in progress toward innovation-based economic growth, especially in the post-Soviet countries. The findings argued that no evidence might support the assumptions that EU institutions or the type of economic model of the country are directly related to the effectiveness of the national innovation system. Instead, the ease of doing business and the protection of investors are most related to the degree of effectiveness, explaining the differences in the performance of different national innovation systems.

### **Environmental challenges**

Regarding innovation for environmental concerns, the scholars highlighted the negative consequences induced by industrialisation and increased consumption, which have contributed to growing the economy at the cost of environmental degradation (Chi, 2022; Zhang & Xie, 2022). In addition, the studies introduced the concept of green innovation as a more inclusive concept of sustainable innovation composed of the development of products and processes resulting in a reduction of environmental impact compared with alternative practices. The findings promoted novel insights into the complexity of the value chain, and several configuration models were proposed to implement this innovation (e.g. systemic innovation technology-independent enterprises). Also, by cooperation to increase efficiency, the organisations may facilitate the implementation of green innovation along the value chain (Abadzhiev et al., 2022).

The role of managers' strategic intelligence and green environmental awareness in elaborating and implementing green product strategies was also studied. As scholars argued, managers with high-cognition strategic intelligence believe that innovation in green product design can better grasp market development trends and consumer needs. Therefore, green products designed and innovated according to consumer demands and market trends can better meet demand and increase market share (Yang & Liu, 2021).

Other findings investigated the interconnections among recent technological progress (i.e. Industry 4.0), innovation, and sustainability implications, concerning understanding the underlying mechanisms and enabling capacities of sustainable innovation. The findings stressed that innovation related to industry 4.0 supported various innovation types (e.g. product, process, organisational) that advanced the concept of the triple bottom line of sustainability, circular economy, sustainable business models, as well as the achievement of sustainable development goals (Khan et al., 2023). Moreover, the current research considered industrial waste and overall energy consumption, revealing the significant gaps in innovation efficiency among EU regions. The findings argued the central role of government environmental protection policies in innovation efficiency, which explained why the northern and southern areas of the EU remain the fundamental forces driving technological innovation in the EU (Xu et al., 2023).

The studies on the role of environmental uncertainty, complexity and regulations emphasised the significant promotion effect on firms' green technological innovation. The increasing uncertainty (e.g. high degree of competition in the industry) motivates firms to carry out green technological innovation, improve the handling efficiency and control ability of luck, comply with the environmental policies to promote enterprises' green technological innovation, maximise the firms market value (Chen et al., 2022). In addition, Li et al. (2022) argued that the firm's green innovation performance depends on its absorptive capacity, which may lead to proactively responding to external policy pressures and internal innovation learning capabilities to accelerate the pace of green innovation.

**Social challenges**

The innovation for social concerns, seen as a distinct type of innovation, is characterised by a lesser emphasis on political and technological success factors and an increased focus on the positive impact on the quality and quantity of life (Repo & Matschoss, 2019; Haskell, et al., 2021). Notably, human-related factors were considered relevant in predicting innovation outputs providing solutions for many pressing social, economic and environmental issues communities face. The quality of intellectual capital in terms of knowledge, skills, competencies, and involvement in research & development and international scientific collaboration networks were also mentioned as driving factors reinforcing innovation for social challenges (Martinidis et al., 2021).

The concern for innovation as a trigger in the structural changes argued its complicated role within modern development tendencies. Druzhynina et al. (2020) paid attention to the negative impact of innovation on employment by the changing nature of work, automation of tasks and reduction of the current workforce, which may hinder the supporting living standards and progressive socioeconomic state development. In addition, financial rewards and personnel training were outlined as key drivers for expanding innovation capacity, which in turn shape the enterprises' ability to develop better products and positively affect operating performance and profitability (Chin-miel, 2018).

Other studies revealed a close relationship between learning, creativity, and responsible research and innovation (Timmermans et al., 2020). In addition, Schröer (2021) argued that innovation is based on the results of internal learning processes. Individuals, teams, and even organisations learn and engage in creative problem-solving to create new and innovative products and services. In addition, making favourable conditions enabling innovation was linked to the innovation policy in higher education and science, which contributed to creating an innovative environment for transformational change. The findings outlined the critical contribution of higher education in innovation policy due to the mission to research and disseminate knowledge and educate and train qualified specialists (Romanovskiy et al., 2021).

In sum, plenty of scientific literature investigated the threats and challenges of research and innovation for sustainable development. There is a considerable need to ascertain further how current political frameworks and strategic initiatives from international, regional and local levels guide and support certain investments and measures for promoting research and innovation for sustainability transformation.

**3. Research and innovation - outlooks of EU policies**

Research and innovation in many sectors of the economy reflect the pressing issues facing Europe as it tries to compete while preserving its distinctive social model tied to sustainable development. At the level of strategic decisional factors and bodies, there is an overarching interest in innovation towards sustainable development within Europe and beyond. Addressing the innovation divide across Member States and regions is the leading force that shapes a wide range of strategic initiatives and interconnected development objectives toward accelerating the diffusion of innovation and improved competitiveness. To this end, table 1 presents the blueprint with the main strategic initiatives to support research and innovation performance towards sustainable development at the European Union level.

**Table 1.** Policy initiatives for innovation and sustainable development - the EU level

Framework & year	Aims & Description
<p><b>"A Renewed Agenda for Research &amp; Innovation", 2018</b></p>	<p>Set of actions to create a research and innovation friendly-environment based on:</p> <ul style="list-style-type: none"> <li>• public and private investment instruments;</li> <li>• a better regulatory framework for innovation;</li> <li>• widening the boundaries of research and innovation;</li> <li>• re-skilling and up-skilling of the workforce;</li> <li>• modernisation of the education system.</li> </ul>
<p><b>"The European Green Deal", 2019</b></p>	<p>Set of transformative policies with SDGs at the core of policymaking and actions in the areas of:</p> <ul style="list-style-type: none"> <li>• climate neutrality;</li> <li>• clean, affordable and secure energy;</li> <li>• industry for a clean and circular economy;</li> <li>• energy and resource-efficient buildings;</li> <li>• sustainable and smart mobility;</li> <li>• fair, healthy and environmentally-friendly food system;</li> <li>• preservation of ecosystems and biodiversity;</li> <li>• pollution prevention and a toxic-free environment.</li> </ul>
<p><b>"Competitive Sustainability Agenda", 2021</b></p>	<p>Promotes a prosperity-focused policy agenda based on four pillars:</p> <ul style="list-style-type: none"> <li>• environmental sustainability;</li> <li>• productivity;</li> <li>• fairness;</li> <li>• macroeconomic stability.</li> </ul>
<p><b>"A New Europe Innovation Agenda", 2022</b></p>	<p>Five flagship areas to strengthen the EU's twin transition considering:</p> <ul style="list-style-type: none"> <li>• growth of deep-tech start-ups;</li> <li>• deep tech innovation for the uptake of innovative new products and processes;</li> <li>• innovation ecosystems across the EU;</li> <li>• fostering, attracting and retaining deep tech talents;</li> <li>• improving the innovation policymaking framework.</li> </ul>

*Source:* European Commission (2018; 2019; 2022a; 2022b)

**The Renewed Agenda for Research & Innovation**

The ageing population, climate change and security are among the significant societal and industrial issues that Europe's unique innovation model is intended to address (European Commission, 2018). This agenda for research and innovation promoted a set of actions aimed to modernise industry and sustain the social and economic model through innovation which permeates social, economic and industrial decisions. Concrete measures were proposed as reactions to the changing nature of innovation and encouraging collaborations and international investment in research and innovation through:

- Increasing the scale of private and public investment in research and innovation at local, national and European levels for productivity enhancement and competitiveness. Albeit the headline investment target of 3% of GDP (Gross Domestic Product) in Research & Development (R&D) has yet to be fulfilled, it provided a stimulus for EU growth and competitiveness (European Commission, 2022d). In 2020, EU research and development expenditure relative to GDP stood at 2.31 %, higher than in the previous year when it recorded 2.23 %, but lagging China with 2.4%, Japan with 3.26% and the United States with 3.45% (European Commission, 2018; Eurostat, 2022).
- Creating a better regulatory environment for innovation that includes common standards and interoperability guidelines to make it easier for innovative solutions to be adopted and deployed on the market. Additionally,

a careful balance between consistency and adaptability and the assurances of fair competition has been taken into account.

- Widening the boundaries of research and innovation by considering the investments across multiple sectors such as energy and climate, transportation, advanced manufacturing, health and food, digital, scientific fields (including social sciences and humanities), and various players and stakeholders.
- Significant investments in education, training, and research system help with faster knowledge dissemination, reuse, and access and decrease the skills gap.
- Supporting the modernisation of education and public research organisations through cross-border cooperation, increased student, professional, and researcher mobility, and meaningful transnational European knowledge-creating teams.

There is a growing emphasis on addressing the twin challenges of green and digital transformation driven by technological progress and industry 4.0 revolutions which changed the nature of work and raised new business models with embedded digital components (European Commission, 2022d). Thus, the EU's growth model that bundles environmental concerns, reduced inequality, improved well-being, and resilience fully encompassed the research and innovation initiatives and policies as important components of the revolutionary change needed to achieve sustainable futures.

### **The European Green Deal**

Given the complexity and interdependency of economic, social, and environmental concerns, the European Green Deal put forward a set of transformative policies centred on the Sustainable Development Goals (SDGs), which integrate and indivisible balance the economic, social, and environmental facets of sustainable development (United Nations, 2015). As European Commission (2019) acknowledged the, transformational change is foreseen through the set of investment measures aimed to support and accelerate innovation endeavours framed by sustainability concerns in the areas of:

- transforming the economy with the aim of climate neutrality by additional greenhouse gas emissions reductions; as well as a significant increase in sustainable public and private investment to encourage changes in consumer and business behaviour;
- investment in research and innovation projects for renewable energy, circular economy, and efficient buildings;
- attaining sustainable transport by offering more readily available, less expensive, healthier, and cleaner mobility options;
- developing a sustainable food value chain by using novel, creative methods to increase the food system's sustainability (e.g. organic farming, agro-ecology, agro-forestry, etc.);
- improving the legislative framework for better monitoring, reporting, prevention and remedying pollution from the air, water, soil, and consumer products.

### **The Competitive Sustainability Agenda**

An interesting outlook in the attempt to decouple economic prosperity as far as possible from environmental degradation was advocated by the European Economic and Social Committee, which pinpointed the need for a holistic approach to the EU growth model. As the Competitive Sustainability Agenda acknowledges, environmental sustainability, productivity, fairness, and macroeconomic stability are crucial pillars for a fair, green and digital transition, fostering innovation. These pillars are closely interlinked, equally important, and

mutually reinforcing (European Commission, 2022b). In addition, innovation is promoted as a cross-cutting constituent in the attempt to overcome climate change and environmental degradation, enhancing productivity in a fair and prosperity-orientated way by reinforcing people's skills, stepping up training and education, strengthening the transfer and valorisation of knowledge and promoting resource efficiency; strengthening the public finance and the stability of the financial markets for preventing social hardship.

Innovation is also the engine for technological advancement, a green and digital transition transforming how people work, live and communicate. The uptake of cloud technologies, the Internet of things, cyber-security, data analytics, 3D printing, artificial intelligence, robotics and automated machinery become underlying reasons for innovation concerns and investments. Also, given the complex nexus with interrelated socio-technical systems, goals and interests, innovation gained particular importance as the primary source of prosperity and catalyst for change.

### **The New Europe Innovation Agenda**

In the race to enable conditions for research and innovation, the new Europe Innovation Agenda promoted ambitious framework conditions conducive to innovative solutions to critical societal challenges (European Commission, 2022a). It put forward concrete new measures that strengthen the Europe twin transition and improve innovation performance through five flagship areas:

- growth of deep-tech start-ups focused on private capital investments;
- deep tech innovation using public procurement to create local initiatives for a green and digital transition;
- new models of collaboration between public and private sectors for the adoption of new technologies and the spread of innovations;
- training of specialists in fields having high innovation potential to further deployment of these digital technologies across all economic sectors;
- creating a shared understanding of the current status of innovation and the many elements and trends in the European Union.

## **4. Research and innovation – measurement frameworks**

Measuring innovation performance has gained particular relevance in the attempt to thwart research and innovation shortcomings. Various monitoring tools and assessment frameworks support knowledge sharing, sustainability uptake, and leveraging innovation across regions and Member States. These help decisional factors consider practical triggers and boundaries for further innovation endeavours. However, looking at the innovation concern, the current landscape is varied with multiple definitions concerning key terminology and embedded components, which often lead to certain difficulties when comparing innovation performance across countries.

Having an integrative look at innovation, the Global Innovation Tracker assesses the full spectrum of innovation performance from idea inception to impact. It considers four stages of the innovation cycle, which are grounded on relevant triggers for innovation potentials such as science and innovation investments (e.g. scientific publications, R&D expenditures), technological progress and adoption, and socioeconomic impact of innovation in terms of labour productivity, life expectancy, and carbon dioxide emissions (WIPO, 2022a).

Envisioned to capture the innovation status across the world, the Global Innovation Index (GII) was built as a composite indicator including measurements on the political environment, education, infrastructure and knowledge creation of each economy around the globe. The set of seven measurement variables (e.g. institutions, human capital and research, infrastructure, market development, business growth, knowledge and technology outputs, and creative outputs) enables researchers to measure the innovation performance through a wide range of metrics which highlight strengths, weaknesses, and gaps in innovation data. For example, the data revealed that

the United States continues to lead in the number of GII innovation indicators for which it ranks first globally, ranked the highest for 15 of the 81 indicators analysed. Additionally, Europe continues to host the most innovative leaders among the top 25 regions, with a total of 15, while there is a persisting regional innovation gap (WIPO, 2022b).

Having a more regional perspective, another trustworthy monitoring tool pertains to the European Innovation Scoreboard built on 12 innovation dimensions grouped into four categories as follows (European Commission, 2022f):

- framework conditions related to the primary triggers of innovation external to the organisation (e.g. quantity and quality of the workforce, the attractiveness level of research systems, and the level of digital technologies);
- degree of investments for research and innovation, the level of private investments, and the use of information technologies;
- innovation in the business sectors that stand for the share of products and business process innovators, the degree of collaboration for innovation capabilities, and the intellectual assets generated by the innovation process;
- impacts of innovation on employment, economic activities, and environmental sustainability.

Worthy, both monitoring tools used for assessing innovation performance (i.e. Global Innovation Index and European Innovation Scoreboard) integrate critical economic, social and environmental indicators in such a way as to measure the progress towards sustainable development. This may provide a better understanding of differences between countries struggling to foster research and innovation for better sustainability performance.

In sum, to respond to the new geopolitical challenges posing uncertainties of economic and social development at the global and European levels, the innovation concern is put at the centre of political initiatives and measurements towards sustainability transformation.

## **5. Research and innovation – local challenges**

Albeit measuring the innovation performance is challenging, the EU growth model depends on the capability of each Member State to overcome the shortcomings of productivity and competitiveness through adequate measures for sustaining innovation. These points out the necessity of investigating the state of play in the local context to better understand substantial threats and opportunities of innovation for sustainable development.

The analysis of Romania's progress on sustainable development revealed a series of structural vulnerabilities from high regional disparities in terms of productivity, investments and employment gaps. Figures demonstrate that productivity (69%) was below the EU average, with significant regional heterogeneity and a lack of essential resources, including transportation infrastructure, highly skilled people, and high employment levels in high-technology sectors and R&D spending (European Commission, 2022c). Also, Romania is well below the EU average regarding resource productivity, which measures how effectively the economy uses natural resources to create wealth and had the lowest level in the EU in 2020. The public expenditure on R&D as a percentage of GDP has decreased from 0.28% in 2010 to 0.19% in 2020 whilst the business expenditure shows a slight increase from 0.18% to 0.28%. Several improvements were noticed in environmental sustainability (e.g. Zero hunger- SDG2; Industry, Innovation, infrastructure-SDG9; Clean water and sanitation-SDG6; Sustainable cities and communities-SDG11; Climate action-SDG13; Life on land-SDG15.) whilst the poorest performance level was for responsible consumption and production-SDG12.

Romania has done well in employment and growth; between 2015 and 2020, its long-term unemployment rate was reduced by half, bringing it to 1.5% from 2.4%, below the EU average. However, it also demonstrates low public spending on R&D (0.47% in 2020 vs an EU average of 2.32%), which impacts the development of patents and industrial capabilities. In contrast to the EU's overall growth over the previous five years, tertiary educational accomplishment (at 24.9% in 2020) is also dropping (European Commission, 2022c).

Looking at the overarching role of innovation, the Global Innovation Index ranked Romania in the upper middle-income group with an overall innovation score of 34.1 out of 100 points (49<sup>th</sup> place out of 132 countries), having a performance innovation level below expectations. There are considerable countries differences, with top performers as Switzerland (64.6 pct.) and the United States (61.8 pct.), while Romania is lagging behind other EU countries such as Slovenia (40.6 pct.), Hungary (39.8 pct.) and Bulgaria (39.5 pct.), facing weaknesses in terms of policies for doing business, entrepreneurship policies and culture, percentage of firms offering formal training as well as the lack of global corporate R&D investments and venture capital investors. However, when considering the country's performance by income group, Romania is the top-ten performers in its group, ranked in 8<sup>th</sup> out of 36 countries, followed by Brazil and Serbia (WIPO, 2022b).

Alongside this, the European Innovation Scoreboard placed Romania in the emerging innovators' group together with Bulgaria, Croatia, Hungary, Latvia, Poland, and Slovakia, having an overall performance level of 32.6% in 2022, below 70% of the EU average (European Commission, 2022f). The high-level analysis revealed that innovation is below the average of this group of innovators (50.0%). Despite some progress in increasing the performance innovation rate, Romania performance gap with the EU is becoming larger.

A detailed analysis is needed to ascertain further the relative strengths and weaknesses of the country's performance to fully comprehend particular difficulties involved in driving the twin green and digital transition and enhancing social and economic resilience. In this regard, table 2 shows performance scores by country level, measured relative to that of the EU in 2022.

**Table 2.** Romania's performance innovation scores

Innovation category	Performance score relative to EU in 2022	Performance change relative to EU between 2015-2022
Human resources	19.2	- 24.2
Attractive research systems	35.5	19.0
Digitalisation	86.7	12.7
Finance and support	29.5	3.7
Firm investments	12.2	- 6.5
Use of information technologies	13.0	3.3
Innovators	4.6	6.5
Public-private linkages	7.4	- 1.4
Intellectual assets	32.7	5.6
Employment impacts	8.0	0.0
Economic impacts	69.3	7.7
Environmental sustainability	45.6	- 14.4

Source: European Commission, (2022f)

The relative strengths of the country seem to be digitalisation, with the highest composite score of 86.7 followed by the economic impact of innovation scored at 69.3. The relative weaknesses of the country are the innovators' pillar with the lowest combined score of 4.6 composed by enterprise product innovation scored at 6.7 vs. the EU

average of 27.00 and business process innovators scored at 5.3 vs. the EU average of 41.6. Worryingly, the country is lagging behind the EU average for both innovation triggers. Another chronic difficulty comes from the linkage performance having a low composite score of 7.4 formed by the innovative collaboration of enterprises with the value of 1.5 vs the EU average of 11.7 and public-private co-publications scored at 53.9 vs the EU average of 133.8 (European Commission, 2022f).

In conclusion, Romania has the lowest rate of innovation in the EU. Despite a slight gain in GDP of 0.5% in 2017, the total R&D intensity declined to 0.47% of GDP in 2020, maintaining significantly below the initial aim of 2%. Moreover, the 2021 Eco-Innovation Scoreboard, which assessed resource efficiency outcomes, socioeconomic conditions, eco-innovation inputs, activities, and outputs, also identified other structural weaknesses. Romania scored 71, placing it in 24th place on the "2021 Eco-Innovation Scoreboard", indicating the need to increase its eco-innovation efforts (European Commission, 2022e).

## Discussions

The results of this research stress the need to overcome the shortcomings of productivity and competitiveness through adequate measures for sustaining innovation at the local and regional levels, primarily through effective policy instruments for sustainability transition (Miedzinski et al., 2022). Additionally, the investments in product innovation and business process innovators may take advantage of open innovation practices (e.g. sharing innovation free of charge), which may contribute to the diffusion of innovation, and inclusive, social, and responsible innovation, enabling sustainable path creation for sustainability transitions (Costa & Matias, 2020; Eppinger, 2021; Priyono & Hidayat, 2022).

The findings are consistent with other research in the field and highlight structural vulnerabilities in terms of underdeveloped investments and lack of adequate measures which hamper Romania's innovation performance. Addressing the interdependency of economic, social, and environmental concerns for sustainable growth requires specific changes to support the progress toward sustainability innovation, and appropriate attention shall be paid to counteracting measures at the country level, such as:

- a) Increasing public support for private research and development to reinforce the collaboration between academia – public research, and businesses;
- b) Steeping up science-business cooperation by increasing the public-private scientific co-publications as a share of total publications;
- c) Strengthening the performance of the public research system through better working conditions and career prospects for researchers and increasing the investment in public science, including sustainability innovation outcomes;
- d) Increasing the investments in education and training to foster research and innovation projects, public and private networks, dissemination of innovation knowledge, and decreasing the creativity and critical thinking skill gaps.

Finally, it is essential to understand that research and innovation capabilities contribute to the competitiveness of a country. Designing appropriate measures to enable incremental improvements in the path of sustainability transformation may involve public investment support, development of research projects through university – industries cooperation, innovation cluster development for achieving innovation outputs as well as more social innovation projects (Novillo-Villegas et al., 2022; Nagy & Somosi, 2022).

In this view, especially in Romania's context, a set of measures and investment interventions are critical to keeping pace with the EU innovation performance trends in all sustainability dimensions (economic, social, and environmental concerns) which require the integration of specific sustainability objectives in the policy areas related to national research and innovation system (Baldassarre et al., 2020). It is also critical to stimulate

interregional linkages, improve dialogue between innovation policymakers and other policy domains, enhance cooperation between business and research, and improve the research system to generate relevant research and knowledge ecosystems (Kivimaa, 2022).

## Conclusions

Given the unprecedented challenges for sustainable transformation, there is increasing interest at all levels to enhance the innovativeness and competitiveness solutions to support the twin transition through investments in innovation, technological advancement and increased socioeconomic effect of innovation. The future economic growth at the European Union level depends on the capacity to leverage innovation across regions through a set of regulatory packages to improve the national research and innovation system's management for mobilising public research funding and infrastructure as well as investment packages to support international cooperation and links between academia and other private sectors.

The study aimed to fill the knowledge gap in the innovation trends in the light of sustainable development concerns. It can be valuable for academics, researchers and decisional factors interested in increasing awareness about the EU strategic initiatives in research and innovation as well as some of the long-run challenges related to the country's innovation performance.

The novelty of the research relies on the structured analysis of the implications of current research and innovation endeavours on the sustainability transition. It contributes to enhanced dialogues between scholars from different specialisations and disciplines and between decision-making factors responsible for innovation performance in three areas, i.e. economic, environmental and social outcomes. Our findings add to a growing body of scientific literature on the role of political frameworks and strategic initiatives in pursuing innovation toward sustainable development. The paper's original aspects are provided by identifying local vulnerabilities linked to innovation performance indicators, which may contribute to the early identification of suitable improvement measures to meet the agenda focused on the transition to sustainability.

Also, the paper has managerial implications supported by several recommendations for actions at the individual level for those academics, researchers and decisional factors which are willing to foster research and innovation on multiple levels and dimensions (i.e. economic, environmental and social aspects), becoming active agents of change in the transformation towards sustainable development.

However, the paper still needs to improve regarding a limited number of political frameworks and strategic initiatives selected for analysis. Further research is required in order to expand the scope of strategic initiatives and to include additional values for the country's performance scores which can deepen the knowledge of local improvement measures in the pursuit of research and innovation for sustainability transformation.

## References

- Abadzhiev, A., Sukhov, A., Sihvonen, A., & Johnson, M. (2022). Managing the complexity of green innovation. *European Journal of Innovation Management*, 25(6), 850–866. <https://doi.org/10.1108/ejim-02-2022-0098>
- Baldassarre, B., Keskin, D., Diehl, J. C., Bocken, N., & Calabretta, G. (2020). Implementing Sustainable Design Theory in Business Practice: A call to action. *Journal of Cleaner Production*, 273, 123113. <https://doi.org/10.1016/j.jclepro.2020.123113>

- Carro-Suárez, J., Sarmiento-Paredes, S., Rosano-Ortega, G., Garnica-González, J., & Vega-Lebrún, C.A. (2020). The process of innovation as a determinant factor of sustainable development in companies. *International Journal of Innovation and Sustainable Development*, 15(1), 100-125. <https://doi.org/10.1504/IJISD.2021.111552>
- Ceptureanu, S. I., Ceptureanu, E. G., Popescu, D., & Anca Orzan, O. (2020). Eco-innovation Capability and Sustainability Driven Innovation Practices in Romanian SMEs. *Sustainability*, 12(17), 7106. <https://doi.org/10.3390/su12177106>
- Chen, J., Wang, X., Shen, W., Tan, Y., Matic, L. M., & Samad, S. (2022). Environmental Uncertainty, Environmental Regulation and Enterprises' Green Technological Innovation. *International Journal of Environmental Research and Public Health*, 19(16), 9781. <https://doi.org/10.3390/ijerph19169781>
- Chi, N.T.K. (2022). Ethical Consumption Behavior towards Eco-friendly Plastic Products: Implication for Cleaner Production. *Cleaner and Responsible Consumption*, 5, 100055. <https://doi.org/10.1016/j.clrc.2022.100055>
- Chin-miel, S. (2018). A Study of Policies for Improving the Technological Innovation Capacity of Small and Medium-Sized Enterprises. *TEM Journal*, 7(2), 268-280. <https://doi.org/10.18421/TEM72-05>
- Costa, J., & Matias, J. C. O. (2020). Open Innovation 4.0 as an Enhancer of Sustainable Innovation Ecosystems. *Sustainability*, 12(19), 8112. <https://doi.org/10.3390/su12198112>
- De Marchi, V., Pineda-Escobar, M. A., Howell, R., Verheij, M., & Knorringa, P. (2022). Frugal innovation and sustainability outcomes: findings from a systematic literature review. *European Journal of Innovation Management*, 25(6), 984-1007. <https://doi.org/10.1108/ejim-02-2022-0083>
- Druzhynina, V., Viedienina, Y., Sakun, L., & Likhonosova, G. (2020). Creative Analysis of Innovation as a Catalizer of Socialization of Structural Change. *European Journal of Sustainable Development*, 9(2), 349. <https://doi.org/10.14207/ejsd.2020.v9n2p349>
- Engwall, M., Kaulio, M., Karakaya, E., Mitrev, M., & Berlin, D. (2021). Experimental Networks for Business Model Innovation: A Way for Incumbents to Navigate Sustainability Transitions? *Technovation*, 108, 102330. <https://doi.org/10.1016/j.technovation.2021.102330>
- Eppinger, E. (2021). How Open Innovation Practices Deliver Societal Benefits. *Sustainability*, 13(3), 1431. <https://doi.org/10.3390/su13031431>
- European Commission. (2018). *A renewed European Agenda for Research and Innovation - Europe's chance to shape its future*. COM(2018) 306 final. Retrieved January 15, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0306>
- European Commission. (2019). *The European Green Deal*. COM(2019) 640 final. Retrieved January 20, 2023 from [https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF)
- European Commission. (2022a). *A New European Innovation Agenda*. COM (2022) 332 final. Retrieved February 12, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0332>
- European Commission. (2022b). *Annual Sustainable Growth Survey 2022*. COM(2021) 740 final. Retrieved January 20, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0740>
- European Commission. (2022c). *Recommendation for a Council Recommendation on the 2022 National Reform Programme of Romania and delivering a Council opinion on the 2022 Convergence Programme of Romania. 2022 – Country Report Romania*. SWD (2022) 624 final. Retrieved February 12, 2023 from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0624>
- European Commission. (2022d). *Science, research and innovation performance of the EU 2022–Building a sustainable future in uncertain times*. Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-53506-5. <https://doi.org/10.2777/78826>
- European Commission. (2022e). *The Eco-innovation Scoreboard and Eco-innovation index*. Retrieved February 12, 2023 from [https://wayback.archive-it.org/1495/20220906155212/https://ec.europa.eu/environment/ecoap/indicators/index\\_en](https://wayback.archive-it.org/1495/20220906155212/https://ec.europa.eu/environment/ecoap/indicators/index_en)
- European Commission. (2022f). *European Innovation Scoreboard 2022*. Publications Office of the European Union. <https://data.europa.eu/doi/10.2777/309907>

- Eurostat. (2022). *Eurostat Regional Yearbook*. Retrieved January 15, 2023 from <https://ec.europa.eu/eurostat/documents/15234730/15242104/KS-HA-22%E2%80%91EN-N.pdf>
- Haskell, L., Bonnedahl, K. J., & Stål, H. I. (2021). Social innovation related to Ecological Crises: A Systematic Literature Review and a Research Agenda for Strong Sustainability. *Journal of Cleaner Production*, 325, 129316. <https://doi.org/10.1016/j.jclepro.2021.129316>
- Ionescu, R. V., Antohi, V. M., Zlati, M. L., Georgescu, L. P., & Iticescu, C. (2022). To a Green Economy across the European Union. *International Journal of Environmental Research and Public Health*, 19(19), 12427. <https://doi.org/10.3390/ijerph191912427>
- Khan, I. S., Ahmad, M.O., & Majava, J. (2023). Industry 4.0 Innovations and their Implications: An Evaluation from Sustainable Development Perspective. *Journal of Cleaner Production*, 405, 137006. <https://doi.org/10.1016/j.jclepro.2023.137006>
- Kivimaa, P. (2022). Transforming Innovation Policy in the Context of Global Security. *Environmental Innovation and Societal Transitions*, 43, 55-61. <https://doi.org/10.1016/j.eist.2022.03.005>
- Li, B., Lei, Y., Hu, M., & Li, W. (2022). The Impact of Policy Orientation on Green Innovative Performance: The Role of Green Innovative Capacity and Absorptive Capacity. *Frontiers in Environmental Science*, 10, 842133. <https://doi.org/10.3389/fenvs.2022.842133>
- Lüdeke-Freund, F. (2020). Sustainable Entrepreneurship, Innovation, and Business Models: Integrative Framework and Propositions for Future Research. *Business Strategy and the Environment*, 29, 665-681. <https://doi.org/10.1002/bse.2396>
- Martinidis, G., Komninos, N., Dyjakon, A., Minta, S., & Hejna, M. (2021). How Intellectual Capital Predicts Innovation Output in EU Regions: Implications for Sustainable Development. *Sustainability*, 13(24), 14036. <https://doi.org/10.3390/su132414036>
- Miedzinski, M., McDowall, W., Fahnestock, J., Rataj, O., & Papachristos, G. (2022). Paving the Pathways towards Sustainable Future? A Critical Assessment of STI Policy Roadmaps as Policy Instruments for Sustainability Transitions. *Futures*, 142, 103015. <https://doi.org/10.1016/j.futures.2022.103015>
- Nagy, S., & Somosi, M. S. (2022). The Relationship between Social innovation and Digital Economy and Society. *Regional Statistics*, 12 (2), 1-27. <https://doi.org/10.15196/RS120202>
- Novillo-Villegas, S., Acosta-Vargas, P., Cruz-Boada, C., Garzon, M., Marin-Dett, A., & Anzules-Falcones, W. (2022). Sustaining the Path for Innovation Capability from a Developing Country Perspective: A Conceptual Framework. *Sustainability*, 14(19), 12807. <https://doi.org/10.3390/su141912807>
- OECD. (2020). Addressing Societal Challenges using Transdisciplinary Research. *OECD Science, Technology and Industry Policy Papers*, 88, OECD Publishing, Paris. <https://doi.org/10.1787/0ca0ca45-en>
- OECD. (2021). *OECD Science, Technology and Innovation Outlook 2021: Times of Crisis and Opportunity*. OECD Publishing, Paris. <https://doi.org/10.1787/75f79015-en>
- Priyono, A., & Hidayat, A. (2022). Dynamic Capabilities for Open Innovation: A Typology of Pathways toward Aligning Resources, Strategies and Capabilities. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(4), 206. <https://doi.org/10.3390/joitmc8040206>
- Ratner, S. V., Balashova, S. A., & Lychev, A. V. (2022). The Efficiency of National Innovation Systems in Post-Soviet Countries: DEA-Based Approach. *Mathematics*, 10(19), 3615. <https://doi.org/10.3390/math10193615>
- Repo, P., & Matschoss, K. (2019). Social Innovation for Sustainability Challenges. *Sustainability*, 12(1), 319. <https://doi.org/10.3390/su12010319>
- Romanovskiy, O., Romanovska, Y., & Romanovska, O. (2021). The Impact of Academic Capitalism on the Formation of Innovation Policies in Higher Education and Science. *Baltic Journal of Economic Studies*, 7(5), 169-183. <https://doi.org/10.30525/2256-0742/2021-7-5-169-183>
- Schröer, A. (2021). Social Innovation in Education and Social Service Organizations. Challenges, Actors, and Approaches to Foster Social Innovation. *Frontiers in Education*, 5, 555624. <https://doi.org/10.3389/feduc.2020.555624>
- Silva, L. M. da, Bitencourt, C. C., Faccin, K., & Iakovleva, T. (2019). The Role of Stakeholders in the Context of Responsible Innovation: A Meta-Synthesis. *Sustainability*, 11(6), 1766. <https://doi.org/10.3390/su11061766>

Timmermans, J., Blok, V., Braun, R., Wesselink, R., & Nielsen, R. (2020). Social Labs as an Inclusive Methodology to Implement and Study Social Change: the Case of Responsible Research and Innovation. *Journal of Responsible Innovation*, 7(3), 410-426. <https://doi.org/10.1080/23299460.2020.1787751>

United Nations (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. Retrieved January 15, 2023 <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/291/89/PDF/N1529189.pdf?OpenElement>

World Intellectual Property Organization (WIPO) (2022a). *Global Innovation Tracker*. Retrieved February 12, 2023 from <https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2022-section2-en-global-innovation-tracker-global-innovation-index-2022-15th-edition.pdf>

World Intellectual Property Organization (WIPO). (2022b). *Global Innovation Index 2022: What is the future of innovation-driven growth?* Geneva, WIPO. <https://doi.org/10.34667/tind.46596>

Xu, K., Mei, R., Sun, W., Zhang, H., Liang, L. (2023). Estimation of Sustainable Innovation Performance in European Union Countries: Based on the Perspective of Energy and Environmental Constraints. *Energy Reports*, 9, 1919-1925. <https://doi.org/10.1016/j.egyr.2023.01.010>

Yang, G., & Liu, B. (2021). Research on the Impact of Managers' Green Environmental Awareness and Strategic Intelligence on Corporate Green Product Innovation Strategic Performance. *Annals of Operations Research*. <https://doi.org/10.1007/s10479-021-04243-5>

Yu, C., Zhang, Z., Lin, C., & Wu, Y. (2017). Knowledge Creation Process and Sustainable Competitive Advantage: the Role of Technological Innovation Capabilities. *Sustainability*, 9(12), 2280. <https://doi.org/10.3390/su9122280>

Zhang, D., & Xie, Y. (2022). Customer Environmental Concerns and Profit Margin: Evidence from Manufacturing Firms. *Journal of Economics and Business*, 120, 106057. <https://doi.org/10.1016/j.jeconbus.2022.106057>

**Author Contributions:** Conceptualisation: *B.F., E.F., S.M.*; methodology: *B.F., E.F., S.M., I.M.C.*; data analysis: *B.F., E.F., S.M., I.M.C.*; writing—original draft preparation: *B.F., E.F., S.M., I.M.C.*; writing; review and editing: *B.F., E.F., S.M., I.M.C.*; visualisation: *B.F., E.F., S.M.* All authors have read and agreed to the published version of the manuscript.

**Bogdan FLEACĂ** is associate Professor at the Faculty of Entrepreneurship, Business Engineering and Management (FEBEM), University Politehnica of Bucharest (UPB), Romania; Ph.D. in Industrial Engineering. Research interests: Quality 4.0 and management standards; business productivity; innovation & process optimisation; education and sustainable management system; sustainability in Higher Education.

ORCID ID: <https://orcid.org/0000-0001-5469-0885>

**Elena FLEACĂ** is professor at the Faculty of Entrepreneurship, Business Engineering and Management (FEBEM), University Politehnica of Bucharest (UPB), Romania; Ph.D. In Industrial Engineering; Doctor habilitate in Industrial Engineering. Research interests: business analysis; innovation and process improvement; project management processes; sustainable development in higher educations; standards for sustainability reporting.

ORCID ID: <https://orcid.org/0000-0002-7828-2330>

**Sanda MAIDUC** is researcher at Department of Management for Scientific Research Activities, University Politehnica of Bucharest, Romania; Ph.D., economist; specialised in Entrepreneurship and Intellectual Property. Research interests: creativity, innovation and entrepreneurship, sustainable entrepreneurship, employment relations and organisational climate, organisational creativity and innovation including learning in the workplace, motivation and work environment.

ORCID ID: <https://orcid.org/0000-0002-8801-1091>

**Ionut Marius CROITORU** is teaching assistant at University Politehnica of Bucharest, Romania; Ph.D., economist; specialised in European studies and European Project Management. Research interests: project management, innovation and research, efficiency of investments, financial management and public procurement, entrepreneurship and innovation.

ORCID ID: <https://orcid.org/0009-0007-1290-6394>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

**SUSTAINABLE DEVELOPMENT GREEN INDEX: MEASURING PROGRESS  
TOWARDS SUSTAINABLE DEVELOPMENT GOALS IN THE EUROPEAN UNION**

**Oleg Rybalkin<sup>1</sup>, Olga Lavrinenko<sup>2</sup>, Alina Danileviča<sup>3</sup>, Wiesława Lizińska<sup>4</sup>**

<sup>1,2,3</sup> *Institute of Humanities and Social Sciences, Daugavpils\* University, Parades Str. 1-421, Daugavpils, LV-5401, Latvia*

<sup>4</sup> *University of Warmia and Mazury in Olsztyn, Faculty of Economic Sciences, Institute of Economics and Finance, Oczapowskiego 4, 10-720 Olsztyn, Poland*

E-mails: <sup>1</sup> [oleg.rybalkin@gmail.com](mailto:oleg.rybalkin@gmail.com); <sup>2</sup> [olga.lavrinenko@du.lv](mailto:olga.lavrinenko@du.lv); <sup>3</sup> [alina.danilevica@du.lv](mailto:alina.danilevica@du.lv); <sup>4</sup> [wieslawa.lizinska@uwm.edu.pl](mailto:wieslawa.lizinska@uwm.edu.pl)

*Received 18 February 2023; accepted 6 June 2023; published 30 June 2023*

**Abstract.** The EU positions itself at the forefront of the global green agenda. Therefore, it is necessary to assess the development of European countries considering the "green" component of this process. Not all currently known indices cover all aspects of sustainable development. The article aims to develop a Sustainable Development Green Index (SDGI), which, on the one hand, would be used as an effective tool for measuring progress in the implementation of sustainable development goals; and, on the other hand, would take into account economic, social, educational, environmental and political aspects. This study's results demonstrate effectiveness of the suggested tool. Practical application of the SDGI may be instrumental for reaching faster movement towards Sustainable Development Goals in the European Union.

**Keywords:** Sustainable Development Goals; Sustainable Development Green Index

**Reference** to this paper should be made as follows: Rybalkin, O., Lavrinenko, O., Danileviča, A., Lizińska, W. 2023. Sustainable Development Green Index: measuring progress towards sustainable development goals in the European Union. *Entrepreneurship and Sustainability Issues*, 10(4), 279-292. [http://doi.org/10.9770/jesi.2023.10.4\(17\)](http://doi.org/10.9770/jesi.2023.10.4(17))

**JEL Classifications:** C43, O44, O52, O57, R11, Q20, Q30

## 1. Introduction

So far, several comprehensive and inclusive indices measuring progress toward more sustainable development have been created. Ryszawska (2013, 2015, 2017) has worked out a Green Economy Index, which includes the following factors: economy (pollution, resource consumption, emissions, waste), society (social inequalities and poverty), natural capital (biodiversity, ecosystems), politics (environmental policies and strategies). Kasztelan (2017a, 2017b, 2018, 2021) used the Organisation for Economic Cooperation and Development methodology. Its Green Growth Indicators include inequality, GDP per capita, low income, air pollution exposure, environmentally

---

\* *The research was funded by Daugavpils University, Latvia*

related innovation and taxation environmentally adjusted multi-factor productivity, CO<sub>2</sub> productivity, material productivity. (OECD Green Growth Indicators 2017, 2017).

The analysed indexes aggregate only some aspects of sustainable development, and their framework hasn't been used for testing the relationship with SDGs'. The present article suggests using an original Sustainable Development Green Index (SDGI), which embraces economic, social, educational, environmental and political aspects and demonstrates a strong relationship with some SDGs' progress in the European Union.

## **2. Review of literature**

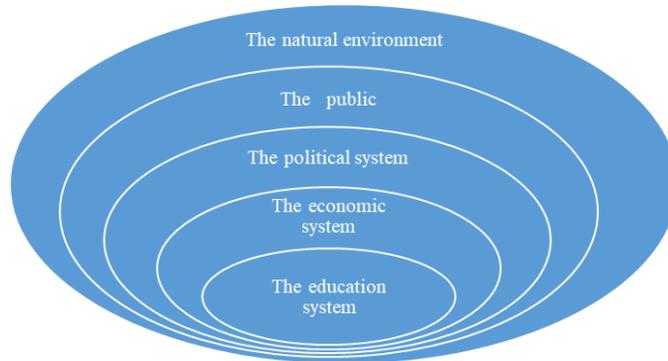
The industrialisation has caused environmental degradation, climate change, pollution (Mealy et al., 2020; Adamowicz, 2022), biodiversity loss, and uncontrolled resource exploitation (Burck et al., 2018; Zhao et al., 2021; Usman et al., 2022). Negative consequences affect the quality of human life and economic opportunities (Michalak et al., 2020; Purbawati et al., 2023).

In 2015, the United Nations devised seventeen sustainable development goals (SDGs) to counter such negative consequences. SDGs included five critical areas of importance by 2030 – planet, people, peace, partnership, and prosperity (UNDP, 2022). United Nations motivated global economies to incorporate sustainable principles in their industrial processes (Sivageerthi et al., 2022).

SDGs are commonly classified into three groups: economy, society and biosphere (or environment) (Stockholm Resilience Centre, 2016; Paoli et al., 2019; Yu et al., 2022). However, it is necessary to broaden this view because some SDGs have educational (SDG 4, partially – SDG 9) and political (SDG 13, 16-17, partially – SDG 7) dimensions.

The necessity to integrate economic, social, educational, environmental and political factors into the analysis of SDGs predetermined by applying the Quintuple Helix model within the research. The Quintuple Helix model focuses on the transfer of knowledge and public exchange within the ecosystem of the state (Barth, 2011; Arsova et al., 2021; Purbavati et al., 2023). In addition, the innovative Quintuple Helix model explains how the natural environment, knowledge and innovations are interdependent (Carayannis et al., 2012; 2021; Cai, 2022). The Quintuple Helix Model is a complex structure, with all five helices requiring knowledge in natural science, social science, and humanities (Carayannis and Campbell, 2012; Vitola et al., 2021).

Fig. 1 presents the structure of the Quintuple Helix Model, where knowledge moves in a circle from the education system to the economic system, then to the political system, the public, and the natural environment (Grundel et al., 2016). These five helices work as "subsystems" (Ibid).



**Figure 1.** The Model the Quintuple Helix.

*Source:* The authors' constructions according to Carayannis et al., 2009, 2010, 2011, 2012, 2021

Despite the previous attempts to relate Quintuple Helix Model to sustainable development processes, there is still a gap, in area of how this model could be used for measuring of complex green growth processes.

### **3. Methodology**

The authors suggest to look at sustainable development process via lenses of the Quintuple Helix Innovative Model. Here it has to be noted that similar attempts already has been made by e.g. Barcellos-Paula et al. (2021).

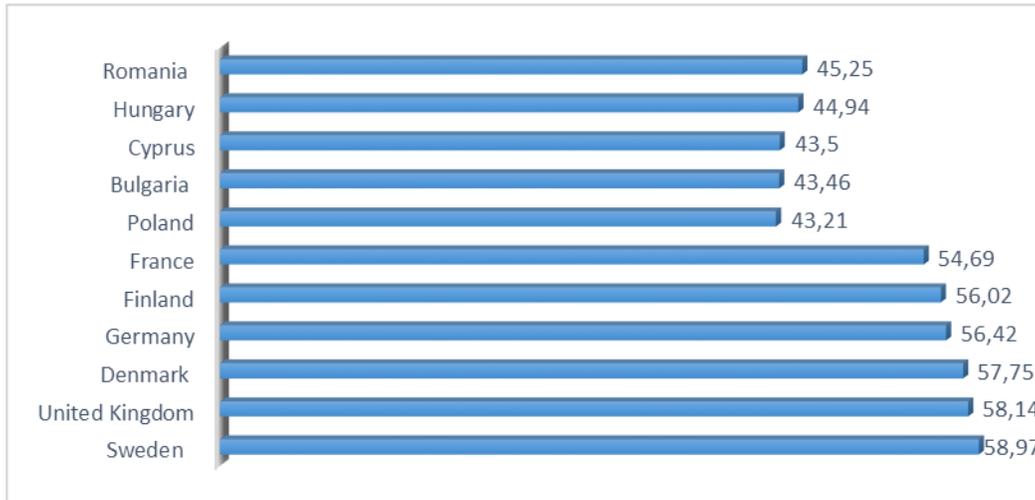
Hence, Quintuple Helix Model has been used to make necessary calculations of SDGI. An equal number of indicators (10) were assigned to each of the subsystems (5), 50 indicators in total (see Appendix). All indicators are standardised.

The mean values Sustainable Development Green Index are obtained as arithmetic means of the corresponding indicators. The integrated SDGI was received as the arithmetic mean of the values of five subsystems (Rybalkin, 2022).

### **3. Results and discussion**

The Sustainable Development Green Index (along with its subsystems) has been calculated for the European Union countries (plus the United Kingdom) data collected in 2020. The results of the calculations were analysed and visualised with the help of SPSS software; specifically, cluster analysis was performed. Being a quantitative method of data analysis aimed at discovering groups in data (in the case of the present article – clusters of the EU countries), the value of such research is that it suggests groupings that might form the basis of future hypotheses to be investigated (Landau et al., 2010).

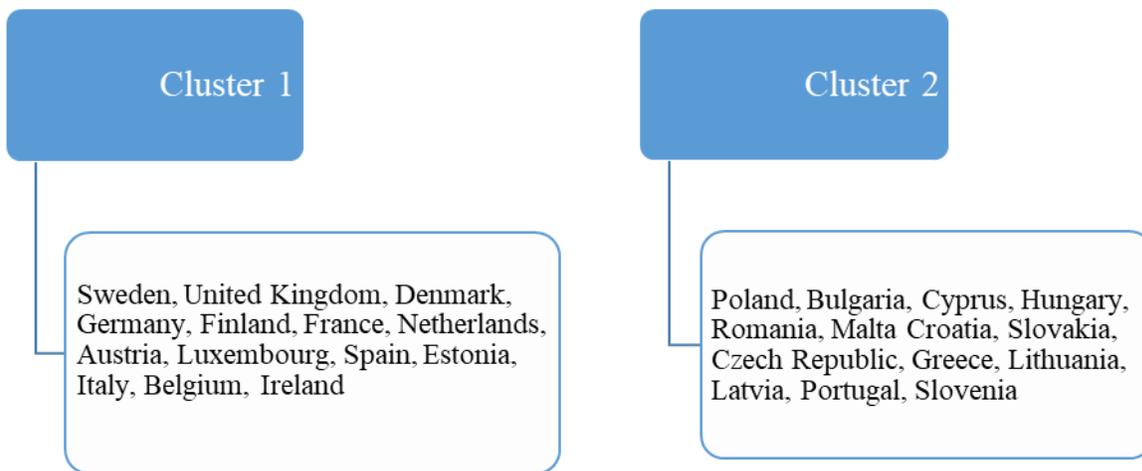
The results of the leading and outsider countries in terms of the Sustainable Development Green Index in 2020 are presented in Fig. 2.



**Figure 2.** The Sustainable Development Green Index 2020

*Source:* The authors' calculations in SPSS according to statistical data; were elaborated using mapchart.net.

Cluster analysis allowed to group EU countries into two homogeneous clusters (Figure 2) by their SDGI. The first cluster (Cluster 1) included countries with higher mean values of all five subsystems; a lower level of these mean values characterised other countries (Cluster 2). See Figure 3 below.



**Figure 3.** European Union countries are divided into Cluster 1 and Cluster 2 by the Sustainable Development Green Index, 2020

*Source:* The authors' calculations in SPSS according to statistical data; were elaborated using mapchart.net.

Considering the mean values of the subsystems in the two clusters, it can be concluded that all mean values of subsystems in the Cluster 1 exceed those of subsystems in Cluster 2. Notably, the mean value of the educational subsystem – by 27%, the mean value of the political subsystem – by 18.5%, the mean value of the societal subsystem – by 14.3%, the economic subsystem – by 14.2%, the environmental subsystem – by 11.3% (Figure 4).

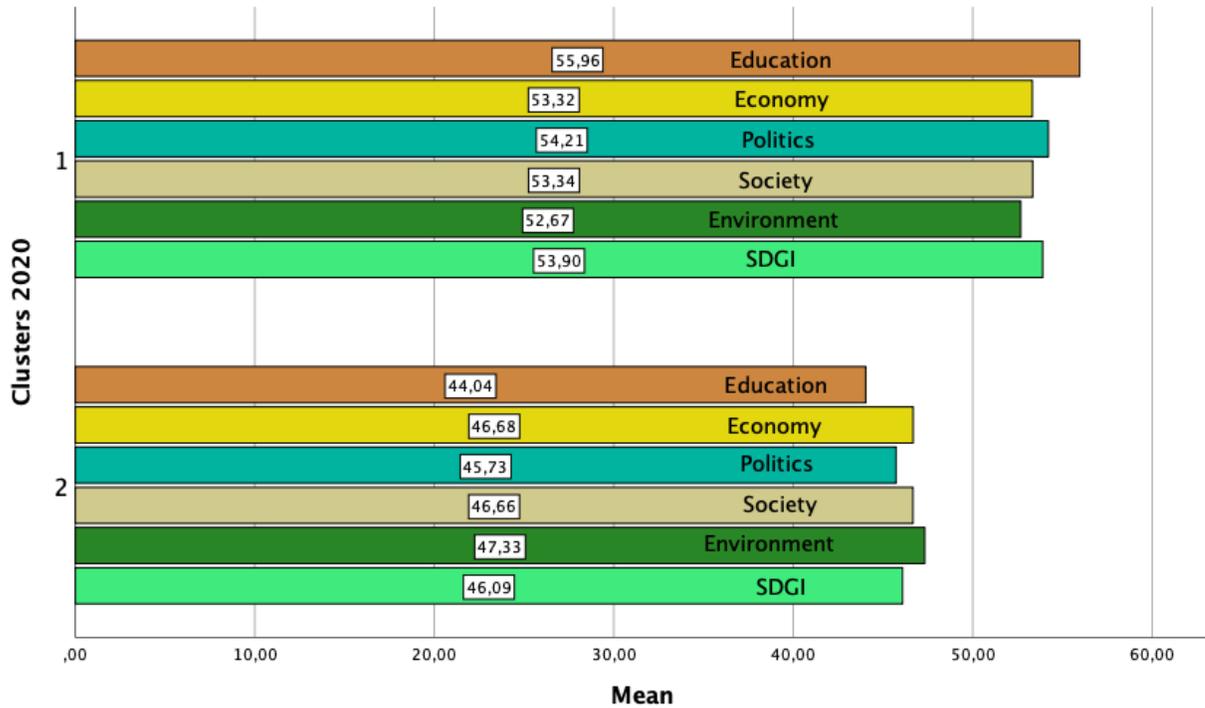


Figure 4. Comparison of Cluster 1 and Cluster 2 according to the Sustainable Development Green Index subsystems, 2020

Source: The authors` calculations in SPSS according to statistical data.

The Sustainable Development Green Index elaborated within the present article has helped to divide the EU countries into two homogeneous clusters, find out the main differences in the performance of the green economy in the context of sustainable development between the clusters. It would be helpful to make it less complicated by revealing the most relevant indicators and constructing simplified version of the index which would contained a reduced number of indicators.

The analysis of the multicollinearity of the unified statistical indicators was performed. To that end, the coefficients of determination  $R^2 = r^2$  of each of the primary statistical indicators of the analysed set were found (Ajvazyan, 2005). Next, selecting the most informative criteria among the indicators of each Sustainable Development Green Index category was conducted. The most informative set is the one in which the sum of the coefficients of determination of the dependent variable by the explanatory variables is maximum.

I.e., the set of indicators  $x^{(j_1^1)}, x^{(j_2^0)}, K, x^{(j_3^0)}$  is considered to be the most informative, if

$$\sum_{l=1}^{m_j} R^2 \left( x^{(j^l)}, \left( x^{(j_1^0)}, K, x^{(j_3^0)} \right) \right) = \max_{l_1, l_2, K, l_3} \sum_{l=1}^{s_j} R^2 \left( x^{(j^l)}, \left( x^{(j_1^l)}, K, x^{(j_3^l)} \right) \right)$$

where  $R^2(y; (x^{(l)}, K, x^{(s)}))$  - coefficient of determination of the dependent variable by the explanatory variables  $x^{(l)}, K, x^{(s)}$ .

The quantitative composition of a limited set of indicators is chosen in each specific case based on a combination of theoretical (substantial) considerations and requirements for the minimum allowable values of  $R^2_{min}$  of the coefficients of determination.

After that, it was decided to take three indicators with the most significant sum of the coefficients of determination within each of the subsystems (to ensure equal representation of indicators, just like in the Sustainable Development Green Index itself). The average of their sum constituted the simplified Sustainable Development Green Index (Table 1).

**Table 1.** Simplified SDGI and its indicators, 2020

<b>Subsystems of the simplified SDGI</b>				
<b>Educational</b>	<b>Economic</b>	<b>Political</b>	<b>Societal</b>	<b>Environmental</b>
1. Citations per document	1. Efficiency sectors	1. Enforcement of environmental regulations	1. World Press Freedom Index	1. Environmental Performance Index
2. h-index	2. Growth of innovative companies	2. Environmental performance indicator*	2. Democracy Index	2. Air quality
3. Patents by origin	3. Energy Transition Index	3. Intellectual property protection	3. Incidence of corruption	3. Water resources

\* This indicator is a part of the Global Innovation Index and measures environmental performance on a state level; it is not the same as the Environmental Performance Index (environmental subsystem) from the Environmental Performance Index Report (which deals exclusively with the quality of the environment).

*Source:* the author’s calculations in SPSS according to statistical data.

As seen from Table 3, the multicollinearity analysis has allowed us to define the most relevant indicators within each of the subsystems of the Sustainable Development Green Index and construct its simplified version, which consists of 15 instead of 50 indicators.

Now that the simplified version of SDGI has been presented, it is suggested to test empirically its interrelation with indicators connected with some of the Sustainable Development Goals in the European Union by correlation analysis, with a focus on society-related SDGs because of the high demand for such studies (Sianes et al., 2022).

To determine if there is an interrelation between the Sustainable Development Green Index and SDG 3, 'Good health and well-being', SDG 4 'Quality education', SDG 9 'Industry, innovation and infrastructure' correlation analysis were performed. The 'Smoking Prevalence' indicator reflects progress towards Sustainable Development Goal 3 (Eurostat, 2022a). For Sustainable Development Goal 4 – the indicator 'Share of individuals having at least basic digital skills' (Eurostat, 2022b). Finally, for Sustainable Development Goal 9, the indicator of the market share of plug-in electric vehicles in the EU countries in 2020 (European Automobile Manufacturers Association (ACEA, 2021) was analysed.

The results upon analysing the relationship between progress towards the abovementioned SDGs and SDGI and its subsystems were as follows (Table 2). They are also compared to the correlation with GDP per capita in the EU countries.

**Table 2.** Correlation analysis between SDGI and some SDGs' progress in the EU

		U	H	O	E	S	E	C	U
Smoking prevalence (SDG 3 'Good health and well-being)	Pearson Correlation	,654**	,793**	,684**	,796**	,660**	,766**	,528**	
Digital skills (SDG 4 'Quality education)	Pearson Correlation	,752**	,767**	,830**	,814**	,816**	,850**	,547**	
ECV registration growth (SDG 9 'Industry, innovation and infrastructure)	Pearson Correlation	,793**	,835**	,738**	,797**	,730**	,835**	,522**	
Average Pearson Correlation		,733	,798	,751	,802	,735	,817	0,532	

\*\* . Correlation is significant at the 0.01 level (2-tailed)

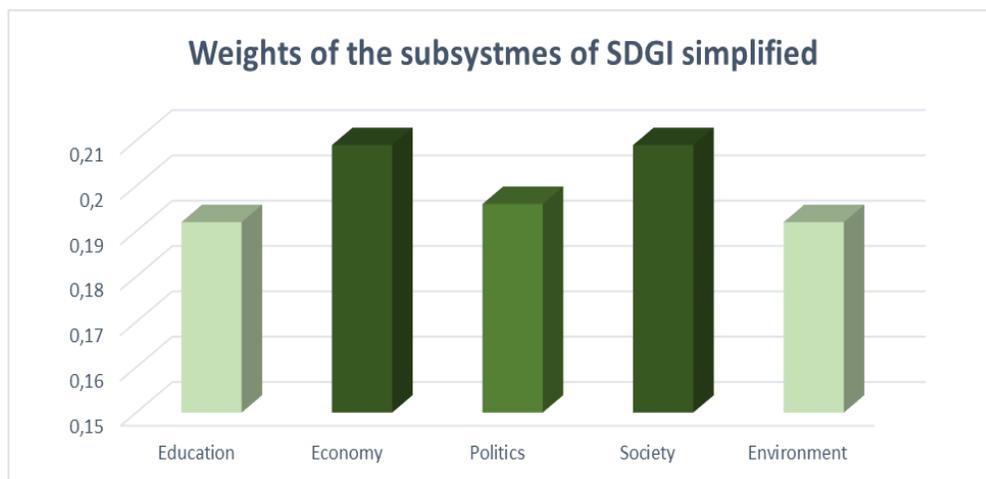
Source: The authors' calculations in SPSS according to statistical data.

As can be seen from the table, the correlation between the indicators corresponding to SDGs 3, 4, 9 and the simplified version of the Sustainable Development Green Index was significant and can be characterised as very strong according to Quinnipiac University's interpretation (as quoted from Akoglu, 2018).

Also, it can be observed that all analysed SDGs interrelated with the simplified SDGI are more robust than with such conventional metrics as GDP per capita, which covers only the economy.

These findings substantiate the statement that Sustainable Development Green Index is more suitable for measuring progress towards SDGs in Europe than conventional metrics, since it is more consistent with sustainable development and considers all subsystems: educational, economic, political, societal and environmental.

It can also be seen that the correlation coefficients of various subsystems of simplified SDGI are different (Fig. 5):



**Figure 5.** SDG-weighted subsystems of SDGI simplified

Source: The authors' calculations according to statistical data

As the Figure 5 shows, in an SDG-weighted simplified version of the Sustainable Development Green Index, the subsystems have the following weights: education and environment – 0,192, politics – 0,196, economy and society – 0,209.

#### 4. Conclusions

The article revealed strong interrelations between the simplified version of the Sustainable Development Green Index and SDGs 3, 4, and 9 progress in the European Union.

The correlation was higher than with GDP per capita. It makes the newly elaborated SDGI more relevant to measuring progress towards SDGs than conventional metrics. The created SDGI considers all subsystems of the phenomenon: educational, economic, political, societal and environmental, and thus more consistent with the context of sustainable development.

It also underlines the fact that a market-centric approach seems to be entirely one-sided, overestimating the influence of economic prosperity on sustainable development.

That SDGI provides a better-balanced and multidimensional view of this phenomenon, considering all related factors.

Sustainable Development Green Index proposed within the present study offers academia, society, business and governments a tool to measure a country's performance in terms of sustainable development and progress towards some of the SDGs. The suggested tool can be helpful for different stakeholders. The study opens up new research opportunities regarding the further applicability of the index towards sustainable development issues in EU countries and globally.

Analysing the interrelation between the SDGI and other SDGs by performing correlation analysis will still need to be the purpose of subsequent research.

#### References

- Adamowicz, M. (2022). Green Deal, Green Growth and Green Economy as a Means of Support for Attaining the Sustainable Development Goals. *Sustainability*, 14(10), 5901. <https://doi.org/10.3390/su14105901>
- Ajvazyan, S.A. (2005). Razrabotka i analiz integralnykh indikatorov kachestva zhizni naseleniya Samarskoj oblasti [Development and analysis of integral indicators of the quality of life of the population of the Samara region.]. Moskva: CEMI RAN.
- Akoglu, H. (2018). User's guide to correlation coefficients. *Turkish Journal of Emergency Medicine*, 18(3), 91–93. <https://doi.org/10.1016/j.tjem.2018.08.001>
- Arsova, S., Genovese, A., Ketikidis, P. H., Alberich, J. P., & Solomon, A. (2021). Implementing Regional Circular Economy Policies: A Proposed Living Constellation of Stakeholders. *Sustainability*, 13(9), 4916. <https://doi.org/10.3390/su13094916>
- Barcellos-Paula, L., De La Vega, I., & Gil-Lafuente, A. M. (2021). The Quintuple Helix of Innovation Model and the SDGs: Latin-American Countries' Case and Its Forgotten Effects. *Mathematics*, 9(4), 416. <https://doi.org/10.3390/math9040416>
- Barth, T. D. (2011). The Idea of a Green New Deal in a Quintuple Helix Model of Knowledge, Know-How and Innovation. *International Journal of Social Ecology and Sustainable Development*, 2(1), 1-14. <https://doi.org/10.4018/jesd.2011010101>
- Brundtland, G. (1987). *Report of the World Commission on Environment and Development: Our Common Future*. United Nations General Assembly document A/42/427. Retrieved September 24, 2022, from: <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
- Burck, J., Marten, F., Bals, Ch., Höhne, N., & Frisc, C. (2018). *Climate Change Performance Index*. Retrieved September 24, 2022 from <https://germanwatch.org/sites/default/files/publication/20504.pdf>

- Cai, Y. (2022). The Tribology of the Helixes: Relations between Triple, Quadruple and Quintuple Helix Models. *Triple Helix*, 9(1), 1-5. <https://doi.org/10.1163/21971927-12340006>
- Carayannis, E. G., & Campbell, D. F. (2011). *Mode 3 Knowledge Production in Quadruple Helix Innovation Systems: 21st-Century Democracy, Innovation, and Entrepreneurship for Development*. Springer Science & Business Media. <https://doi.org/10.1007/978-1-4614-2062-0>
- Carayannis, E. G., & Campbell, D. K. (2009). “Mode 3” and “Quadruple Helix”: toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3/4), 201. <https://doi.org/10.1504/ijtm.2009.023374>
- Carayannis, E. G., Barth, T. D., & Campbell, D. K. (2012). The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship*, 1(1), 2. <https://doi.org/10.1186/2192-5372-1-2>
- Carayannis, E. G., Campbell, D. F. J., & Grigoroudis, E. (2021). Helix Trilogy: the Triple, Quadruple, and Quintuple Innovation Helices from a Theory, Policy, and Practice Set of Perspectives. *Journal of the Knowledge Economy*, 13(3), 2272-2301. <https://doi.org/10.1007/s13132-021-00813-x>
- Dual Citizen. (2018). *Global Green Economy Index*. Retrieved September 25, 2022, from <https://dualcitizeninc.com/global-green-economy-index/economic-environmental-indicators.php?id=3>
- Economist Intelligence Unit. (2020). *Democracy Index*. Retrieved September 25, 2022, from: <https://www.in.gr/wp-content/uploads/2020/01/Democracy-Index-2020.pdf>
- European Automobile Manufacturers Association (ACEA). (2021). *European Countries Listed by Plug-In Electric Car Market Share In Q1–Q4, 2020. InsideEVs*. Retrieved September 25, 2022, from <https://insideevs.com/news/489169/european-countries-plugin-market-share-q1q4-2020/>
- Eurostat. (2018). *Environmental Tax Revenues*. Retrieved September 27, 2022 from [http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020\\_rt320&plugin=1](http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_rt320&plugin=1)
- Eurostat. (2019). *Resource Productivity and Domestic Material Consumption (DMC)*. Retrieved September 27, 2022 from [http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=sdg\\_12\\_20&language=en](http://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=sdg_12_20&language=en)
- Eurostat. (2022a). *Smoking Prevalence by Countries*. Retrieved September 27, 2022, from [https://ec.europa.eu/eurostat/databrowser/view/sdg\\_03\\_30/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/sdg_03_30/default/table?lang=en)
- Eurostat. (2022c). *Share of Individuals Having at Least Basic Digital Skills*. Retrieved September 27, 2022, from [https://ec.europa.eu/eurostat/databrowser/view/sdg\\_04\\_70/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/sdg_04_70/default/table?lang=en)
- Green Growth Indicators 2017. (2017). In *OECD eBooks*. Organisation for Economic Cooperation and Development. <https://doi.org/10.1787/9789264268586-en>
- Grundel, I., & Dahlström, M. (2016). A Quadruple and Quintuple Helix Approach to Regional Innovation Systems in the Transformation to a Forestry-Based Bioeconomy. *Journal of the Knowledge Economy*, 7(4), 963-983. <https://doi.org/10.1007/s13132-016-0411-7>
- Kasztelan, (2021). On the Road to a Green Economy: How Do European Union Countries ‘Do Their Homework’? *Energies*, 14(18), 5941. <https://doi.org/10.3390/en14185941>
- Kasztelan, A. (2017a). Green Growth, Green Economy and Sustainable Development: Terminological and Relational Discourse. *Prague Economic Papers*, 26(4), 487-499. <https://doi.org/10.18267/j.pep.626>
- Kasztelan, A. (2017b). The use of the Hellwig’s Pattern Model for the evaluation of green growth in OECD countries. In *Proceedings of the 29<sup>th</sup> International Business Information Management Association Conference*, 1035–1044. Vienna, Austria. Retrieved September 28, 2022, from [https://www.researchgate.net/publication/320566883\\_The\\_Use\\_of\\_the\\_Hellwig's\\_Pattern\\_Model\\_for\\_the\\_Evaluation\\_Of\\_Green\\_Growth\\_in\\_OECD\\_Countries](https://www.researchgate.net/publication/320566883_The_Use_of_the_Hellwig's_Pattern_Model_for_the_Evaluation_Of_Green_Growth_in_OECD_Countries)
- Kasztelan, A. (2018). Multi-criteria analysis of green competitiveness of the EU countries. *Proceedings of the 4th International Conference on European Integration* (pp. 376–387). Ostrava (Czech Republic): Technical University of Ostrava. Retrieved September 30, 2022 from [https://www.researchgate.net/profile/Armand\\_Kasztelan/publication/325323264\\_Multi-](https://www.researchgate.net/profile/Armand_Kasztelan/publication/325323264_Multi-)

[Criteria Analysis of Green Competitiveness of the EU Countries/links/5b05a18e0f7e9b1ed7e823cc/Multi-Criteria-Analysis-of-Green-Competitiveness-of-the-EU-Countries.pdf](#)

Landau, S., & Ster, I. C. (2010). Cluster Analysis: Overview. *Elsevier EBooks*, 72-83. <https://doi.org/10.1016/b978-0-08-044894-7.01315-4>

Mealy, P., & Teytelboym, A. (2022). Economic complexity and the green economy. *Research Policy*, 51(8), 103948. <https://doi.org/10.1016/j.respol.2020.103948>

Michalak, D., Rosiek, K., & Szyja, P. (2020). *Gospodarka niskoemisyjna – gospodarka cyrkularna – zielona gospodarka. Uwarunkowania i wzajemne powiązania* [Low-emission economy - circular economy - green economy]. Lodz (Poland): Publishing House of the University of Lodz. <https://doi.org/10.18778/8220-032-4>

NETGreen. (2015). *Green Economy Indicators*. Retrieved September 23, 2022, from <https://measuring-progress.eu/printpdf/complete-indicator-list>

Organisation for Economic Co-operation and Development (OECD). (2011). *Towards Green Growth: Monitoring Progress. OECD Indicators*. Retrieved September 23, 2022 from <https://www.oecd.org/greengrowth/48224574.pdf>

Organisation for Economic Co-operation and Development (OECD). (2017) Green growth indicators. *OECD Green Growth Studies*. Paris: OECD Publishing. <https://doi.org/10.1787/9789264268586-en>.

Paoli, A. D., & Addeo, F. (2019). Assessing SDGs: A Methodology to Measure Sustainability. *Athens Journal of Social Sciences*, 6(3), 229-250. <https://doi.org/10.30958/ajss.6-3-4>

Pawłowski, A. (2009). The Sustainable Development Revolution. *Problemy Ekorozwoju*. [Problems of Sustainable Development], 4(1), 65-79. Retrieved October 30, 2022, from <https://ssrn.com/abstract=1481723>

Purbawati, D., Widiartanto, W., Pimem, R. (2023). Green Business Sustainability: SMES Strategy to Increase Business Performance and Save the Environment. *Journal of Marketing Research and Case Studies*, 2023, 516052. <https://doi.org/10.5171/2023.516052>

Reporters without borders. (2020). *World Press Freedom Index*. Retrieved September 15, 2022, from <https://rsf.org/en/index?year=2020>.

Rybakina, O. (2022) Sustainable development goals progress in the European Union: correlation with EEPSE Green Economy Index. *Access to Science, Business, Innovation in Digital Economy, ACCESS Press* 3(2), 121-135. [https://doi.org/10.46656/access.2022.3.2\(3\)](https://doi.org/10.46656/access.2022.3.2(3))

Ryszawska, B. (2013). *Zielona gospodarka: teoretyczne podstawy koncepcji i pomiar jej wdrażania w Unii Europejskiej* [Green economy: theoretical foundations of the concept and measurement of its implementation in the European Union]. Wrocław (Poland): Publishing House of the Economic University of Wrocław

Ryszawska, B. (2015). Green economy indicators. In M. Burchard-Dziubińska (Ed.), *Towards a green economy. From ideas to practice* (pp. 31–52). Lodz (Poland): Publishing House of the University of Lodz

Ryszawska, B. (2017). Green Economy transition and regional policy of European Union. *Prikladna ekonomika- vid teori i do praktiki*. [Applied economics - a kind of theory and practice] (pp.13-16). Retrieved December 15, 2022 from <http://dspace.wunu.edu.ua/bitstream/316497/24349/1/RYSZAWSKA%20B..pdf>

Sianes, A., Vega-Muñoz, A., & Ariza-Montes, A. (2022). Impact of the Sustainable Development Goals on the academic research agenda. A scientometric analysis. *Plos one*, 17(3), 1-23, e0265409. <https://doi.org/10.1371/journal.pone.0265409>

Sivageerthi, T., Sankaranarayanan, B., Ali, S. M., AlArjani, A., & Karuppiyah, K. (2022). Modelling Challenges for Improving the Heat Rate Performance in a Thermal Power Plant: Implications for SDGs in Energy Supply Chains. *Sustainability*, 14(8), 4510. <https://doi.org/10.3390/su14084510>

SJR – SCImago. (2020) Scimago journal & country rank. *International Science Ranking, 2017–2020*. Retrieved December 15, 2022, from <https://www.scimagojr.com/countryrank.php?category=230>.

Solubility. (2020) The Global Sustainable Competitiveness Index. *Sustainable Intelligence*. Retrieved December 17, 2022, from <https://solubility.com/the-global-sustainable-competitiveness-index/the-index>

Stockholm Resilience Centre. (2016). The SDGs' wedding cake. Retrieved December 18, 2022 from <https://www.stockholmresilience.org/research/research-news/2016-06-14-the-sdgs-wedding-cake.html>

UNDP, 2022. What are the Sustainable Development Goals? Retrieved December 20, 2022, from <https://www.undp.org/sustainable-development-goals>

UNEP. (2011). *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*. Retrieved October 21, 2022, from [https://sustainabledevelopment.un.org/content/documents/126GER\\_synthesis\\_en.pdf](https://sustainabledevelopment.un.org/content/documents/126GER_synthesis_en.pdf)

United Nations. (2022). *The Ten Principles of the UN Global Compact*. Retrieved December 24, 2022 from <https://www.unglobalcompact.org/what-is-gc/mission/principles/principle-2>

Usman, M., Jahangir, A., Makhdum, M. S. A., Balsalobre-Lorente, D., & Bashir, A. (2022). How do financial development, energy consumption, natural resources, and globalisation affect Arctic countries' economic growth and environmental quality? An advanced panel data simulation. *Energy*, 241, 122515. <https://doi.org/10.1016/j.energy.2021.122515>

Vertakova, Y., & Plotnikov, V. (2017). Problems of sustainable development worldwide and public policies for green economy. *Ekonomičnij časopis-XXI*, 166(7-8), 4-10. <https://doi.org/10.21003/ea.v166-01>

Vitola, Z., Aleksejeva, L., & Ostrovska, I. (2021). Multiannual-annual financial framework investments of the European Union in the context of Green Goals. In *International Multidisciplinary Scientific GeoConference SGEM 2021 proceedings*, 5.1 (pp.899-908). <https://doi.org/10.5593/sgem2021/5.1/s21.109>

Wendling, Z., Emerson, J., Sherbinin, A., & Esty, D. (2020). *Environmental Performance Index 2020*. Retrieved December 21, 2022 from [https://www.researchgate.net/publication/343263658\\_Environmental\\_Performance\\_Index\\_2020](https://www.researchgate.net/publication/343263658_Environmental_Performance_Index_2020)

World Economic Forum. (2019a). *The Global Competitiveness Report*. Retrieved December 23, 2022 from [http://www3.weforum.org/docs/WEF\\_TheGlobalCompetitivenessReport2019.pdf](http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf)

World Economic Forum. (2019b). *The Travel & Tourism Competitiveness Report*. Retrieved December 22, 2022 from <https://www.weforum.org/reports/the-travel-tourism-competitiveness-report-2019>

World Economic Forum. (2021). *Energy Transition Index*. Retrieved December 22, 2022 from [https://www3.weforum.org/docs/WEF\\_Fostering\\_Effective\\_Energy\\_Transition\\_2021.pdf](https://www3.weforum.org/docs/WEF_Fostering_Effective_Energy_Transition_2021.pdf)

World Intellectual Property Organization. (2020). *The Global Innovation Index Report*. Retrieved December 22, 2022 from [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2020.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf)

Yu, Z., Khan, S. a. R., Ponce, P., Lopes De Sousa Jabbour, A. B., & Chiappetta Jabbour, C. J. (2022). Factors affecting carbon emissions in emerging economies in the context of a green recovery: Implications for sustainable development goals. *Technological Forecasting and Social Change*, 176, 121417. <https://doi.org/10.1016/j.techfore.2021.121417>

Zhao, L.J., Zhang, D.L., Zhu, T., Zhang T., & Wu, F.P. (2021). Influence of Venture Capital on Enterprise Financing Constraints and Sustainable Growth Abilities from the Perspective of Lifecycle. *Transformations in Business & Economics*, Vol. 20, No 1 (52), pp.69-92.

**Funding:** The research was funded by Daugavpils University, Latvia.

**Data Availability Statement:** All data is provided in full in the results section of this paper.

**Author Contributions:** Conceptualisation: O.R., O.L., A.D., W.L.; methodology: O.R., O.L., A.D., W.L.; data analysis: O.R., O.L., A.D. W.L.; writing—original draft preparation: O.R., O.L., A.D., W.L.; writing; review and editing: O.R., O.L., A.D.W.L.; visualisation: O.R., O.L., A.D., W.L. All authors have read and agreed to the published version of the manuscript.

**Oleg RYBALKIN** is Dr. Oec, Daugavpils University. His research interests: regional economics, sustainable development, green economy.

ORCID ID: <https://orcid.org/0000-0002-7310-4594>

**Olga LAVRINENKO** is Dr. Oec, a Leading researcher at the Institute of Humanities and Social Sciences of Daugavpils University, Latvia. She has the status of an expert of the Latvian Council of Science in the field of economics and entrepreneurship. Her research interests: are regional economics and sustainable economic development.

ORCID ID: <https://orcid.org/0000-0001-7383-3749>

**Alina DANILEVIČA** is Dr. Oec, a Researcher at the Institute of Humanities and Social Sciences of Daugavpils University, Latvia. She has the status of Expert of the Latvian Council of Science in the fields of economics and entrepreneurship, sociology and social work. Her research interests: regional economics, investments, investment climate (entrepreneurial environment).

ORCID ID: <https://orcid.org/0000-0002-2749-2725>

**Wiesława LIZIŃSKA** is a professor at the University of Warmia and Mazury in Olsztyn, Faculty of Economic Sciences, Institute of Economics and Finance, Department of Economic Policy. Research interests: regional and local policy; local government; rural development; institutional economics, international economics.

ORCID ID: <https://orcid.org/0000-0002-6957-2846>

## Appendix

Indicators used for subsystems of Sustainable Development Green Index with the justification of their use:

### Educational subsystem

S\_1\_1 Research institutions prominence 0–100 (best) (World Economic Forum, 2019a) –

SDG 4; justified at NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021;

S\_1\_2 Scientific publications score (World Economic Forum, 2019a) – SDG 9; justified at Ryszawska, 2015; Kasztelan, 2021; Barcellos-Paula et al., 2021;

S\_1\_3 Gross expenditure on R&D, % of GDP (World Intellectual Property Organization, 2020) – SDG 9; justified at Ryszawska, 2015; Kasztelan, 2021; NETGreen, 2015; Barcellos-Paula et al., 2021;

S\_1\_4 Total number of documents in Scopus, Environmental science, cumulative, 1996–2019 (SJR – SCImago, 2021) – SDG 9; justified at NETGreen, 2015; Barcellos-Paula et al., 2021;

S\_1\_5 Citable documents, 1996 – 2019 (SJR – SCImago, 2021) – SDG 9; justified at NETGreen, 2015;

S\_1\_6 Citations (SJR – SCImago, 2021) – SDG 9; justified at NETGreen, 2015; Barcellos-Paula et al., 2021;

S\_1\_7 Self-citations (SJR – SCImago, 2021) – SDG 9; justified at NETGreen, 2015;

S\_1\_8 Citations per document (SJR – SCImago, 2021) – SDG 9; justified at NETGreen, 2015;

S\_1\_9 h-index (SJR – SCImago, 2021) – SDG 9; justified at NETGreen, 2015; Barcellos-Paula et al., 2021;

S\_1\_10 Patents by origin / bn PPP\$ GDP (World Intellectual Property Organization, 2020)\*\*\* – SDG 9; justified at Kasztelan, 2021; Barcellos-Paula et al., 2021.

### Economic subsystem

S\_2\_1 GDP per unit of energy use (World Intellectual Property Organization, 2020) – SDG 7, 12; justified at NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021;

S\_2\_2 ISO 14001 environmental certificates per bn PPP\$ GDP (World Intellectual Property Organization, 2020) – SDG 12; justified at NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021;

S\_2\_3 Resource efficiency index (Solability, 2020)\*\*\* – SDG 12; justified at NETGreen, 2015; Ryszawska, 2015; Dual Citizen, 2018; Kasztelan, 2021;

S\_2\_4 Greenhouse gas emissions score (Climate Change Performance Index, 2021) – SDG 13; justified at NETGreen, 2015; Ryszawska, 2015; Vertakova, Plotnikov, 2017; Dual Citizen, 2018; Kasztelan, 2021;

S\_2\_5 Share of renewable energy in gross final energy consumption by sector, % (Eurostat, 2019) – SDG 7; justified at Ryszawska, 2015; Dual Citizen, 2018; Kasztelan, 2021;

S\_2\_6 The global sustainable competitiveness index (2020)\*\*\* – SDG 9; justified at Kasztelan, 2021;

- S\_2\_7 Circular material use rate, % of material input for domestic use (Eurostat, 2019)\*\*\* – SDG 12; justified at Kasztelan, 2021;
- S\_2\_8 Efficiency sectors (World Economic Forum, 2019a) – SDG 9; justified at NETGreen, 2015;
- S\_2\_9 Growth of innovative companies 1–7 (best) (World Economic Forum, 2019a) – SDG 9; justified at NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021;
- S\_2\_10 Energy transition index (Energy transition index by World Economic Forum, 2020)\*\*\* – SDG 7; justified at NETGreen, 2015.

#### Political subsystem

- S\_3\_1 Stringency of environmental regulations, index (World Economic Forum, 2019b) – SDG 13, 16; justified at NETGreen, 2015; Kasztelan, 2021;
- S\_3\_2 Enforcement of environmental regulations, index (World Economic Forum, 2019b) – SDG 13, 16; justified at NETGreen, 2015; Kasztelan, 2021;
- S\_3\_3 Environment-related treaties in force count (out of 29 possible) (World Economic Forum, 2019a) – SDG 17; justified at NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021;
- S\_3\_4 Climate policy index – covers both national and international climate policy performance (Climate change performance index, 2021)\*\*\* – SDG 16, 17; justified at Kasztelan, 2021;
- S\_3\_5 Climate Change Performance Index (Climate change performance index, 2021) – SDG 13; justified at NETGreen, 2015; Kasztelan, 2021;
- S\_3\_6 Environmental performance, index (Wendling et al., 2020) – SDG 13; justified at NETGreen, 2015; Kasztelan, 2021;
- S\_3\_7 Environmental tax revenues, % of GDP (Eurostat, 2018) – SDG 13, 16; justified at the Table 1.3; NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021;
- S\_3\_8 Intellectual property protection 1–7 (best) (World Economic Forum, 2019a) – SDG 9, 16; justified at Ryszawska, 2015; Kasztelan, 2021;
- S\_3\_9 Population covered by the Covenant of Mayors for Climate & Energy signatories – percentage of total population (Eurostat, 2019, for the UK – 2018)\*\*\* – SDG 17;
- S\_3\_10 Renewable energy regulation 0–100 (best) (World Economic Forum, 2019a) – SDG 7, 16; justified at Ryszawska, 2015; Kasztelan, 2021.

#### Societal subsystem

- S\_4\_1 Attitude of European citizens towards the environment, % of population who consider environmental issues to be important (Eurobarometer, 2017)\*\*\* – SDG 13; justified at NETGreen, 2015;
- S\_4\_2 World Press Freedom Index (Reporters without borders, 2020)\* – SDG 16; justified at Brundtland, 1987; NETGreen, 2015;
- S\_4\_3 Democracy index (Economist Intelligence Unit, 2020) – SDG 16; justified at Brundtland, 1987; NETGreen, 2015;
- S\_4\_4 Civil liberties (Economist Intelligence Unit, 2020)\*\*\* – SDG 3, 16; justified at Brundtland, 1987; NETGreen, 2015;
- S\_4\_5 Social Capital Index (Solability, 2020)\*\*\* – SDG 3; justified at Kasztelan, 2021; NETGreen, 2015; Barcellos-Paula et al., 2021;
- S\_4\_6 Incidence of corruption, scores 0-100 (best) (World Economic Forum, 2019a) – SDG 16; justified at United Nations, 2022; NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021; Barcellos-Paula et al., 2021;
- S\_4\_7 Internet users, % of adult population (World Economic Forum, 2019a) – SDG 3; justified at Ryszawska, 2015; Kasztelan, 2021;
- S\_4\_8 People at risk of poverty or social exclusion (Eurostat, 2019, except for Ireland, Italy, the UK – 2018)\*\*\* – SDG 1, 10; justified at NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021; Barcellos-Paula et al., 2021;
- S\_4\_9 Share of busses and trains in total passenger transport, % of total inland passenger-km (Eurostat, 2018)\*\*\* – SDG 11 ‘Sustainable cities and communities’; justified at NETGreen, 2015;
- S\_4\_10 Females employed with advanced degrees, % (World Intellectual Property Organization, 2020)\*\*\* – SDG 5; justified at NETGreen, 2015; Kasztelan, 2021; Barcellos-Paula et al., 2021.

#### Environmental subsystem

- S\_5\_1 Environmental performance index (Wendling et al., 2020)\*\*\* – SDG 13; justified at NETGreen, 2015;
- S\_5\_2 Air quality (Wendling et al., 2020)\*\*\* – SDG 15; justified at NETGreen, 2015;
- S\_5\_3 Water resources (Environmental performance index report, 2020)\*\*\* – SDG 6; justified at NETGreen, 2015; Dual Citizen, 2018; Kasztelan, 2021;
- S\_5\_4 Biodiversity and habitat (Wendling et al., 2020)\*\*\* – SDG 14, 15; justified at NETGreen, 2015; Kasztelan, 2021;
- S\_5\_5 Forest cover change, % (World Economic Forum, 2019b)\* – SDG 15; justified at NETGreen, 2015;
- S\_5\_6 Wastewater treatment, % of total (World Economic Forum, 2019b) – SDG 6, 12; justified at NETGreen, 2015;
- S\_5\_7 Total protected areas, % of territory (World Economic Forum, 2019b) – SDG 15; justified at Organisation for Economic Co-operation and Development (OECD), 2011; NETGreen, 2015; Kasztelan, 2021;
- S\_5\_8 Natural capital (Solability, 2020)\*\*\* – SDG 14, 15; justified at Kasztelan, 2021;

S\_5\_9 Ecological sustainability, index (World Intellectual Property Organization, 2020) – SDG 13; justified at NETGreen, 2015; Kasztelan, 2021;

S\_5\_10 Agriculture (Wendling et al., 2020)\*\*\* – SDG 2 ‘Zero hunger’; justified at NETGreen, 2015; Ryszawska, 2015; Kasztelan, 2021.

\* destimulant (inverse relationship with sustainable development and green economy).

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VSI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

## INVESTIGATION OF DISTINGUISHED APPROACHES TOWARDS SYNERGY\*

Martin Holubčík<sup>1</sup>, Jakub Soviar<sup>2</sup>, Viliam Lendel<sup>3</sup>

<sup>1,2,3</sup> Department of Management Theories, Faculty of Management Science and Informatics,  
University of Žilina, Univerzitná 8215/1, 010 26 Žilina, Slovakia

E-mails: <sup>1</sup> [martin.holubcik@uniza.sk](mailto:martin.holubcik@uniza.sk); <sup>2</sup> [jakub.soviar@uniza.sk](mailto:jakub.soviar@uniza.sk); <sup>3</sup> [viliam.lendel@uniza.sk](mailto:viliam.lendel@uniza.sk)

Received 11 February 2023; accepted 6 June 2023; published 30 June 2023

**Abstract.** The investigation of synergy is the initial impetus for achieving effective investments in sustainable organisational solutions. This article focuses on synergy phenomenon; various views across different areas are critically reviewed. The authors investigate two essential areas: synergy and synergistic effects. The main result is the identification of seven sources, or, as the authors call them, generalised approaches to synergies. The paper provides a new contribution to area of management of companies, which cooperate, and compete simultaneously. The obtained results may be instrumental for better strategic management of contemporary cooperating organisations.

**Keywords:** strategic management; cooperation; synergistic effects; investing in cooperation

**Reference** to this paper should be made as follows: Holubčík, M., Soviar, J., Lendel, V. 2023. Investigation of distinguished approaches towards synergy. *Entrepreneurship and Sustainability Issues*, 10(4), 293-306. [http://doi.org/10.9770/jesi.2023.10.4\(18\)](http://doi.org/10.9770/jesi.2023.10.4(18))

**JEL Classifications:** C7, J5, P13

### 1. Introduction

Synergy is a phenomenon of added value creation as a result of cooperation. We can observe the origins of synergy in many fields. According to Haken (1978), it originated in physics as a theory of the emergence of new cooperative structures in systems with nonlinear dynamics. Comprehensive theoretical review of research (Ivanička, 1997; Lasker et al., 2001; Vodáček and Vodáčková, 2009; Zrakova et al., 2017; Castañer and Oliveira, 2020) led to the identification of areas in which synergy occurs, and is part of them.

Synergy is found in such areas, as biology (changes in the quality of biological systems, the problem of selection, glucose, photosynthesis, solitons, cells - creating an impulse, the heart), chemistry (chemical reaction of substances - reaction systems, spatial and functional structures, thermodynamics), biochemistry (influencing the concentration of components), physics (oscillations in mechanical processes, spatial structures in

---

\* This research was funded by VEGA: 1/0533/20 Online reputation management: Tools and methods

hydromechanics, thermodynamics), management (management, dynamic systems with a lot of nonlinear relationships), economics and sociology. In economics, there are methods for measuring and capturing synergy (it provides mathematical, economic, and accounting models), functional theoretical models and market dynamics (relationship between supply and demand). Social processes are also one of the areas of synergy, presented in dynamics, temporal oscillations, modelling of social evolution and cultural behaviour. Synergy explains the emergence of today's complex systems in astrophysics and cosmology (the formation of galaxies and the universe). Ecological phenomena also have a synergistic nature: predator-prey interactions (antagonistic systems), symbioses, co-feeding interactions, ecological waves (systems, pests), Fick's laws of diffusion and many others. On the other hand, synergy is also manifested in technological and informational progress (computer languages and their application in robotics, the number of transistors on a microprocessor, the connection of hardware and software, and the parallel connection of computers).

The content analysis above pointed to several scientific fields in which synergy is observed and confirmed (biology, chemistry, physics, economics, management, sociology and others). This results in a broad area of action of synergy and synergistic effects. Therefore, it is necessary to specify the boundaries of the study.

A prerequisite for investigating synergy within the business environment, i.e. cooperative organisational forms, is a comprehensive and in-depth content analysis of the studied phenomenon - synergy, synergistic effect. It is essential to strengthening knowledge about synergy in the business environment, in which it is possible not only to find synergy but also to apply it as a method that supports cooperative organisational forms, and together with it, it is necessary to identify suitable elements for the strategic management of cooperation concerning the creation of a particular value, synergy and synergistic effect. From the synergy and synergistic effect research, it is possible to identify these concepts relatively accurately and determine their essence.

Synergy is a connection and involvement in cooperation within a specific environment in which this environment change develops and reacts. This connection is created by combining the properties of two or more elements between which mutual interactions occur (this is one of the essential elements of the essence of synergy). Controlled interaction connections ensure the achievement of synergistic effects (expected but also the incredible added value of cooperation) (Corning, 2006; Martin and Eisenhart, 2001; Liu et al., 2018; Priede-Bergamini et al., 2020; Stojkovic et al., 2021).

A synergistic effect is a value, an expected and unexpected result, or a state that arises within a particular environment. It represents value and the input-output substance of many events and changes in evolution. For example, for the company, it means its development forward. Within the state, it means cooperation and joining of businesses in a specific environment (Damodaran, 2005; Vodáček and Vodáčková, 2009; Liu et al., 2018).

When analysing the situation of the issue of synergy and the synergistic effect at present, several areas and disciplines are identified in which this phenomenon exists: interactions in biology, teleonomic selections, the development of society, cultural clashes, division of labour, political campaigns, cooperation (partnership), and others. We assume that synergy and synergistic effect has existed here since the very existence of the world in various forms, including contemporary ones, such as hidden agreements and cartels in modern politics (Ivanička, 1997; Zhou et al., 2021; Galkina et al., 2022). Synergy is found in different areas, while each scope represents a specific environment in which the investigated phenomenon arises. The research, therefore, needs a more detailed background. The research area is broad; therefore, the significant and hidden reasons for the emergence of the given phenomenon may remain unexplored.

According to Kaplan and Norton (2006), Dykan et al. (2021), synergy is an essential managerial concept based on coordinated cooperation. A combined synergistic effect indicates that the joint strategy is pivotal in overall corporate performance (Martin and Eisenhardt, 2001; Szolnoki and Danku, 2018). Interactive connection and

cooperative action between partial business units result in the creation of added value via a synergistic effect (Vodáček and Vodáčková, 2009; Ivanička, 1997). Due to the combination of various contributions of individuals in the system in question, it is necessary to manage and direct the synergistic effect, which can bring about its much higher impact. Synergy increases the bargaining position concerning company aggregations (Lozano et al., 2013).

Among the indicators of a non-cooperative environment, we can include the use of shared resources without one's contribution, imperfect information status, incorrect evaluation of the partner, high investments in the relationship, the emergence of conflicts, incorrectly designed and corresponding parts of the system, poor adjustment of the control mechanism and others. The changing market conditions, actors, capital investments, political situations and many other factors make the cooperative relationship a dynamic system defined for a certain period within the established boundaries. The goal of every collaboration is a particular benefit for one cooperating party, either parties or the entire community (Ju et al., 2020).

Based on our research in cooperation, we set the goal of exploring synergy and synergistic effects and deriving its basic approaches for application in the management of organisations.

The article is compiled from an essential examination of data from relevant sources focused on the issue and its depiction in the real world. At the beginning of the article, we discuss the basic concepts of synergy and its penetration into the cooperative management of organisations, which can be improved and more sustainable. The methodology chapter describes the methods used. In the literature review chapter, we dealt with the essential depiction of synergistic effects and synergy in the context of managing organisations and their occurrence. In the results chapter, we included and derived basic, repeatable approaches that can be used in the development and restructuring of organisations. In the discussions and conclusion, we summarised the basic seven approaches to synergies applicable in the management of organisations.

## **2. Materials and methods**

The complex content analysis for this study must be defined as part of the procedure: determination of the investigated area (unit), a compilation of features, and development of a list of specific analytical categories (quantitative findings in interpretive analysis). The research can be further continued using other qualitative or quantitative research methods. We use the following methodology:

- a) summarise current knowledge in the researched area;
- b) reveal the topicality of the investigated issue;
- c) bring new expertise to the scientific field (i.e., identify the studied phenomenon, categorise the investigated phenomenon, and create suitable identifiers for further investigation of the phenomenon);
- d) create conclusions in the researched area.

Inductive and deductive methods were used in data processing. In addition, we use a qualitative evaluation of the collected data. It is mainly an experiential approach based on the knowledge and expertise of the authors. They keep a logical sequence, defining the structure and progress of the work, combining and sorting the ability found and the author's polemic on the findings.

This article has two research tasks. Research task 1: Theoretical analysis of synergy and synergistic effects. The fulfilment of this task required a complex theoretical and practical analysis of the secondary data investigated in the area of synergy and synergistic effects. In the framework of synergy, and synergistic management, various views of essential authors are examined, as well as their research results and application of synergy in the environment. Furthermore, the categorisation of synergy and synergistic effects into areas of its action (approaches) is carried out.

Research task 2: Defining the basic approaches of synergy. In this task, it was necessary to use the acquired theoretical and practical knowledge and transform them into total outputs and discussions within the investigated synergy issue. Synergy research is used in the framework of identification of starting points for the creation of synergistic effects and synthesis of the obtained data. Subsequently, individual findings were combined through data synthesis, and the main conclusions of the investigation were determined - identification of 7 basic approaches to synergies.

### 3. Results

The following selected areas discuss specific synergy creation in different areas. These areas and the content of the previous chapters point to the starting points for creating synergy and strategic management. Individual examples allow observing how synergies were created. There were also specific barriers to creation. Synergy in particular areas not only had a positive effect and positive results but also pointed to possible parasitism, disadvantage of the other side or imperfect estimation of possible results. From the theoretical examination of the issue of synergy, it is possible to draw a partial conclusion that the creation of synergy can be conditional or unconditional.

It is essential to note that synergy depends on resources (tangible, intangible), processes, properties and characteristics of interaction elements through which potential synergistic effects can be realised. All results were influenced not only by the specific internal conditions of each researched area but also by those, as mentioned above, dynamic and turbulent environments created by the opportunities and threats of the globalised environment and individual interactions (direct and indirect links, externalities). Ivanička (1997) indicated four basic driving forces conditioning synergy or new values:

- Evolutionary material;
- Variability (recombination) of evolutionary material;
- Selection of new variants in the cooperation of system and environment;
- Fixing the choice (choice of structures ensuring the results of choice).

Factors affecting synergetic effects are the following: history, development of social conditions, the industrial revolution, division of labour, inventions, and trade exchanges. Cultural clashes are significant when acquisitions take place. Cultural conflicts usually, are inevitable when two large enterprises merge. The conflicts cause delays in getting synergy (Damodaran, 2005). Vodáček and Vodáčková (2009) notice that the cultural background impacts the atmosphere for managerial work in the company, which in turn affects motivation, strength and quality of interaction ties, and work results. Synergy in cooperation is manifested in partnership activities (actions). These actions can be strengthened by associating similar partners who share a particular point of view (a specific point of view) or provide the same kind of service (Cirjevskis, 2022). Synergy also manifests in thinking and actions resulting from cooperation and partnership relations with the broader community (a more complex and comprehensive view) (Lasker et al., 2001). Synergetic effects depend on the successful division of work. Lasker et al. (2001) combine the results of different authors and list the elements of the partnership that impact the partnership's ability to achieve a high degree of synergy. The authors consider the sources of synergy to be mainly financial and internal (i.e., money, premises, equipment, materials, skills, experience, information, connections with people and businesses, power of conviction, legitimacy and trustworthiness).

Synergy can be assessed by answering two fundamental questions (Damodaran, 2005):

- What form of synergy should be adopted? (Will it reduce costs as a percentage of sales and increase profit margin? Will it increase future growth or the length of the growth period?)
- When will the synergy begin to influence future flows? Synergy rarely shows up immediately; it is more likely to show up over time (cash flow).

Synergy can be influenced by four inputs to the valuation process: higher cash flow from existing assets (economies of scale), higher expected growth rate (market power, higher growth potential), more extended growth period (from increased competitive advantages), lower cost of capital (higher debt capacity).

The value metric of Vodáček and Vodáčková (2009) draws attention to the resulting synergistic effect of the interaction of relations with the market environment, in points:

- The prosperity of the company (successful implementation of the strategy, operation of operational plans);
- Stability of the company (balanced development of the company in the period of strategic plans);
- Entrepreneurial potential (balance of knowledge and capacity-resource assumptions);
- Prestige, customer credibility and others;

Strategic alliances as examples of the way to create synergistic effects.

Martin and Eisenhardt (2001) identified the coexistence of cooperation and competitiveness in business. They identified three interconnected, standard enter-prise-level processes that became particularly characteristic of increasing market dynamism. They are processes:

- Knowledge movement between business units;
- Reconnecting within the changing network of business unit collaboration also includes knowledge exchange;
- Reconfiguration of business units and their lease related to changing market opportunities.

These processes create an internal market of cooperating enterprises and help the coexistence of cooperation and competitiveness in business. It also helps the managers be better acquainted with the issue, focus on changes in market opportunities, and take advantage of shared resources and the coordination of chances themselves.

Strategic alliances, according to Vodáček and Vodáčková (2009), are a significant example of partner interaction cooperation, which has prerequisites for the emergence of synergistic effects. We can characterise strategic alliances as cooperation between two or more separate enterprises for a common purpose, goals or problem-solving. One of the conditions for the functioning of alliances is the activation of potentially positive synergistic effects. A classic type of synergy arises here: the exchange of different activities or resources, what one partner has enough of, its strength, and what the other partner does not get or its weakness. However, the goals should be consistent in such groupings, for example, using the BSC method. When evaluating an alliance, it is not important how long it lasts but to what extent it meets or has met the expectations placed on it by individual partners.

We can see examples of synergistic effects in strategic alliances: in the framework of mutual exchange or sharing of production and non-production resources; in securing access to the necessary financial resources; in improving the current level of value metrics of delivered products and services; in improving the economy of production, circulation and sales; and as part of cost reduction for some business operations.

The conditions for the functioning of alliances (achieving synergistic effects) include: ensuring the coordination of partners' goals and activities - being able to harmonise partners' goals; creation of interaction links of positive cooperation and ensuring their functioning; activation of interaction links of positive collaboration and potentially positive synergistic effects of this cooperation - reduction of the consequences of earlier antagonistic cooperation; creation of coordination mechanisms; making allies; sharing problems and resources to manage issues; sharing in shared good and bad outcomes; acquiring "self-control" and the ability to dampen conflicts.

### **3.1 Seven basic approaches to synergy**

By induction of individual outputs of essential authors and with the help of synthesis, Table 1 is created, which points to the generalised approaches of synergy and synergistic effects (focusing on the reality of the investigated phenomenon and a closer description of synergy and its forms). From this overview, it is possible to identify the result that synergy exists within normal conditions. It also influences the area of the investigated issue - the

emergence and creation of synergy and synergistic effect within cooperative organisational forms using appropriate strategic management. In further research, it will be necessary to focus on their connection with strategic direction using the identified elements of strategic management. This output also identifies seven synergy approaches (Table 1).

**Table 1.** Selected authors' approaches and attitudes to synergy and synergistic effect.

Approaches	Authors
Cooperation, combined effect, partnership Coordination of cooperation within cooperative management (management of a group of enterprises; linking of the management of subsequent processes; coordination of strategies; common strategy).	Corning (2006); Lasker et al. (2001); Martin and Eisenhart (2001); Damodaran (2005); Kaplan and Norton (2006); Vodáček and Vodáčková (2009); Foster et al. (2021); Dykan et al. (2021)
Increasing resulting cooperation effects (performance, profitability, problem-solving) Performance within the strategic management of the system Sharing of information and knowledge Resource recombination – management of business activities, such as capital allocation, development and sharing of human, information and organisational capital Distribution of performance within the size or participation of the enterprise in joint activities Diversification of costs and risks	Ansoff (2007); Corning (2006); Lasker et al. (2001); Martin and Eisenhart (2001); Damodaran (2005); Kaplan and Norton (2006); Knoll (2008); Vodáček and Vodáčková (2009); Manrique et al. (2021)
Joint bargaining power: joint effects of enterprises against environmental influences	Corning (2006); Vodáček and Vodáčková (2009); Cao et al. (2021)
It produced a typical result within concretely defined boundaries that support the existence of environmental actors	Damodaran (2005); Ansoff (2007); Vodáček and Vodáčková (2009); Koman et al. (2022); Santos (2021)
The complementary, independent effect of each subject within mutual interactions	Liu et al. (2018); Friede-Bergamini et al.(2020)
A random factor as a stimulus for qualitative change	Zhou et al. (2021)
Unpredictable combination of work performed by actors regardless of outcome (convergence)	Damodaran (2005); Castañer and Oliveira (2020); Gupta (2021)
Causal relationship: a more significant number of individuals can achieve an effect (do things) that a smaller number cannot (an individual does not create this effect)	Corning (2006); Damodaran (2005); Sirower (2007); Szolnoki and Danku (2018)
Interaction action: mutual interaction of individual subsystems, for example, in production, supply-customer process and others	Kaplan and Norton (2006); Ansoff (2007); Ivanička (1997); Damodaran (2005); Vodáček and Vodáčková (2009); Varmus et al. (2022); Turner et al. (2022); Yarosh-Dmytrenko et al. (2022)
Combination of functional properties of individual parts (complementarity)	Damodaran (2005); Kaplan and Norton (2006); Ansoff (2007); Corning (2006); Vodáček and Vodáčková (2009); Xua and Haob (2021)
A sudden change in system state or properties	Corning (2006)
Newly discovered structures	Corning (2006); Peterson and Zeng (2020)
The evolutionary approach in the framework of survival and future development (internal property of the system)	Corning (2006); Ivanička (1997)
Different or negative results from planned (desired), but also unexpected	Corning (2006); Kaplan and Norton (2006); Ansoff (2007); Vodáček and Vodáčková (2009); Xinghua et al. (2021)

The following approaches to synergies point to their complexity and interconnectedness within the investigated world. The "Seven Basic Approaches to Synergy" represents the induction of comprehensive synergy research and describes the unification of the individual researched areas of synergy. Based on the content analysis of the authors' secondary research in this chapter on synergy, it is necessary to create seven basic approaches to synergy:

- Approach to synergy within nature
- Synergy as an evolutionary approach
- Synergy as something new, newly discovered
- Synergy as cooperation

- Approach to synergy as an interaction effect
- Approach to synergy as a higher value
- Approach to synergy as the framework for strengthening the business environment

### ***3.1.1 Approach to synergy within nature***

According to Corning (2006) synergy in biology expresses combined effects produced by two or more particles, elements, parts or organisms. A definition of synergy from the field of sociology points out that collective enterprise is a space of synergy of individuals, where achieving a common goal is a possibility of attaining individual goals. From the point of view of medicine, synergy is a process in which two muscles, organs, substances or components work simultaneously and cooperate to improve the whole's function and increase its effect and performance (Morasso et al., 2010)

Synergetics can be described using one formalism as a large class of complex systems (complex synergistic system).

Synergy is the value created and captured over time through the sum of business performance relative to what would have been developed separately (evolutionary approach). The existence of an effect of collaboration on variance in a business performance captured by factors associated with membership in different stores within the association shows that synergy exists in business (Martin and Eisenhardt, 2001). Ivanička (1997) points to synergy as proof that time, change, evolution and history are essential in the inorganic, organic and social world. Here we get to the current understanding of synergy, the choice of the right tools for managing cooperation, knowledge management and the ability to see ahead not only organisational shifts, shifts in strategies, trends, global problems, and digitisation, but also development requirements.

The causal role of synergy depends on the success of survival and evolution. However, the development trajectory has shifted causal dynamics inexorably away from autocatalytic phenomena and towards purposeful and functional phenomena. Accordingly, the future lies in self-determination – that is, it is based on information and purposeful innovation. Here we can safely predict that new forms of synergy will play a key role(s) in shaping our future development.

### ***3.1.2 Synergy as something new, newly discovered***

Environmental changes, the development of science and technology, evolution in all directions and areas, and the activities of humanity create a dynamic environment in which every function, equation and variable has a random factor that we cannot influence. Corning (2006) enriched the previous definitions with one crucial thing. He considered synergy as combined or cooperative effects created by two or more particles, elements, parts or organisms. Still, at the same time, they are effects that cannot be obtained in any other way.

Ivanička (1997) states synergy reflects newly discovered properties such as dissipative structures, bifurcations and phase transitions. These properties are linked to the specific behaviour of the systems. Similarly, earlier Shannon (1998) pointed out that synergy is not only cooperation and exchange of resources but that by combining the individual perspectives (attitudes), resources and skills of the partners, the group together creates something new and valuable.

### ***3.1.3 Synergy as cooperation***

From the point of view of lexicology, the term synergy is derived from the Greek word "synergein", which means "to work together" - "to cooperate". According to Ivanička (1997, p.25) "the evolution and progress of a social system have its structure of global behaviour, which, after mastering the theory of synergetics, can be better identified and used in constructive approaches even in conflict situations."

Synergy is built on cooperation, the cooperation of two or more elements, people or companies, and therefore it is necessary to look at synergy from the perspective of cooperation strategy. Suppose company managers want to create a cooperation strategy. In that case, they must analyse the cooperation potential of the company, create a shared vision with partners and determine the orientation of cooperation. At the same time, it is necessary to deal with the tasks of building cooperation management, namely: transition to the concept of cooperation (requirements, activities); changing the view of cooperation (trans-formation into mutual relations within cooperation - long-term oriented); changes in the thinking of all parties involved (benefits of cooperation); measuring the achieved level of cooperative management building processes in enterprises; use of modern technologies.

#### ***3.1.4 Approach to synergy as an interaction effect***

Corning (1995) pointed out that synergy is a theory about the causal role of relationships between biological phenomena. He points out that synergy is equally at home with two types: integration (aggregation, fusion, alliance of various kinds) and internal differentiation. Synergy also directs our attention to relationships with functional properties and fitness consequences (gaining advantages) of cooperative phenomena of all kinds – data linked to a causal explanation of the evolution of complexity (Corning, 1995). Synergy is an effect that individuals cannot achieve alone (Ivanička, 1997), since the structure in the world of synergy can be defined as an internal property of the system that ensures its integrity, functionality and evolution. It provides stability in given situations and progressive and effective transformations that enable it to adapt to new conditions and survive.

On the other hand, it is about ensuring effective transformation and solving new problems (survival) and interactions and interactive action. The authors Vodáček and Vodáčková (2009) focused on the interaction effect. They defined synergy as a change in the behaviour and properties of the system due to the creation of the interaction effect of its subsystems. The result of these interactions (joint binding action between subsystems) is a synergistic effect (the result of interaction action), characterising the difference from the situation when the considered subsystems would work without these interactions.

#### ***3.1.5 Approach to synergy as a higher value***

Several authors created another group based on the finding: synergy is an effect (ability, performance, added value) higher than the sum of the individual results. According to Damodaran (2005), synergy is the added value generated by combining two businesses, creating opportunities that would not otherwise be available to independently operating companies. The existence of synergies generally means that a combination of businesses will become more profitable or grow faster through mergers than if the businesses were working separately. Here, assessing whether the merged companies have improved their performance (profitability and growth) relative to their competition is essential.

According to Sirower (2007), it also increases competitiveness and bottom-line cash flow compared to what both businesses expected to achieve separately. Knoll (2008) underlines that synergy is an effect that combines the profitability of the whole, which is greater than the sum of the revenues of the individual parts.

#### ***3.1.6 Approach to synergy as the framework for strengthening the business environment***

Authors in the field of management define synergy as the value created by two cooperating divisions (enterprises), which is greater than the value that both divisions would make if they worked separately. Synergy occurs when cooperating subsystems can create a more significant effect than if they were trying to do it alone. Convincing evidence of the existence of synergy performance supports the fact of shared value and impact. The combined effect indicates that the collective strategy plays a focal role in overall corporate performance. The performance of collaborative groups is not only due to the unique industrial structure but also to the sum of the individual performances of the business units (Martin and Eisenhardt, 2001). In today's world, goals based on gaining an advantage cannot be achieved by one person, company or sector. They are based on cooperation and

synergy, which form the system. A system that is subject to economic and technological changes and becomes more competitive and specific (Lasker et al., 2001). Businesses from different industries with different but complementary capabilities link their capabilities to create value for end users.

Regarding the cooperation of individual divisions and companies to create synergistic effects, and added value, the authors Kaplan and Norton (2006) deepen their view of the Balanced Scorecard, which is known as a performance measurement framework for strategic planning and system management. Alignment is critical if a business is to achieve synergy through its business and support units. Accurate determination of the benefits of business alignment is made possible by a measurement and management system based on strategy maps and BSC systems. Ivanička (1997) also pointed out the harmonisation of the operations of enterprises and stated that new structures are not only an independent legacy of the previous structures of the system but also especially the legacy of the interactions of the system with the environment. From this point of view, synergy is based on the very functioning of individual enterprises together with the environment and only harmonises their action for the emergence of synergistic effects. They identify the creation of value-added synergy in a group of shared services business units managed by headquarters. Alignment is an ongoing process that begins when headquarters determines the value that creates synergy between operating units, support units, and partners.

### ***3.1.7 Companies' synergy based on human capital***

The decision of how to work with competing companies in a shared environment is based on efficiency concerning corporate goals. Strategic management of synergistic effects creates a cooperative aspect – a tool for achieving competitive advantage using jointly developed value. The result of interactions of cooperating enterprises is a synergistic effect, which characterises the difference from the situation where the considered systems would work without cooperative interactions. Knowing how to manage this environment is necessary to achieve synergy strategically. To a large extent, management depends on its executors - managers. Kaplan and Norton believe that approach is at the organisation's centre. Through integrated planning, human capital aligns its activities with the company's overall strategy. To maintain competitiveness, the company must apply for active communication programs with employees, their education, motivation and tuning of their activities with the strategy in the environment (Kaplan and Norton, 2006). Strict management settings (so-called orthodox) can have adverse consequences.

Human capital represents an essential element of the company for creating synergistic effects within the cooperation framework. That is why appropriate management skills in the strategic management of cooperatives play an active factor in influencing the control itself and deciding how to adapt to environmental changes. Slávik (2009) stated strategic direction as a modern and rapidly developing discipline that arose as a reaction to the new characteristics of the business environment. The starting point points to elements in systems that influence each other more or less, and their interaction determines the possibilities of their survival on the market. The alignment of strategy and business activities creates success and provides value from mutual synergy. If we can base the company's management on strategic management for synergy, we can build a company with a long-term perspective and growth.

## **4. Discussion**

Using the induction of the individual outputs of the examined authors, we summarised the authors' approaches and attitudes to synergies and the synergistic effect. This output is also used in the identification of the Seven Synergy Approaches. The importance of finding new directions in the management of modern enterprises supports the idea of synergy and synergistic effect as a subject of investigation and reflection. Unifying individual views on the investigated phenomenon - synergy- represents identifying the Seven Basic Approaches to Synergies. The identified approaches can be combined; they can coexist or follow each other chronologically, and in some cases, they represent a relatively similar approach.

This division is limited by the current amount of examined sources within the scope of the survey so far; therefore, it is necessary to assume their possible incompleteness. These approaches can be found in different scientific disciplines and areas, so the division must be considered complete. Seven basic approaches to synergies (the generalisation was based on the study of scientific outputs of scientists (Ivanička, 1997; Shannon, 1998; Corninga, 2006; Lasker et al., 2001; Martin and Eisenhardt, 2001; Kaplan and Norton, 2006; Peterson and Zeng, 2020; Xua and Haob, 2021; Turner et al., 2022):

1. *Approach to synergy within nature*

Elements within a group, individuals within a group, and enterprises within an industry are built on specific basic functional properties and exhibit particular behaviour in the environment in which they exist. Synergy is found in these systems within their interactions as a basic form of the emergence of specific properties, abilities or statuses.

2. *Synergy as an evolutionary approach*

The causal role of synergy no longer depends only on random and unpredictable phenomena. Still, evolution has shifted to purposeful functions and interactions within elements between individuals, business entities, etc. These new phenomena realise the future of development as such.

3. *Synergy as something new, newly discovered*

The dynamism of the current environment allows the combination of different elements, individuals, and enterprises, which are characterised by various characteristics, abilities and resources - within such a diverse environment, synergy can create something new.

4. *Synergy as cooperation*

The joint work of elements, individuals, and companies within various conditions, approaches and situations, with the help of knowledge of the meaning and meaning of synergy, can make an evolutionary shift of cooperation within the framework of individual and global behaviour.

5. *Approach to synergy as an interaction effect*

Causal interactions between elements, individuals, and businesses point to additional results that individuals would not achieve on their own - this is the output of mutual exchange within the synergy and evolution of relationships.

6. *Approach to synergy as a higher value*

Synergy within individual and joint performance can create an opportunity for added value in higher performance, revenue, faster growth, and competitiveness.

7. *Approach to synergy as the framework for strengthening the business environment*

Interactions in the business environment within the framework of different management approaches, coordination of cooperation, shared strategy, harmonisation of subsystems, and competitiveness represent a mechanism for obtaining advantages that would only be achieved with the value created within the synergy.

These approaches to synergy represent its basic observed types of repeating patterns within the examined issue. They expand the view of synergy to something with larger dimensions (elements) and broader impacts (the result of reactions). Based on these approaches of synergy, it is necessary to point out its complexity and interconnectedness within the entire investigated world, in which there is life, reactions to changes, development towards the future and mutual influence of organic and inorganic objects within the framework of intentional or unintentional actions, during which deliberate or unintended results (values). One of the approaches is synergy within the business environment (Lasker et al., 2001; Kaplan and Norton, 2006; Liu et al., 2018; Xinghua et al., 2021), which confirms the topicality and importance of researching the chosen topic of the work. Based on these approaches, we can infer the dynamic nature of synergy, which can act as a stimulus for new events.

***An investment approach to confirm advantageous cooperation bonds***

The study of the obtained information about IBM confirms that precisely the company's clearly defined mission and values support the company's strategy and critical competencies and create the company's growth potential. An essential element of IBM is its CEOs - leaders. They ensure and create a long-term relationship with all company actors. They see this relationship as a personal investment, not just a business. These leaders can implement the chosen strategy while adhering to the company's values.

At Intel, relationship maintenance and development (adapting to change) are essential to Intel's cooperative relationships. We identified agreements that led to priority delivery of products (ahead of the competition). The results of the cooperation relationship were earlier delivered to the cooperation participants and later to other competing companies (customers). This development is continuously transitioning from old technological infrastructures to new ones (Industry 4.0, IoT, Big Data, cloud services). Interaction processes in product development and production are at a high level. A high degree of process interconnection will ensure a better result. Intel strives for this in cooperative relationships, and the success of individual collaborative relationships, as well as the financial results themselves, is proof of that. The organisational structures of respective companies linked financial and human resources in the area of high investments and knowledge within the framework of joint activity.

Tesla has achieved significant achievements in cooperative relations, which are identified in the studied cases: innovative battery technology (Panasonic), innovations in design and production processes (Lotus and Toyota), licenses for security systems (Lotus), securing and expanding production capacity (Lotus, Toyota), development assistance in the field of batteries and chargers for the electric drive (Daimler), subsidies replacing the high initial investment of purchasing an electric car (Norwegian government, Netherlands, Germany, Finland, Austria, and other countries), supporting investments in the development of electromobility (European Union), building your charging network with various parties such as hotels, restaurants, shopping centres, airports and others (targeted charging).

Our research's novelty lies mainly in identifying theoretically defined synergistic approaches in actual practice. The analysed examples represent high competitiveness and are significant in the economy, product innovation, effective management, and marketing. The availability of analytical data on these examples allowed us to identify their association with individual positive synergies more precisely. The structured information on the analysed cases is of interest to business practice. According to the explanation of synergies, it is possible to be inspired and use the described methods strategically and tactically. The understanding of working with positive synergies in business can also be used for strategic management planning, decision making and developing marketing strategies and concepts. Our research has several significant limitations. The selected examples were analysed according to the available information. There was no direct observation or generation of primary data for each example studied. The synergies in each sample were identified based on logical reasoning, logical comparison and explanation. The number of examples needed to be increased. This was compensated for by their significance and using more qualitative analysis and research approaches.

**Conclusions**

Synergy and synergistic effects are everywhere. On the one hand, individual examples, allow to understand how synergies are created; on the other hand, specific barriers hindering reaching synergies can be revealed. Cooperation can result in parasitism, and have other disadvantages, such as occurrence of various risks or unnecessary investments. It means that the consequences of cooperation can be positive, negative or zero - it is essential to choose a criterion for evaluation and think of the resulting impact of the interaction action. The estimated effect should condition the amount and frequency of the investment in the cooperative relationship.

Seven direct synergistic effects depend on investment resources (tangible, intangible), processes, properties and characteristics of interaction actors through which they can be realised.

Thanks to investments in cooperative relationships, businesses can achieve various synergistic effects and reduce the risk of negative cooperation results. They can use a shared environment (advantages) but compete and thrive with each other. The new trend in cooperation is the search for ways to maximise profits and reduce risk. On the one hand, businesses create pooled connections; on the other hand, they compete with each other - thus creating competing alliances.

Synergy represents a new contribution to management of companies, which cooperate, and compete simultaneously. The obtained results may be instrumental for better strategic management of cooperating organisations.

### References:

- Ansoff, H.I. (2007). Strategy management. Palgrave Macmillan. <https://doi.org/10.1057/9780230590601>
- Blaskova, M., Tumova, D., & Miciak, M. (2022). Taxonomy of Factors Involved in Decision-Making to Sustain Organization Members' Creativity. *Administrative Sciences*, 12(1). <https://doi.org/10.3390/admsci12010039>
- Cao, X., Xing, Z.Y., & Zhang, LP. (2021). Effect of dual network embedding on the exploitative innovation and exploratory innovation of enterprises based on the social capital and heterogeneous knowledge. *Technology Analysis & Strategic Management*, 33(6). <https://doi.org/10.1080/09537325.2020.1832983>
- Castañer, X., & Oliveira, N. (2020). Collaboration, coordination, and cooperation among organisations: establishing the distinctive meanings of these terms through a systematic literature review. *Journal of Management*. 46(6), 965-1001. <https://doi.org/10.1177/0149206320901565>
- Cirjevskis, A. (2022). Discourse on foresight and the valuation of explicit and tacit synergies in strategic collaborations. *Journal of Risk and Financial Management*, 15(7). <https://doi.org/10.3390/jrfm15070305>
- Corning, P.A. (2006). Nature's Magic. Synergy in Evolution and the Fate of Humankind. *Artificial Life*, 12(4), 639-641. <https://doi.org/10.1162/artl.2006.12.4.639>
- Damodaran, A. (2005). The Value of Synergy. Stern School of Business. <https://doi.org/10.2139/ssrn.841486>
- Dykan, V., Pakharenko, O., Saienko, V., Skomorovskyi, A., & Neskuba, T. (2021). Evaluating the efficiency of the synergistic effect in the business network. *Journal of Eastern European and Central Asian Research*, 8(1), 51-61. <https://doi.org/10.15549/jeeecar.v8i1.646>
- Forster, D.E., Pedersen, E.J., McCullough, ME., & Lieberman, D. (2021). Evaluating Benefits, Costs, and Social Value as Predictors of Gratitude. *Psychological Science*, 33(4), 538-549. <https://doi.org/10.31234/osf.io/ckedr>
- Galkina, T., Atkova, I., & Yang, M (2022). From tensions to synergy: Causation and effectuation in the process of venture creation. *Strategic Entrepreneurship Journal*, 16(3), 573-601. <https://doi.org/10.1002/sej.1413>
- Gupta, A.K. (2021). Innovation dimensions and firm performance synergy in the emerging market: A perspective from Dynamic Capability Theory & Signaling Theory. *Technology in Society*, 64, 101512. <https://doi.org/10.1016/j.techsoc.2020.101512>
- Haken, H. (1978). Synergetics - An Introduction. Berlin-Heidelberg-New York, Springer. <https://doi.org/10.1007/978-3-642-96469-5>
- Ivanička, K. (1997). Basics of synergetics. Publisher: Matej Bel University in Banská Bystrica,

- Ju, S., Zhang, J., & Li, S. (2020). Cooperation of Global Value-Added Trade Network: An Evolutionary Game Analysis. *Transformations in Business & Economics*, Vol. 19, No 3 (51), pp.291-309.
- Kaplan, R.S., & Norton, D.P. (2006). *Alignment: Using the Balanced Scorecard to Create Corporate Synergies*. Harvard Business Press.
- Knoll, S. (2008). Cross-Business Synergies: A typology of cross-business synergies and a mid-range theory of continuous growth synergy realisation. Springer. <https://doi.org/10.1007/978-3-8349-9687-9>
- Koman, G., & Bubeliny, O. (2020). Building Enterprise Reputation by Doing Sustainable Socially Responsible Business. Education Excellence and Innovation Management: A 2025 Vision to Sustain Economic Development during Global Challenges. 35 IBIMA, 2020. Seville, Spain, 79109-7118.
- Lasker, R.D., Weiss, E.S., & Miller, R. (2001). Partnership Synergy: A Practical Framework for Studying and strengthening the collaborative advantage. *The Milbank Quarterly*, 79(2) <https://doi.org/10.1111/1468-0009.00203>
- Liu, J., Meng, H., Wang, W., Li, T., & Yu, Y. (2018). Synergy punishment promotes cooperation in spatial public good game. *Chaos, Solitons and Fractals*, 109, 214-218. <https://doi.org/10.1016/j.chaos.2018.01.019>
- Lozano, S., Moreno, P., Adensi-Diaz, B., & Algaba, E. (2013). Cooperative game theory approach to allocating benefits of horizontal cooperation. *European Journal of Operational Research*, 229(2), 444-452. <https://doi.org/10.1016/j.ejor.2013.02.034>
- Manrique, H.M., Zeidler, H., Roberts, G., Barclay, P., Walker, M., Samu, F., Farina, A., Bshary, R., & Raihani, N. (2021). The psychological foundations of reputation-based cooperation. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 376, 1838. <https://doi.org/10.1098/rstb.2020.0287>
- Martin, J.A., & Eisenhardt, K.M. (2001). Exploring Cross-Business Synergies. Academy of Management Annual Meeting Proceedings 2001(1), H1-H6. <https://doi.org/10.5465/APBPP.2001.6123191>
- Morasso, P., & Casadio, M. (2010). A neural mechanism of synergy formation for whole body reaching. *Biological Cybernetics*, 102(1), 45-55. <https://doi.org/10.1007/s00422-009-0349-y>
- Peterson, T.M., & Zeng, Y.L. (2020). Conflict and cooperation with trade partner. *International Interactions*, 47(2), 266-290. <https://doi.org/10.1080/03050629.2020.1835892>
- Priede-Bergamini, T., Lopez-Cozar-Navarro, C., & Benito-Hernandez, S. (2020). Cooperation Behavior towards Innovation: Examining Differences between Family and Non-Family Businesses. *Transformations in Business & Economics*, Vol. 19, No 3 (51), pp.310- 328.
- Santos, J.N. (2021). Linking joint value creation to the interplay of competition and cooperation: A fuzzy set approach. *Industrial Marketing Management*, 92. <https://doi.org/10.1016/j.indmarman.2020.10.015>
- Shannon, V.J. (1998). Partnerships: The foundation for future success. *Canadian Journal of Nursing Administration*, 11, 61-76.
- Sriower, M.L. (2007). *The synergy trap*. Free Press.
- Slávik, Š. (2009). *Strategický manažment*. Sprint, Bratislava.
- Stojkovic, D., Dokic, A., Vlacic, B., & Silva, S.C.E. (2021). Toward the inter-channel synergy renaissance in emerging markets: evidence from adding clicks to bricks in Serbia. *International Journal of Emerging Markets*. <https://doi.org/10.1108/IJOEM-10-2020-1166>
- Szolnoki, A., & Danku, Z. (2018). Dynamic-sensitive cooperation in the presence of multiple strategy updating rules. *Physica A: Statistical Mechanics and its Applications*, 511, 371-377. <https://doi.org/10.1016/j.physa.2018.08.007>
- Turner, K., Harris, M.C., Crook, T.R., & Ranft, A.L. (2022). Too much of a good thing? An assessment of the effects of competitive and cooperative action repertoires on firm performance. *Management Decision*, 60(1). <https://doi.org/10.1108/MD-03-2020-0244>
- Varmus, M., Kubina, M., Bosko, P., & Miciak, M. (2022). Application of the Perceived Popularity of Sports to Support the Sustainable Management of Sports Organizations. *Sustainability*, 14(3), 1927. <https://doi.org/10.3390/su14031927>

Vodáček, L., & Vodáčková, O. (2009). Synergies in modern management. Management Press: Tiskárny Havlíčkův Brod. ISBN 978-80-7261-190-4.

Xinghua, J., Lingfang, W., Bin, C., & Xinyu, F. (2021). Benefit distribution and stability analysis of enterprises' technological innovation cooperation alliance. *Computers & Industrial Engineering*, 161, 107637. <https://doi.org/10.1016/j.cie.2021.107637>

Xua, S., & Haob, A. (2021). Understanding the impact of national culture on firms' benefit-seeking behaviors in international B2B relationships: A conceptual model and research propositions. *Journal of Business Research*, 130, 27-37. <https://doi.org/10.1016/j.jbusres.2021.02.062>

Yarosh-Dmytrenko, L., Martyniak, I., Domyshche-Medyanyk, A., Lukianets-Shakhova, V., & Yasinska, T. (2022). Business alliances in the economy of EU countries. *Amazonia Investiga*, 11(53), 249-258. <https://doi.org/10.34069/AI/2022.53.05.25>

Zhou, J, Yang, J, & Zhou, X. (2021). Customer Cooperation and Employee Innovation Behavior: The Roles of Creative Role Identity and Innovation Climates. *Front Psychology*, 3(12), 639531. <https://doi.org/10.3389/fpsyg.2021.639531>

Zrakova, D., Kubina, M., & Koman, G. (2017). Influence of information-communication system to reputation management of a company. *Procedia Engineering*, 192, 1000-1005. <https://doi.org/10.1016/j.proeng.2017.06.172>

**Funding:** This research was funded by VEGA: 1/0533/20 Online reputation management: Tools and methods.

**Author Contributions:** Conceptualisation: *Holubčík, Soviar, Lendel*; methodology: *Holubčík, Soviar*; data analysis: *Holubčík, Soviar*; writing—original draft preparation: *Holubčík*, writing; review and editing: *Holubčík, Soviar*; visualisation: *Holubčík, Soviar, Lendel*. All authors have read and agreed to the published version of the manuscript.

**Martin HOLUBČÍK, Ing, PhD.** is assistant profesor at the University of Žilina. Research interests: cooperation and synergy in management, manager's decision-making, strategy management, marketing and online marketing.

**ORCID ID:** <https://orcid.org/0000-0002-5200-2441>

**Jakub SOVIAR, doc. Mgr., PhD,** is an associate professor at the University of Žilina. Research interests: cooperation management, marketing strategies, market research and online reputation.

**ORCID ID:** <https://orcid.org/0000-0003-3029-5607>

**Viliam LENDEL, doc. Ing, PhD.** is an associate professor at the University of Žilina. Research interests: innovation management, CRM and innovation process management.

**ORCID ID:** <https://orcid.org/0000-0001-7008-1254>

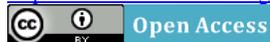
Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

---

Copyright © 2023 by author(s) and VSI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

## ANALYSIS OF THE IMPACT OF COVID-19 PANDEMIC ON CONSUMER BUYING BEHAVIOR IN FOOD CHAIN STORES\*

Veronika Čabinová <sup>1\*</sup>, Peter Gallo <sup>2</sup>, Ján Dobrovič <sup>3</sup>, Beáta Balogová <sup>4</sup>, Mykola Palinchak <sup>5</sup>

<sup>1</sup> University of Prešov in Prešov, Rectorate, Ul. 17 Novembra 15, 080 01 Prešov, Slovakia

<sup>2,4</sup> University of Prešov in Prešov, Faculty of Arts, Ul. 17 Novembra 1, 080 01 Prešov, Slovakia

<sup>3</sup> College of International Business ISM Slovakia in Prešov, Duchnovičovo námestie 1, 080 01 Prešov, Slovakia

<sup>5</sup> Uzhorod National University, Faculty of International Economic Relations, University Street 14, 880 00 Uzhorod, Ukraine

E-mails: <sup>1\*</sup> [veronika.cabinova@unipo.sk](mailto:veronika.cabinova@unipo.sk) (Corresponding author); <sup>2</sup> [peter.gallo.1@unipo.sk](mailto:peter.gallo.1@unipo.sk); <sup>3</sup> [dobrovic@ismpo.sk](mailto:dobrovic@ismpo.sk); <sup>4</sup> [beata.balogova@unipo.sk](mailto:beata.balogova@unipo.sk); <sup>5</sup> [f-intrel@uzhnu.edu.ua](mailto:f-intrel@uzhnu.edu.ua)

Received 11 February 2023; accepted 10 June 2023; published 30 June 2023.

**Abstract.** The paper's chief goal is to determine the impact of COVID-19 on consumer purchasing behaviour and purchasing decisions concerning selected factors affecting consumers when buying food products in chain stores. The research was conducted in V4 countries, and data were obtained from a questionnaire. Essential research methods, such as analysis, synthesis, comparison, induction and deduction, were used in the presented research. Selected basic methods of descriptive statistics, normality tests and correlation coefficients were also applied. After evaluating the results of the questionnaire and verifying the research hypotheses, the expected conclusion regarding the apparent impact of COVID-19 on consumer purchasing and decision-making was confirmed. The hypothesis focused on buying behaviour in relation to gender ( $p = 0.03665$ ), and economic status ( $p = 0.0407$ ) was confirmed, manifesting a statistically significant relationship between these factors. A statistically significant relationship between age and buying behaviour during the COVID-19 pandemic was not confirmed ( $p > 0.05$ ). The research's benefit is identifying changes in buying behaviour and consumer decision-making during the COVID-19 pandemic, which is crucial information, especially for entrepreneurs who can thus adjust their business activities to the current customer needs.

**Keywords:** consumer; consumer behaviour; wholesale; retail; COVID-19 pandemic

**Reference** to this paper should be made as follows: Čabinová, V., Gallo, P., Dobrovič, J., Balogová, B., Palinchak, M. 2023. Analysis of the impact of COVID-19 pandemic on consumer buying behaviour in food chain stores. *Entrepreneurship and Sustainability Issues*, 10(4), 307-319. [http://doi.org/10.9770/jesi.2023.10.4\(19\)](http://doi.org/10.9770/jesi.2023.10.4(19))

**JEL Classifications:** D10, D22, L66, R20

---

\* This research was supported by the project by KEGA project no. 027PU-4/2022 Digital transfer technologies into the innovation of professional methodology practice in the undergraduate preparation of students' social work.

## **1. Introduction**

The COVID-19 pandemic has affected every sector of the economy, wholesale and retail. The pandemic upheaval has been a massive test of the economy's and trade's resilience. Businesses and policymakers need to respond effectively to a rapidly changing economic environment. Despite its vital role in the supply chain and the flow of goods, the retail sector has also been negatively affected during the pandemic. Due to the continuing unfavourable pandemic situation, many businesses have wholly or partially restricted the operation of their retail stores. Partial lockdown, originally supposed to last for a few weeks during the first wave of COVID-19 pandemic, was extended to more than three months, thus causing retailers to start looking for alternative ways to reach customers, for example, online sales. The relentless second wave of the COVID-19 pandemic closed retail stores for over one hundred days. Shortened opening hours, stricter protective measures, and high demand for durable foodstuffs all impacted food retailers and changes in consumer behaviour. Those businesses in the retail sector which, for various reasons, have not at least partially moved their business online have been affected by long-lasting restrictions during the second wave of COVID-19 pandemic, even to the point of existential problems. Despite its stable growth and relative resilience, this impact has also been reflected in the retail food industry. Although this upheaval has required a comprehensive response to support those worst affected entities, it has also accelerated specific trends in the retail food industry. Compared to the significant underperformance of the manufacturing sector, the retail food industry has manifested positive development during the pandemic. Retail sale of food has remained largely unaffected by the current crisis, even showing an increase in comparison with the previous years (Drago et al., 2020; Gavilan et al., 2021; Ginevicius et al., 2021; Caso et al., 2022).

The COVID-19 pandemic has severely disrupted all sectors of the food industry worldwide. Although these disruptions have had significant negative consequences, they have simultaneously reinforced the trends to which retailers must adapt anyway. The most important of them are digitization and changing consumer preferences. These accelerators enable more sustainable recovery. However, stakeholders need to be prepared for broader structural changes across retail, including digitization, the shift to more common online shopping, and stricter environmental legislation. To some extent, COVID-19 pandemic is the onset of these changes (Ham et al., 2020; Pradana et al., 2021; Csákay et al., 2021; Glova et al., 2022). The chief goal of the present paper is to find out the impact of COVID-19 on consumer buying behaviour and decisions concerning selected factors affecting consumers when shopping for food in retail chains.

The structure of the paper is as follows. The second chapter contains a brief literature overview addressing the issue of consumer buying behaviour. The third chapter presents the research focused on analyzing the impact of COVID-19 on consumer buying behaviour in grocery store chains. The study utilized an electronic questionnaire, data collection lasted from February 3 until March 12 last year. Based on the research results, we have formulated certain proposals and recommendations listed in the last chapter of the present paper. The achieved results are especially beneficial for entrepreneurs, who can thus respond more flexibly to the vicissitudes in consumer behaviour due to COVID-19 pandemic.

## **2. Theoretical background**

The role of marketing is to satisfy the target customers' needs and desires better than the competition. Therefore, marketers need to understand how consumers reason and how they feel fully and consequently, they should offer clear value to each target customer. A company that wants to be successful in the market should consider its customers' needs. The company must realize that success in the market does not come by itself. Identifying the customers' needs and monitoring consumer behaviour are critical determinants in market research. Entrepreneurial success does not depend on what the company thinks the customer needs but on what the customer wants,

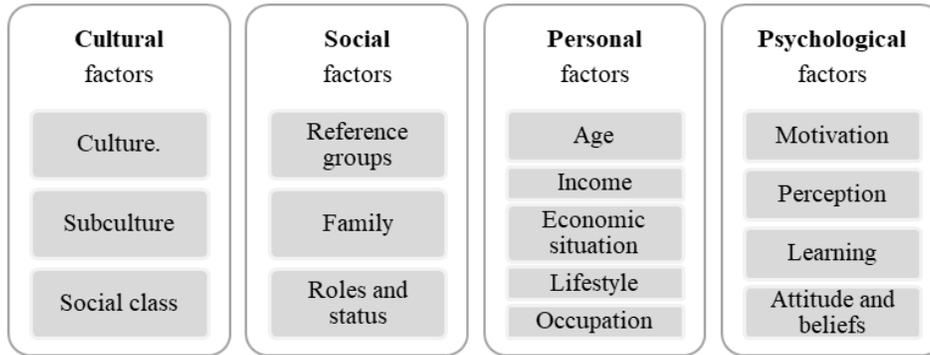
regardless of the entrepreneur's view of consumer behaviour (Dobrovič et al. 2016; de-Magistris, 2017; Nurliza & Oktoriana, 2021; Jansson-Boyd & Kobescak, 2020; Korauš et al. 2021; Kobis & Karyy, 2021; Andrejovska & Glova 2022). Within consumer behaviour, the consumer is perceived as a person who makes purchasing decisions under the influence of various external factors, the external environment being shaped by its specific features and the current purchasing situation. Each of us takes both a consumer and customer role throughout one's life. One becomes a customer during their life – they are a person who orders, buys and pays for a product or service.

On the other hand, the concept of a consumer is more general, as we have become one since our birth. The consumer is a person and/or an end user who needs the products and services for their own consumption. Defining and realizing the real role of the person with whom the business comes into contact is an important step in directing the tools of the marketing mix. It is not sufficient to merely address the consumer, customer or buyer – it is paramount to realize that their roles may change over time. For this reason, it is appropriate to manage all marketing stakeholders, as each fulfils a unique role for marketing specialists. The current customer is increasingly demanding concerning the products and services provided, so companies seek new opportunities and resources for continuous growth. Therefore, experts accordingly claim that active customer and management relationship offers businesses a competitive advantage in a difficult competitive environment (Gonos & Gallo, 2013; Hazée et al., 2017; Pramudya & Seo, 2019; Straková et al. 2021; Šip & Kuzyšin 2021; Šimberová et al. 2021; Dancakova et al. 2022).

In the past, marketing specialists could perceive and understand the consumer and their behaviour thanks to the daily experience of direct sales. However, as a result of globalization, markets and businesses have expanded exponentially, thus gradually losing direct contact with their customers and becoming more and more compelled to rely on the results of market research on consumer behaviour. The intention of marketing specialists is basically to reveal how customers respond to the applied marketing stimuli of companies (product features, prices, advertising, etc.) and to understand current and future consumer behaviour as much as possible (Grunert et al., 2014; Brecka & Koraus 2016; Akrouit & Diallo, 2017; Al-Tkhayneh et al., 2019; Taranenko et al., 2021).

Complex consumer behaviour is typified by the consumer manifesting a lot of bias and going through all stages of the purchasing decision process, as there are significant differences between products/brands. The consumer behaviour of a consumer seeking diversity means that the consumer likes to change products/brands, which, however, is not a sign of dissatisfaction, but a wide range of selection. In the case of behaviour-reducing non-compliance, the consumer shows a high degree of interest in buying products but does not perceive any significant differences between products/brands – they try to obtain more information about the available offer but make the purchase decision relatively quickly. Stereotypical consumer behaviour can be defined as a recurring purchasing decision that is made almost without looking for any information or possible options (Chatzipanagiotou et al., 2016; Ismail et al., 2020; Mihalčová et al. 2021; Musova et al., 2021).

Consumer behaviour is currently influenced by many factors, the knowledge of which is fundamental. By identifying them, the driving motives and/or the reasons for buying a product caused by the awareness of a specific need, the necessity to satisfy it can be revealed. Due to the impact of various factors, consumers cannot be understood as a homogeneous group of people. Consumer behaviour across different cultures encompasses several universal elements and characteristics. Consumer behaviour is affected by, among other things, verbal and nonverbal communication, religion, symbols, rituals, myths, etc. The factors affecting consumer behaviour (characteristics) can be divided into four or five primary groups (see Figure 1). Marketers usually cannot control these factors, but they must consider them.



**Figure 1.** Major factors influencing consumer behaviour  
*Source:* Kotler & Keller, 2012

The decision-making stage of consumer purchasing behaviour is not a one-off matter; it results from several decisions that follow each other. Purchasing decisions do not mean whether you buy the product or service as a customer and in what quantity, but first and foremost, whether you go to the store at all. Consumer buying behaviour is the subject of many research studies. However, due to the limited scope of the present paper, we have focused only on exploring mainly retail chains with food products. As illustrated by Amicarelli and Bux (2021), the outbreak of the coronavirus pandemic in early 2020 had a significant impact on lifestyle and consumer behaviour in many ways, including, undoubtedly, the consumption of food and food products. The vast majority of catering companies were forced to close down, causing a sharp increase in domestic consumption, thus increasing household waste. Following this, the above authors decided to research a small sample of Italian families to understand better the current consumer trends and food waste during the coronavirus pandemic. The scholars conclude that a controlled work-life balance, adequate time management, and timely delivery of food to retail outlets are (especially in this adverse period) good ways of reducing household food waste. The change in consumer behaviour of Italian households pertaining to the coronavirus outbreak was also investigated by Cavallo et al. (2020). In their research study, they focused, among other issues, on an overview of the most significant changes in food supply chains, retail outlets contributing to the sustainable development of the food system and food security in the country have significantly prospered (Muangmee et al., 2021; Musova et al., 2021; Ratan et al., 2021).

According to Leone et al. (2020) the coronavirus pandemic has led to significant changes in the distribution, sale, purchase, preparation and consumption of food in the United States. In their study, the scholars sought to analyze the impact of the pandemic on consumer behaviour and grocery stores. In addition to the recommended approaches to building more resilient food chains, they also formulated proposals to ensure the sustainability of small food businesses in the current gross situation. In their research study, Jo et al. (2021) analyzed consumer behaviour changes after the outbreak of the pandemic in South Korea. Using credit card data from January to June 2020, they examined consumer changes in various sectors – catering services, retail chains, wholesale chains, education, travel and leisure. The most significant decrease occurred in travel expenses and subsistence expenses. However, a significant correlation between changes in consumer behaviour in these sectors and the consequences of coronavirus in infected areas has not been confirmed. Understanding consumer behaviour and the factors affecting it is considered a basis for developing successful business strategies by Arenas-Gaitán et al. (2021). Their research study aimed to identify how consumers perceive value creation when shopping in vegetable retail chains. This research was conducted in Spain on a sample of 1,200 consumers of different ages and income groups. Based on the study results, the scholars emphasized the importance of the consumer shopping list, which significantly affects the consumer perception of the product portfolio in retail food stores, subsequently reflected in consumer behaviour. A similar research study was carried out by Xuan (2021). Based on 353 structured

interviews, he examined whether an environmental issue – certified organic packaging could be included in the factors influencing Vietnamese consumer behaviour. Using the example of a selected food product, the author concluded that consumers strongly prefer products packaged in certified organic packaging. At the same time, they tend to trust the certification by independent evaluators, and conversely, they have the least trust in the certificate by the Vietnamese government. According to the author, this factor influencing consumer behaviour also contributes to the transition to the sustainable development of the analyzed Vietnamese province. It encourages policymakers to formulate effective marketing strategies applicable to the relevant retail food chains. Consumer behaviour in grocery stores in other countries was investigated by, e. g. Hecht et al. (2020), Winkler et al. (2020), Beresford & Hirst (2020), Li et al. (2020), Wang et al. (2020).

### **3. Research objective and methodology**

In the current difficult, ever-changing economic and distribution conditions, the sale of products and services is becoming a decisive factor affecting the very existence of businesses, not to mention the selection of food products. Compared to industrial products, food is subject to much faster decay, and the central part of it must be transported to areas with large populations. However, the market position and the concentration of retail food chains in the V4 countries are getting consolidated very fast. Over the past two decades, the chains have achieved a dominant position in the sale of food, as they sell more than 80% of all food products. According to a study carried out for the European Commission, as early as 2009, the concentration of five retail chains in the nationwide food assortment market reached a share of up to 48%. For these reasons, the V4 countries' retail chains operating in the food industry are a very suitable research sample, also in connection with the nature and consequences of the ongoing coronavirus pandemic.

The paper's primary goal is to determine the impact of COVID-19 on consumer buying behaviour and purchasing decisions in terms of selected factors that affect consumers when shopping in retail food chains. The following hypotheses have been formulated:

**H1: We assume that there are statistically significant differences in buying behaviour during the COVID-19 pandemic in terms of respondents' gender.**

**H2: We assume that there is a statistically significant relationship between buying behaviour during the COVID-19 pandemic and the respondents' age.**

**H3: We assume that there are statistically significant differences in purchasing behaviour during the COVID-19 pandemic regarding the surveyed respondents' economic status.**

We obtained data from a questionnaire, which was distributed in an electronic form to potential respondents. Data collection took place in the period from 3 February to 12 March 2023. The questionnaire was anonymous; out of 735 questionnaires, 678 were completed.

We used basic research methods – analysis, synthesis, induction, deduction and comparison. Descriptive statistics tools were also used to understand better the research sample and its brief characteristics, namely group mean, median and standard deviation. We used a nonparametric Wilcoxon test to verify the suggested hypotheses. The selected correlation coefficients were also used to verify the proposed hypotheses: Pearson's correlation coefficient  $r$ , Spearman's order correlation coefficient  $\rho$ , Kendall's tau<sub>b</sub>, Wilcoxon's robust correlation coefficient and polychoric correlation coefficient. After processing the respondents' answers, Excel-coded data were processed in the R-project and SPSS statistical programs to verify the suggested hypotheses.

**4. Result and discussion**

The subject of the research was to establish consumer buying behaviour in retail food chains during the COVID-19 pandemic. In investigating consumer behaviour, in the first hypothesis, we focused on the respondents' gender and its impact on their buying behaviour. We suggested the following hypothesis:

**H1: We assume statistically significant differences in purchasing behaviour during the COVID-19 pandemic regarding respondents' gender.**

From the questionnaire data, more females than males participated in the research. The share of females in the research sample was more than two times higher than that of males. The males included 73 respondents (32.30%), and the females included 153 respondents (67.70%). The descriptive statistics and respondents' gender distribution are given in Table 1.

**Table 1.** Descriptive statistics – males and females

Gender	Group average	Standard deviation	Group median	Quantity
Males	28.48	4.503	28.32	219
Females	29.94	5.010	29.92	459
Total	29.47	4.890	29.28	678

Source: authors' processing

A non-parametric Wilcoxon test was used to verify the hypothesis regarding purchasing behaviour during the COVID-19 pandemic from a gender perspective. The p-value of the test used is much lower than the stated test significance level  $\alpha = 0.05$ . The difference between the group averages of males and females is statistically significant. Females manifest a larger group average (15.47), and their group median is higher (15.28). The p-value calculated using the Wilcoxon test is  $p = 0.03665$ . Based on the results, we may conclude that there is a statistically significant difference in purchasing behaviour during the COVID-19 pandemic regarding the surveyed respondents' gender. Thus, the suggested hypothesis was confirmed. The research results are shown in Table 2.

**Table 2.** Non-parametric Wilcoxon test – results of testing H1

Non-parametric Wilcoxon test
<p><b>data:</b> females and males</p> <p>W = 6543.5</p> <p>p-value = 0.03665</p> <p><b>alternative hypothesis:</b> true location shift is not equal to 0</p>

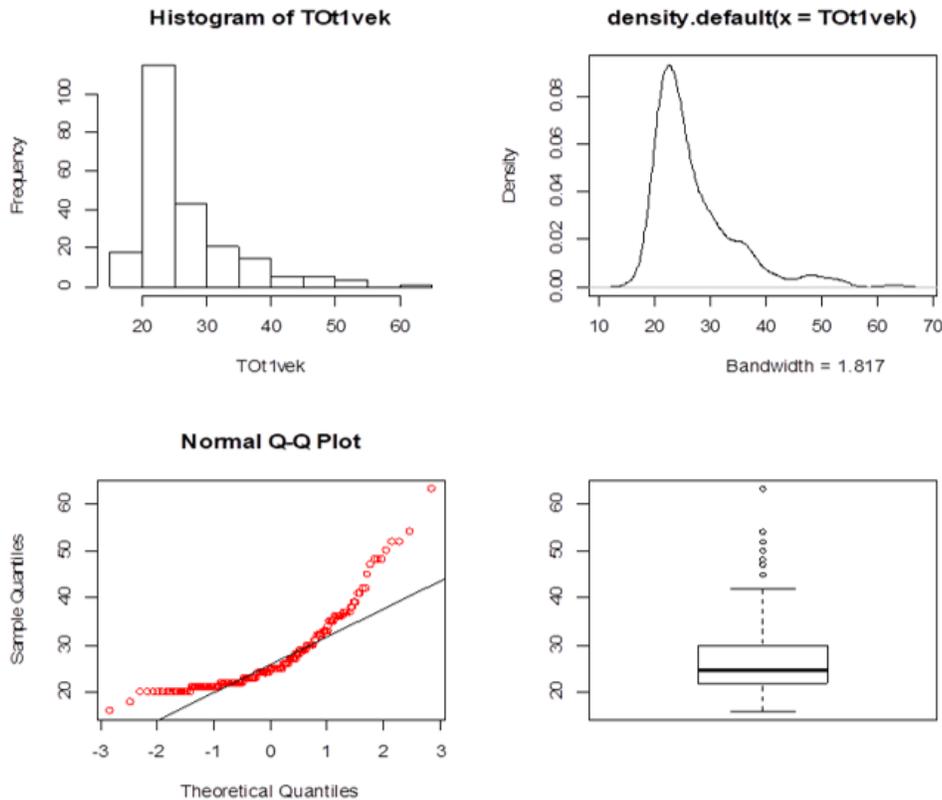
Source: authors' processing

The second hypothesis concerned the buying behaviour during the COVID-19 pandemic in terms of respondents' age, and it was formulated as follows:

**H2: We assume that there is a statistically significant relationship between buying behaviour during a COVID-19 pandemic and the respondents' age.**

The research sample consisted of 678 respondents, an average of 27 years old. The youngest respondent was 16 years old, and the oldest one was 63 years old. Half of the respondents were between the ages of 16 and 24. 113 respondents, i.e.. 50% were between 25 and 63.

In the present research, age is an independent variable with a ratio scale, it is a fixed factor, independent of a particular sample. Its distribution is shown in Figure 2. From the histogram and density graph, we can see a significant skew towards higher values. The Q-Q normality graph also signals a considerable asymmetric distribution. We can notice a large number of outliers from the box chart. In this case, however, it does not depend on the fact whether the distribution is normal; we are particularly interested in the outliers and linearity or nonlinearity of mutual relations of the two correlated variables. A total of 10 outliers (47, 63, 45, 54, 48, 52, 52, 48, 48, 50) were identified in the statistical set, with values of 52 and 48 being repeated.



**Figure 2.** Independent variable distribution with ratio scale  
 Source: authors' processing

We assumed a statistically significant dependence between the correlated variables in the hypothesis. We tested the hypothesis at the significance level of  $\alpha = 0.05$ . The test results are shown in Table 3.

**Table 3.** Results of testing H2

Correlation between buying behaviour during COVID-19 and respondents' age				
Variables	Correlation	Spearman	Pearson	Kendall tau_b
SKOREnasp	Age			
	Correlation coefficient	0.001	0.107	0.002
	Statistical significance	0.994	0.109	0.960
	N – number of cases	678	678.00	678

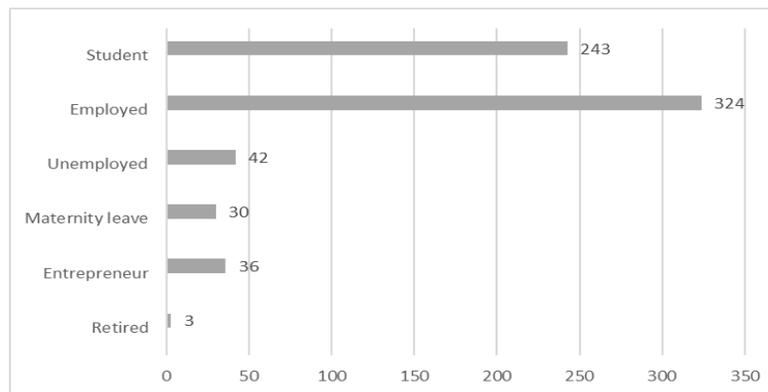
Source: authors' processing

The parametric Pearson's correlation coefficient  $r$  has a value of 0.107, the lower limit of low correlation,  $p$ -value 0.109 ( $N = 678$ ). Nonparametric weaker Spearman's rho and Kendall's tau\_b correlation coefficients are below 0.1; both  $p$ -values are above 0.9 ( $N = 678$ ). The  $P$ -values of the correlation coefficients used are higher than the determined significance level of the test  $\alpha = 0.05$ . Based on the statistical calculations, we must refute the hypothesis since there is no statistically significant relationship between buying behaviour during the COVID-19 pandemic and the respondents' age.

Concerning the third hypothesis, we examined the respondents' economic status in relation to the consumers' buying behaviour during the COVID-19 pandemic. The following hypothesis was set:

**H3: We assume that there are statistically significant differences in buying behaviour during the COVID-19 pandemic regarding the surveyed respondents' economic status.**

In terms of economic status, the research sample included mainly the respondents who were employed and the respondents who stated that they were students. Figure 3 shows the respondents' economic status.



**Figure 3. Respondents' economic status**

Source: authors' processing

We used a nonparametric Wilcoxon test to verify the hypothesis. The  $p$ -value of the test used is slightly lower than the  $p$ -value of the  $t$ -test. The calculated value is 5358 and the  $p$ -value is 0.0407. Based on the verification of the hypothesis, there are statistically significant differences in buying behaviour during the COVID-19 pandemic in terms of the respondents' economic status. Thus, the proposed hypothesis was confirmed. Table 4 shows the results of testing the hypothesis.

**Table 4. Non-parametric Wilcoxon test – results of testing H3**

<b>Non-parametric Wilcoxon test</b>
<b>data:</b> economic status $W = 5358$ $p\text{-value} = 0.04077$
<b>alternative hypothesis:</b> true location shift is not equal to 0

Source: authors' processing

In verifying the hypotheses, two hypotheses that considered consumer buying behaviour during the COVID-19 pandemic were confirmed, and one hypothesis was not confirmed; thus it had to be refuted. The impact of

respondents' gender and economic status on the buying behaviour in retail food chains was confirmed; the age, however, does not seem to affect the buying behaviour or does not affect the said decision-making.

The present research addressed consumer buying behaviour during the COVID-19 pandemic. Quite a few similar research studies related to the coronavirus pandemic have been conducted. Otterbring & Bhatnagar (2022) investigated the consumers' buying behaviour when they were shopping for food and revealed the changes in buying behaviour in terms of avoiding contact, meaning that consumers tended to pay with their credit cards rather than in cash, which was manifested concerning not only gender but also age. Eger et al. (2021), in their research paper, conclude that consumers of generations X and Y have changed their buying behaviour and needs, i.e. they have started to prefer health and safety during the pandemic crisis to their economic concerns. The research by Galasso et al. (2020) pointed to gender differences in buying behaviour; females tend to perceive COVID-19 as a severe health issue. The scholars state that the strategies adopted by the retailers have important implications for consumers' buying behaviour, and that these strategies need to be gender-based, thus highlighting gender differences, i. e. changes in behaviour in response to new risk. Consumer buying behaviour had also changed in Spain when the official statement on the COVID 19 pandemic was published, as Laguna et al. (2020) revealed in their research. The subjects, in terms of gender and age, began to prefer online shopping for food and relied on the statements made by experts or scientists that consumers. Martin-Neuninger & Ruby (2020) examined consumer buying behavior and changing food purchasing habits. Regarding economic status, consumers have reduced their shopping in brick-and-mortar stores and started to use online shopping. A sufficient number of research projects are currently run, and the present research has confirmed the changes in buying behaviour similarly to other research studies in the international arena.

## **Conclusions**

The COVID-19 pandemic has brought many changes all around the world. Face masks and other protective equipment have become part of people's daily lives. Some areas have been hit harder by the pandemic, others less so. This situation affected the retail food chains the least; they have been prospering. In the present paper, we analyzed the impact of COVID-19 on the consumer buying behaviour and purchasing decisions concerning the selected factors affecting consumers. From the data obtained through the questionnaire and the verification of the suggested hypotheses, we may conclude that the pandemic has influenced buying behaviour and consumers' decisions regarding gender and economic status. In terms of minimizing the risk of infection, people have started stockpiling. The present research illustrates that, in buying behaviour, there are statistically significant dependencies between gender and economic status. In terms of age, no statistically significant dependence was confirmed.

We consider men shopping more often and in larger quantities during the COVID-19 pandemic as a managerial benefit compared to women who shop in smaller amounts and more often. The research was also focused on consumer shopping behaviour in terms of age. The benefit for managers is that we have not found any differences between the younger and older consumers; both categories have changed their shopping behaviour during the COVID-19 pandemic and are trying to shop more securely. In terms of economic status, we found differences between the individual categories. As a managerial benefit, we consider that mainly seniors and employed people changed their shopping behaviour and adapted it to the current security conditions of the COVID-9 pandemic. The managerial benefits of the research lie in the analysis of individual demographic and economic categories of consumers, which will enable better orientation for potential sellers in connection with changes in their consumer behaviour during the COVID-19 pandemic.

The limitations of the present research include a restricted research sample, which chiefly represented economically active people and students. The pandemic has also affected seniors, and its impact on the group's buying behaviour may be worth examining. Therefore, in our future research, we will focus on consumers of

various economic statuses that have not been represented sufficiently and on other sectors of the economy, not just retail food stores.

## References

- Akrouf, H. & Diallo, M. F. (2017). Fundamental transformations of trust and its drivers: A multi-stage approach of business-to-business relationships. *Industrial Marketing Management*, 66, 159-171. <https://doi.org/10.1016/j.indmarman.2017.08.003>
- Al-Tkhayneh, K., Kot, S. & Shestak, V. (2019). Motivation and demotivation factors affecting productivity in public sector. *Administration and Management*, 33, 77-102. <https://doi.org/10.24818/amp/2019.33-05>
- Amicarelli, V. & Bux, C. (2021). Food waste in Italian households during the COVID-19 pandemic: A self-reporting approach. *Food Security*, 13, 25-37. <https://doi.org/10.1007/s12571-020-01121-z>
- Andrejovska, A. & Glova, J. (2022). An Effective Average Tax Rate as the Deciding Factor in Tax Competitiveness in the Context of Foreign Investment Influx. *Journal of Competitiveness*, 14(3), 5-23. <https://doi.org/10.7441/joc.2022.03.01>
- Arenas-Gaitán, D. J., Peral-Peral, D. B. & Reina-Arroyo, J. (2021). Ways of shopping & retail mix at the Greengrocer's. *Journal of Retailing and Consumer Services*, 60, 102451. <https://doi.org/10.1016/j.jretconser.2021.102451>
- Beresford, P. & Hirst, C. (2020). How consumers reconcile discordant food retailer brand images. *Journal of Marketing Management*, 36(11-12), 1104-1124. <https://doi.org/10.1080/0267257X.2020.1783347>
- Brecka, S. & Korauš, A. (2016): Innovation and innovation management in the tourism industry in the context of globalization. *Proceedings of 16<sup>th</sup> International Scientific Conference on Globalization and its Socio-Economic Consequences*. Location: Rajecke Teplice, Slovakia. Date: OCT 05-06, 2016. Accession Number: WOS: 000393253800034. ISBN 978-80-8154-191-9
- Cavallo, C., Sacchi, G. & Carfora, V. (2020). Resilience effects in food consumption behavior at the time of Covid-19: Perspectives from Italy. *Heliyon*, 6(12), e05676. <https://doi.org/10.1016/j.heliyon.2020.e05676>
- Caso, D., Guidetti, M., Capasso, M. & Cavazza, N. (2022). Finally, the chance to eat healthily: Longitudinal study about food consumption during and after the first COVID-19 lockdown in Italy. *Food Quality and Preference*, 95, 104275. <https://doi.org/10.1016/j.foodqual.2021.104275>
- Chatzipanagiotou, K., Veloutsou, C. & Christodoulides, G. (2016). Decoding the complexity of the consumer-based brand equity process. *Journal of Business Research*, 69(11), 5479-5486. <https://doi.org/10.1016/j.jbusres.04/15/2016>
- Csáky, Z., Gorgenyi-Hegyés, E. & Fekete-Farkas, M., (2021). The potential responses of the human resource management through CSR in the covid-19 pandemic. *Polish Journal of Management Studies*, 24(2), 102-118. <https://doi.org/10.17512/pjms.2021.24.2.07>
- de-Magistris, T., Gracia, A. & Barreiro-Hurle, J. (2017). Do consumers care about European food labels? An empirical evaluation using best-worst method. *British Food Journal*, 119(12), 2698-2711. <https://doi.org/10.1108/BFJ-11-2016-0562>
- Dancaková, D., Sopko, J., Glova, J. & Andrejovská, A. (2022). The Impact of Intangible Assets on the Market Value of Companies: Cross-Sector Evidence. *Mathematics*, 10(20), 3819. <https://doi.org/10.3390/math10203819>
- Dobrovič, J., Korauš, A. & Dančišinová, L. (2016). Sustainable economic development of Slovakia: factors determining optimal tax collection. *Journal of Security and Sustainability Issues*, 5(4), 533-544. [https://doi.org/10.9770/jssi.2016.5.4\(7\)](https://doi.org/10.9770/jssi.2016.5.4(7))
- Drago, E., Campardelli, R., Pettinato, M. & Perego, P. (2020). Innovations in smart packaging concepts for food: An extensive review. *Foods*, 9(11), 1628. <https://doi.org/10.3390/foods9111628>
- Eger, L., Komárková, L., Egerová, D. & Mičík, M. (2021). The effect of COVID-19 on consumer buying behavior : Generational cohort perspective. *Journal of Retailing and Consumer Services*, 61, 102542. <https://doi.org/10.1016/j.jretconser.2021.102542>

- Galasso, V., Pons, V., Profeta, P., Becher, M., Brouard, S. & Foucault, M., (2020). Gender differences in COVID-19 attitudes and behavior: Panel evidence from eight countries. *Proceedings of the National Academy of Sciences of the United States of America*, 117(44), 27285-27291. <https://doi.org/10.1073/pnas.201252011>
- Gavilan, D., Balderas-Cejudo, A., Fernandez-Lores, S. & Martinez-Navarro, G. (2021). Innovation in online food delivery: Learnings from COVID-19. *International Journal of Gastronomy and Food Science*, 24, 100330. <https://doi.org/10.1016/j.ijgfs.2021.100330>
- Ginevicius, R., Klietstik, T., Stasiukynas, A., & Suhajda, K. (2020). The Impact of National Economic Development on the Shadow Economy. *Journal of Competitiveness*, 12(3), 39-55. <https://doi.org/10.7441/joc.2020.04.03>
- Glova, J., Andrejovska, A. & Vegsoova, O. (2022). Intangibles in Manufacturing Industry: An Empirical Analysis. *EAI / Springer Innovations in Communication and Computing*, 469-477. [https://doi.org/10.1007/978-3-030-67241-6\\_37](https://doi.org/10.1007/978-3-030-67241-6_37)
- Gonos, J. & Gallo, P. (2013). Model for leadership style evaluation. *Management (Croatia)*, 18(2), 157-168.
- Grunert, K. G., Hieke, S. & Wills, J. (2014). Sustainability labels on food products: Consumer motivation, understanding and use. *Food Policy*, 44, 177-189. <https://doi.org/10.1016/j.foodpol.12/12/2013>
- Ham, S., Lee, S., Yoon, H. & Kim, C. (2020). Linking creating shared value to customer behaviors in the food service context. *Journal of Hospitality and Tourism Management*, 43, 199-208. <https://doi.org/10.1016/j.jhtm.April 4, 2020>
- Hazée, S., Van Vaerenbergh, Y. & Armirotto, V. (2017). Co-creating service recovery after service failure: The role of brand equity. *Journal of Business Research*, 74, 101-109. <https://doi.org/10.1016/j.jbusres.2017.01.014>
- Hecht, A. A., Perez, C.L., Polascek, M., Thorndike, A. N., Franckle, R. L. & Moran, A. J. (2020). Influence of food and beverage companies on retailer marketing strategies and consumer behavior. *International Journal of Environmental Research and Public Health*, 17(20), 7381. <https://doi.org/10.3390/ijerph17207381>
- Ismail, N., Kot, S., Aziz, A. S. A. & Rajiani, I. (2020). From innovation to market: Integrating university and industry perspectives towards commercializing research output. *Forum Scientiae Oeconomia*, 8(4), 99-115. [https://doi.org/10.23762/FSO\\_VOL8\\_NO4\\_6](https://doi.org/10.23762/FSO_VOL8_NO4_6)
- Jansson-Boyd, C. V. & Kobescak, M. (2020). To see is to hold: Using food surface textures to communicate product healthiness. *Food Quality and Preference*, 81, 103866. <https://doi.org/10.1016/j.foodqual.2019.103866>
- Jo, H., Shin, E. & Kim, H. (2021). Changes in consumer behavior in the post-COVID-19 era in Seoul, South Korea. *Sustainability*, 13(1), 136. <https://doi.org/10.3390/su13010136>
- Kobis, P. & Karyo, O., (2021). Impact of the human factor on the security of information resources of enterprises during the COVID-19 pandemic. *Polish Journal of Management Studies*, 24(2), 210-227. <https://doi.org/10.17512/pjms.2021.24.2.13>
- Korauš, A., Gombár, M., Vagaská, A., Šišulák, S. & Černák, F. (2021) Secondary Energy Sources and Their Optimization in the Context of the Tax Gap on Petrol and Diesel. *Energies*, 14, 4121. <https://doi.org/10.3390/en14144121>
- Kotler, P. & Keller K., L. (2012). *Marketing Management*. New York.
- Laguna, L., Fiszman, S., Puerta, P., Chaya, C. & Tárrega, A. (2020). The impact of COVID-19 lockdown on food priorities. Results from a preliminary study using social media and an online survey with Spanish consumers. *Food Quality and Preference*, 86, 104028. <https://doi.org/10.1016/j.foodqual.2020.104028>
- Li, J., Hallsworth, A. G. & Coca-Stefaniak, J. A (2020). Changing Grocery Buying behavior s Among Chinese Consumers At The Outset Of The COVID-19 Outbreak. *Journal of Economic and Social Geography*, 111(3), 574-583. <https://doi.org/10.1111/tesg.12420>
- Leone, L. A., Fleischhacker, S., Anderson-Steeves, B., Harper, K., Winkler, M., Racine, E., Baquero, B. & Gittelsohn, J. (2020). Healthy food retail during the COVID-19 pandemic: Challenges and future directions. *International Journal of Environmental Research and Public Health*, 17(20), 1-34. <https://doi.org/10.3390/ijerph17207381>
- Martin-Neuning, R. & Ruby, M. B. (2020). What Does Food Retail Research Tell Us About the Implications of Coronavirus (COVID-19) for Grocery Purchasing Habits? *Frontiers in Psychology*, 11, 1448. <https://doi.org/10.3389/fpsyg.2020.01448>

- Mihalčová, B., Korauš, A., Prokopenko, O., Hvastová, J., Freňáková, M., Gallo, P. & Beáta, B. (2021). Effective Management Tools for Solving the Problem of Poverty in Relation to Food Waste in Context of Integrated Management of Energy. *Energies*, 14(14), 4245. <https://doi.org/10.3390/en14144245>
- Muangmee, C., Kot, S., Meekaewkunchorn, N., Kassakorn, N. & Khalid, B. (2021). Factors determining the behavioral intention of using food delivery apps during covid-19 pandemics. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(5), 1297-1310. <https://doi.org/10.3390/jtaer16050073>.
- Musova, Z., Musa, H. & Matiova, V. (2021). Environmentally responsible behavior of consumers: Evidence from Slovakia. *Economics and Sociology*, 14(1), 178-198. <https://doi.org/10.14254/2071-789X.2021/14-1/12>
- Nurliza, N. & Oktoriana, S. (2021). Perceived benefits of social media networks impact on competitive behavior of Indonesia SMEs: Food and beverage sector. *Economics and Sociology*, 14(3), 146-162. <https://doi.org/10.14254/2071-789X.2021/14-3/8>
- Otterbring, T. & Bhatnagar, R. (2022). Touch, threats, and transactions: Pandemic influences on consumer responses and the mediating role of touch likelihood when shopping for fruits and vegetables. *Food Quality and Preference*, 97, 104461. <https://doi.org/10.1016/j.foodqual.2021.104461>
- Pramudya, R. C. & Seo, H. S. (2019). Hand-feel touch cues and their influences on consumer perception and behavior with respect to food products: A review. *Foods*, 8(7), 259. <https://doi.org/10.3390/foods8070259>
- Pradana, B. I., Yuana, P., Ayuni, R. F., Amir, A. M. & Kartika, A. K. (2021). How to help restaurants survive during COVID-19? *Applied Economics Studies*, 39(12). <https://doi.org/10.25115/eea.v39i12.5998>
- Ratan, S. R. A., Tat, H. H., Latiff, A. S. A. & Nadarajah, D. (2021). Achieving favorable organic food purchase behavior through the mediating role of healthy lifestyle: A perspective of health economics. *Applied Economics Studies*, 39(10). <https://doi.org/10.25115/eea.v39i10.6046>
- Straková, J., Korauš, A., Váchal, J., Pollák, F., Černák, F., Talíř, M. & Kollmann, J. (2021). Sustainable Development Economics of Enterprises in the Services Sector Based on Effective Management of Value Streams. *Sustainability*, 13(16), 8978. <http://dx.doi.org/10.3390/su13168978>
- Šimberová, I.; Korauš, A., Schüller, D., Smolíková, L., Straková, J. & Váchal, J. (2022). Threats and Opportunities in Digital Transformation in SMEs from the Perspective of Sustainability: A Case Study in the Czech Republic. *Sustainability*, 14(6), 3628. <https://doi.org/10.3390/su14063628>
- Šip, M. & Kuzyšin, B. (2021). Spiritual'nyj aspekt uchoda za pacientom v palliativnoj pomoči. *Rocznik Teologiczny*, 63(4), 1309–1328.
- Taranenko, I., Chychun, V., Korolenko, O., Goncharenko, I. & Zhuvahina, I. (2021). Management of the process of e-commerce development in business on the example of the European Union. *Applied Economics Studies*, 39(5). <https://doi.org/10.25115/eea.v39i5.4911>
- Wang, Y., Xu, R., Schwartz, M., Ghosh, D. & Chen, X. (2020). COVID-19 and retail grocery management: Insights from a broad-based consumer survey. *IEEE Engineering Management Review*, 48(3), 202-211. <https://doi.org/10.1109/EMR.2020.3011054>
- Winkler, M. R., Zenk, S. N., Baquero, B., Steeves, E. A., Fleischhacker, S. E., Gittelsohn, J., Leone, L. A. & Racine, E. F. (2020). A model depicting the retail food environment and customer interactions: Components, outcomes, and future directions. *International Journal of Environmental Research and Public Health*, 17(20), 7591. <https://doi.org/10.3390/ijerph17207381>
- Xuan, B. B. (2021). Consumer preference for eco-labeled aquaculture products in Vietnam. *Aquaculture*, 532, 736111. <https://doi.org/10.1016/j.aquaculture.2020.736111>

**Funding:** This research was funded by KEGA project no. 027PU-4/2022 Digital transfer technologies into the innovation of professional methodology practice in the undergraduate preparation of students social work.

**Author Contributions:** Conceptualization: *V. Č., P. G.*; methodology: *V. Č., P. G., J. D.*; data analysis: *V. Č., P. G., B. B.*; writing—original draft preparation: *J. D., V. Č., P. G., M. P.*; writing; review and editing: *B. B., V. Č., P. G., M. P.*; visualization: *J. D., M. P., B. B.* All authors have read and agreed to the published version of the manuscript.

**Mgr. Veronika ČABINOVÁ, PhD.** is a researcher working at the University of Prešov in Prešov, Rectorate, Department of Development, Information Technologies and Quality Assurance. Research interests: multicriteria concepts of evaluation and management of business performance and efficiency, financial and economic analysis, financial management, business economics, modern management tools of business management, evaluation of the international competitiveness.

**ORCID ID:** <https://orcid.org/0000-0003-4367-3590>

**Ing. Peter GALLO, PhD.** is a researcher of Institute of Educology and Social Work, Faculty of Arts, University of Prešov in Prešov. Research interests: The author's publishing activity is focused on the issue of strategic management, human resources management, managerial tools in the field of tourism, managerial decisions in social companies, talent management, and gender stereotypes in society.

**ORCID ID:** <https://orcid.org/0000-0001-5193-1997>

**doc. Ing. Ján DOBROVIČ, PhD.** is a researcher of University of International Business ISM Slovakia in Prešov. Research interests: The author's publishing activity focuses on strategic management, tax problematics in Slovak and Czech Republic and distribution logistics, business plans and innovations, and management in the tertiary sphere.

**ORCID ID:** <https://orcid.org/0000-0002-0637-106X>

**prof. PhDr. Beáta Balogová, PhD., MBA** is a dean of Faculty of Arts, University of Prešov in Prešov. Research interests: The author's publishing activity focuses on social work, talent management, psychology and management in the tertiary sphere.

**ORCID ID:** <https://orcid.org/0000-0001-6069-2721>

**Prof. Mykola PALINCHAK, PhD.** is the Doctor of Political Sciences, Professor of the Department of International Politics, Dean of the Faculty of International Economic Relations of the Uzhorod National University, Ukraine.

**ORCID ID:** <https://orcid.org/0000-0002-9990-5314>

---

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center  
This work is licensed under the Creative Commons Attribution International License (CC BY).  
<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



## A QUANTITATIVE COMPARISON OF SMART CITIES BETWEEN CHINA AND ITALY\*

Alfonso Marino <sup>1</sup>, Paolo Pariso <sup>2</sup>

<sup>1,2</sup>. *Università degli Studi della Campania “L. Vanvitelli” – Dipartimento di Ingegneria, Via Roma, 29 – Aversa - Italy*

E-mails:<sup>1\*</sup> [alfonso.marino@unicampania.it](mailto:alfonso.marino@unicampania.it) (Corresponding author); <sup>2</sup> [paolo.parisio@unicampania.it](mailto:paolo.parisio@unicampania.it)

*Received 18 February 2023; accepted 13 June 2023; published 30 June 2023*

**Abstract.** This study aims to evaluate the similarities and differences between several Smart Cities in Italy and China. For these reasons, the paper is based on two key points; the first is a broad literature review about Smart Cities to explore their evolution and identify strategic elements; the second is based on a quantitative survey of Italian and Chinese Smart Cities to show and compare common and different characteristics. The Smart City concept is a new method of seeing the city of the future. Technological and socioeconomic solutions are required for implementation concerns. Smart Cities solve local and global problems through modern technology and efficient resource management. Nonetheless, each area implements smart projects, activities, and tools as needed based on its unique concerns. There are exciting and substantial differences in Smart City implementation. The research findings present a taxonomy of parallels and differences between Italian and Chinese Smart Cities based on identified essential features.

**Keywords:** Smart city; Italy; Chine; Technological challenge

**Reference** to this paper should be made as follows: Marino, A., Pariso, P. 2022. A quantitative comparison of smart cities between China and Italy. *Entrepreneurship and Sustainability Issues*, 10(4), 320-337. [http://doi.org/10.9770/jesi.2023.10.4\(20\)](http://doi.org/10.9770/jesi.2023.10.4(20))

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

### 1. Introduction

The Smart City is a new way of thinking and managing economic and social relations. Technological innovation changes the role and performance of cities. The realization of this innovative configuration of the city has led to the decentralization of people and infrastructures in the metropolis, generating solutions relating to energy needs, social inclusion, employment, and quality of life. The Smart City, as an implementation of innovative technologies, represents a new management of city government. This new management must recognize local and national government contexts in which a particular city is located. Therefore, within the definition of a Smart city, for which there is no shared definition, there are different operational realizations. These differences are due to the implementation of actions and tools that best meet their specific needs and, on the other hand, the difficulty of overcoming cultural and technological delays, for example, linked to the digital divide. Following what was stated

\* *Research Program V:ALERE – Università della Campania Luigi Vanvitelli, Italy*

above, this study aims to evaluate the similarities and differences between several Smart Cities in Italy and China. In this context, three research questions (RQ) emerge: (RQ1) Which cities could be most attracted to the creation of Smart cities? (RQ2) What government decisions do the initiatives to create Smart City? (RQ3) What is the quality of life level in evolving Smart cities? Starting from the three RQs, the authors decided to investigate Italy and China, two profoundly different countries at a territorial, cultural and regulatory level, but both very active in creating Smart Cities.

In Italy, Smart Cities are widespread in metropolitan cities and small urban centres. However, the Italian government is characterized by a decentralized administrative power that delegates the construction of Smart Cities to Local Authorities. In fact, in Italy, the creation of Smart Cities is managed by the Municipalities. This legal setting determines that the objectives are predominantly local, using investments from the European Union (EU). The Italian Smart Cities aim to implement sectorial innovations, for example, in local transport (smart mobility), according to the main specific criticalities of the territory. The method followed is of the bottom-up type rather than a strategic program.

On the contrary, in China, administrative power is centralized in the central government, which dictates a precise national urban planning strategy. Therefore, the development of intelligent Chinese cities follows a strategic planning set by the central government with a top-down method. Following this research stream, the authors considered it interesting to investigate the dynamics related to the creation of Smart Cities in Italy and China. They investigated whether similarities and differences can emerge in implementing Smart Cities in these two countries. The research develops the following topics: paragraph 2 explores the international scientific literature on which to base the comparison of Italian and Chinese smart cities subsequently; paragraph 3 defines the objectives of the research and the working methodology downstream of the exploration of the literature on the topic of the Smart City which enhances the three RQs highlighted above; paragraph 4 examines the distinctive elements of the Italian and Chinese Smart Cities by comparing both the scientific literature and the empirical cases summarizing the results of the research by grouping the characteristics that emerged from the comparison between Italian and Chinese Smart Cities, paragraph 5 discuss to highlight common and non-common aspects also develop new research topic; paragraph 6 underline the necessity of research agenda; paragraph 7 deals with the conclusions of the work. The research is aimed at both local and national governments, investors, citizens, academic researchers and sector operators.

## **2. Literature review**

Rapid advances in information technology (IT) have empowered cities to acquire and redistribute massive amounts of data to enhance the delivery of public services. Smart cities enable the public sector to boost the value of services supplied to the community by leveraging IT infrastructure and smart devices. This observation results from a course of study that can be presented using research that has received the greatest attention, both as citations and applications, by scholars and governments implementing smart cities. Table 1 highlights both approaches concerning time. Veiga et al. (2001) highlight the importance of creating a dynamic system linked to IT. A clear identification between the creation of a dynamic system and the birth and development of a smart city is not yet present in the research of the time. In 2002, Hislop's study highlighted the need to evaluate the relationship between technological innovation and service innovation. The relationship between technological innovation (IT) and service innovation (IS) represents for the authors the central and underlying theme that must be developed with both theoretical and applicative studies and research in the various economic and social disciplines that see technological innovations as the protagonist of a profound change in society. Pang et al. evaluated This research work as extremely interesting in 2014, considering it to be highly topical after 14 years after its first release. Giffinger (2007) devotes attention to the issue, clearly defining a smart city. The author identifies three main elements that must combine as a prerequisite for developing a Smart City: performance, intelligence, and autonomous aware citizens. Caragliu et al. (2009) highlight the need to deepen the studies and

research regarding the role and potential of information and communication technologies (ICT). In this approach, particular attention is linked to the idea that Smart cities invest in human and social capital and ICT (Pariso et al., 2019) infrastructure developing economic growth and high quality of life through IT governance (Medaglia et al., 2021). Li et al. (2009) developed a specific study concerning public transport, highlighting results applicable to the development and management of smart cities with particular reference to a territory's economic and service organization dimension. Following this research stream, Lacity et al. (2010) developed a study in which physical infrastructure related to services, businesses, and close connections are strategic enabling factors to boost smart cities. Other researchers, Correia et al. (2011), starting from these studies, highlight that, in addition to technological infrastructures, physical and social capital and the political vision of governments represent enabling factors to accelerate the transition towards the development of smart cities. At the same time, Pardo and Nam (2011) highlight the importance of strategies that necessitate innovative behaviours of cooperating with stakeholders, managing resources and providing services. This is one of the first approaches highlighting the need for cooperation between the different actors who can create a smart city, assigning a specific domain to politics in developing smart cities. Technological innovation, particularly digital innovations, is at the centre of the study proposed by Komninos et al. (2012). Smart Cities are joined collective, physical, organized spaces in which digital technologies represent the enabling factor for the development of the Smart city. The central role of the environment concerning the quality of life of the inhabitants and workers in the city or reaching it as a tourist destination is highlighted by Sue et al. (2012). The role of digital innovations is also evaluated as a central element for developing the Smart City by Batty et al. (2012). Following this research stream, Meijer et al. (2014), point out the strategic importance of investments in human and social capital, in communication (Capone et al., 2020) infrastructure, as enabling factors that represent together with a wise management of participatory governance, the possibility of developing the Smart city. From an international point of view, Luftman et al. (2013) underline the importance of specific technological tools as apparatuses that create opportunities and new challenges in the organization of both public and private services. Pang et al. (2014), starting from the relationship between IT and IS, developed focus research based on technological innovation and technological bottlenecks related to government action, i.e. digital divide. Henfridsson et al. (2014) highlight the strategic importance of the relationship between IT and IS with particular attention to the digital age. Furthermore, this approach concerns many geographical areas of the world. It has been identified nationally and globally as one of the main elements to be removed to speed up the transition to the digital society (Pariso et al., 2019a) in which smart cities represent a visible achievement. Albino et al. (2015) highlight the importance of clarifying related expressions frequently used interchangeably. Like the previous ones, this contribution is interesting for the clarifications it provides to the reader in applying the main concepts associated with the study of Smart cities. In line with previous studies, Montahy et al. (2016) developed technological change as the strategic domain in terms of information, digital, and telecommunication technologies that can improve the city's services for the benefit of its inhabitants. It is interesting to report this study because the domain of development sustainability is integrated with technological change. Sustainability assessment is the strategic topic of Ahvenniemi et al. (2017). In this study, the authors develop the idea that in the 21st century, there has been a move from sustainability assessment to smart city goals. A strong critical approach linked to research based on systematic understanding can be traced back to Ruhlandt (2018). The synthesis of his criticism can be summarized as shown in Table 1. In this context, De Reuver et al. (2018) introduce digital platforms as research agenda. The authors developed the relationship between IT and IS with particular attention to future applications of digital technologies. An interesting upgrade related to digital technologies and their application was published by Nicolescu et al. (2018). Tumbas et al. (2018) highlight the strategic importance of digital innovation and specific professionalism related to the future development of digital technologies. The relationships between the urban developments of cities concerning the use of technological innovations are the focus of the research developed by Lau et al. (2019). Øvrelied et al. (2019) highlight the importance of digital infrastructure as strategic support to develop digital transformation. Lyytinen (2019) argue that the development of this topic should be approached with the information system. Starting from this assumption, evaluating Smart cities using quantitative measurement variables is the theme developed by Lai et al. (2020). This approach can contribute to developing standards, "Standards are used to help regulate how smart

cities function and contribute to defining a smart city (Lai et al., 293). Starting from real experience, Pelizza (2020) argues that IT create an accumulation of knowledge in the public sector through large amounts of data, and proper management can improve public service delivery. The author argues that this process is an opportunity and a challenge for the city. Following this research stream IT, public services Tsohou et al. (2020) published research highlighting the necessity to realize smartness in public sector innovation with sufficient management capabilities and robust technology strategies. In 2020, Wiener et al. published a contribution that pointed out results related to digital transformation in the public sector; the article is placed in the research field developed concerning the relationship between IT and IS.

The role and concept of a smart city, based on advanced information and communications technology (ICT), developed by Wu et al. (2021) is strictly linked to the impact of rapid urbanization

**Table 1.** The evolutionary concept of Smart city - timeline of references

<b>Evolutionary Concept of Smart City</b>	<b>Reference</b>
National Culture on IT Implementation and Acceptance as a dynamic model	Veiga et al., 2001
The difficulties in measuring benefits and costs need to be clarified about the expected impact of IT/IS and, thus, are major problems facing decision-makers.	Hislop, 2002
A Smart City is well performing built on the ‘smart’ combination of endowments and activities of self-decisive, independent and aware citizens.	Giffinger, 2007
A city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and high quality of life, with a wise management of natural resources, through participatory governance.	Caragliu et al., 2009
This enables service providers to employ advanced price differentiation and service expansion strategies and achieve new ‘best practices in revenue management.	Lacity et al., 2010
A Smart City can link physical capital with social one and develop better services and infrastructures. It can combine technology, information and political vision into a coherent program of urban and service improvements.	Correia et al., 2011
Smart Cities are about leveraging interoperability within and across policy domains of the city. Smart City strategies require innovative ways of interacting with stakeholders, managing resources and providing services.	Pardo and Nam, 2011
Smart Cities are integrated social, physical, institutional, and digital spaces in which digital components improve the functioning of socioeconomic activities and the management of physical infrastructures of cities while also enhancing the problem-solving capacities of urban communities.	Komninou et al., 2012
Smart City is a city which it can combine technologies as diverse as water recycling, advanced energy grids and mobile communications to reduce environmental impact and offer its citizens better lives.	Su et al., 2012
Cities are becoming smart not only in terms of how we can automate routine functions but in ways that enable us to monitor, understand, analyze and plan the city to improve the efficiency, equity and quality of life for its citizens in real-time.	Batty et al., 2012
Technology connects the physical infrastructure, the IT infrastructure, the social infrastructure and the business infrastructure to leverage the collective intelligence of the city.	Luftman et al., 2013
A city is to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and high quality of life, with a wise management of natural resources, through participatory governance.	Meijer et al., 2014
The focus is shifting towards services and affordances that offer value to individuals, organizations, and society.	Pang et al., 2014

As the term "smart city" gains broader currency, there is still confusion about a smart city, especially since several similar terms are often used interchangeably.	Albino et al., 2015
A smart city is a place where traditional networks and services are made more flexible, efficient, and sustainable using information, digital, and telecommunication technologies to improve the city's operations for the benefit of its inhabitants.	Montahy et al., 2016
In the 21st century, there has been a shift from sustainability assessment to smart city goals.	Ahvenniemi et al., 2017
Research on smart cities needs a systematic understanding of the different components of smart city governance, the metrics to measure these components, their envisaged outcomes and potential contextual factors influencing both components and outcomes.	Ruhlandt, 2018
The advancement of various research sectors has shed some light on transforming an urban city, integrating the techniques mentioned above into a commonly known term - Smart City.	Lau et al., 2019
The smart city concept is ambitious and is being refined with standards. Standards are used to help with regulating how smart cities function and contribute to defining a smart city.	Lai et al., 2020
Recent information technology (IT) developments have enabled cities to collect and disseminate important data to improve public service delivery. "Smart cities" allow the public sector to leverage IT infrastructure and smart devices to increase the value of services delivered to the community.	Pelizza, 2020
Realizing smartness in public sector innovation requires sufficient management capabilities, robust technology strategies, and a willingness to explore and adopt new work practices rather than implement emerging technologies.	Tsohou et al., 2020
We discuss the contribution of our analyses to the research on big data (and IT adoption in general) by older people, the digital divide, and technology acceptance and identify potentially effective paths for future research and theoretical development.	Wiener et al., 2020
The concept of a smart city, based on advanced information and communications technology (ICT), emerged to mitigate the impact of rapid urbanization and was considered feasible.	Wu et al., 2021
Security and Privacy in smart cities	Al-Turjman et al., 2022

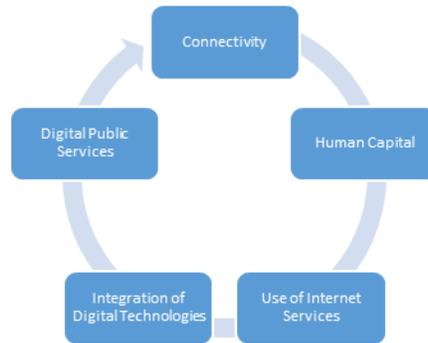
*Source: our elaboration*

Table 1 describes how the concept of a smart city has been approached in the last 21 years of literature, both related to the development of cities as a geographical area and urban space, both with public service and to its organization in terms of government dimension by public administrations and private institutions.

### 2.1. Concept Evolution of Smart City

Despite these differences, some strategic pillars are identified by the authors cited above. The importance of advanced technological networks and infrastructures (Caragliu et al., 2009; Luftman et al., 2013; Meijer et al., 2014; Marino et al., 2021) is detectable in the concept of Connectivity. It predicts STEM expertise, professional education, and background (Correia et al., 2011; Komninos et al., 2012; Pang et al., 2014, Pariso et al., 2019), highlighting the importance of Human Capital in the management of advanced technological networks and infrastructures. A better quality of management supports the development of innovative services for government, governance, and citizens (Giffinger, 2007; Su et al. 2012; Pelizza 2020; Marino 2001) creating a clever use of services. Furthermore, the integration between government, governance, and citizens also makes a competitive business for the firms (Pardo and Nam 2011; Lau et al., 2019; Tsohou et al., 2020, Marino et al., 2022, 2022a) identifiable in the necessity to enhance their technological level. The development and delivery of public services (Batty et al. 2012; Montahy et al., 2016; Tsohou et al., 2020, Di Martino et al., 2020) represent a key factor in realizing a smart city. All these strategic features, summarized in five pillars, highlight a common factor present in the literature given by the relationship between Innovation Technology (IT) and Innovative Services (IS) (Nicolescu et al., 2018; De Reuver et al., 2018, Øvrelied et al., 2019; Lyytinen, 2019; Willcocks et al., 2020,

Wiener et al., 2020; Pelizza, 2020; Tsohou et al., 2020) declining a new idea of smart city. Following this point of view, the summary of the 21 years of literature is shown in Figure 1. Creating a Smart City can be presented as a continuous circular process.



**Figure 1.** Key Pillars of Smart Cities

*Source:* our elaboration

Our study is part of this path and in the Journal that began its development. Starting from this assumption, the authors partially reformulate their research questions: (RQ1) Which cities have made the most significant connection between IT and IS in China and Italy? (RQ2) What government decisions in IT and IS do the initiatives to create Smart City? (RQ3) What is the quality of life level in evolving Smart cities? Starting from the three RQs, the authors confirm to investigate Italy and China, two countries so profoundly different at a territorial, cultural and regulatory level, but both very active in creating Smart Cities.

### 3. Methodology

To evaluate the three RQs, a quantitative approach will be used. A smart city can be presented as a continuous circular process. The Smart city is a complex matrix in which different dimensions are strictly related. The comparison between Smart cities should consider the dimensions in Figure 1: Connectivity, Human Capital, Use of Internet Services, Integration of Digital Technologies, and Digital Public Services.

The connectivity dimension takes both fixed and mobile broadband into account. The Connectivity contains four sub-dimensions, as displayed in Table 3. Connectivity is the premise for developing the relationship between IT and IS; this relationship was clarified by (Nicolescu et al., 2018; De Reuver et al., 2018, Øvrelid et al., 2019; Lyytinen, 2019; Willcocks et al., 2020, Wiener et al., 2020; Pelizza, 2020; Tsohou et al., 2020) and reported in the previous paragraph on the literature review. Human capital: the recent pandemic confirmed how significant digitalization has become to our economies and how basic and advanced digital skills related to human capital can sustain our societies. Human capital contains two sub-dimensions, as displayed in Table 3. Human capital and its sub-dimensions are linked to individuals, organizations, and society. The use of internet services is strategically attractive in a pervasive range of online activities that are possible for those citizens with an internet connection and the necessary skills to benefit from. This dimension contains three sub-dimensions, as displayed in Table 3. The digital community is strictly linked to the adequate development of Internet services. Integrating digital technology allows cities to gain a competitive advantage by improving their services, products and expanding their domains. The sub-dimensions are two, as displayed in Table 3. This dimension, particularly integration, requires management capabilities and robust technology strategies. Digital public services require the supply and demand side of digital public services. The key pillars, pointed out by the literature review and displayed in

Figure 1 as a continuous circular process, are strategic dimensions the European Commission considers to assess technological and service innovation levels applied to a geographical area. Implementing these dimensions is linked to elaborating the Digital Economic Social Index (DESI). DESI allows us to evaluate the three research questions in the literature review. Following the methodological note (European Commission, 2018) and according to their characteristics, different weights were given to each of the five dimensions, displayed in Table 2.

**Table 2.** DESI Dimensions and their sub-dimensions

<i>Dimension weights</i>	<i>Sub Dimension weights</i>
<b>1 Connectivity 25%</b>	1.1 Fixed Broadband 8,5%
	1.2 Mobile Broadband 5,5%
	1.3 Speed 8,5%
	1.4 Affordability 2,5%
<b>2 Human Capital 25%</b>	2.1 Basic Skills and Usage 12,5 %
	2.2 Advanced Skills 12,5 %
<b>3 Use of Internet Services 15%</b>	3.1 Content 5%
	3.2 Communication 5 %
	3.3 Transactions 5%
<b>4 Integration of Digital Technology 20%</b>	4.1 Business Digitization 12%
	4.2 E-commerce 8%
<b>5 Digital Public Services 15%</b>	5.1 E-Government 13,5 %
	5.2 E-Health 1,5%

Source: DESI – Eurostat 2020

Based on a methodological note elaborated by Eurostat (2020), the repartition of specific weights follows these criteria: 25% Connectivity and Human Capital. This weight, which represents the highest, has been assigned because it shows the countries' investments in IT (Connectivity) and Digital Economy (Human Capital). 20% Integration of Digital Technology. This dimension captures the use of ICT by businesses. 15% Use of Internet Services and Digital Public Services. These are the last two enabling dimensions, where the first capture the use of the internet by citizens, and the second displays the digitization of public services. DESI will be applied to Italian and Chinese cities, which have the potential to consolidate the processes relating to the establishment of Smart cities. Starting from OECD (2020) Functional Metropolitan Areas in OECD countries and Demographia World Urban Area (2020) applying DESI criteria, 10 cities as metropolitan areas have been chosen. DESI will be used to Italian and Chinese cities, and the total comparison amount to several cities. To be uniform, the comparison develops as a criterion of the comparability of population density, that is, inhabitants/surface (Km<sup>2</sup>). The cities with similar values have been evaluated by implementing the DESI.

The aggregation of the indicators expressed in the different units in the sub-dimensions and the dimensions of the DESI, table 3, are normalized. In DESI, normalization was performed using the min-max method, which consists of a linear projection of each indicator on a scale between 0 and 1.

$$z = \frac{x - \min(x)}{\max(x) - \min(x)}$$

$$DESI(N) = Connectivity (N) * 0,25 + Human Capital (N) * 0,25 + Use of Internet Services (N) * 0,15 + Integration of Digital Technology (N) * 0,20 + Digital Public Services (N) * 0,15$$

DESI in line with the literature review, offers a practical operational application to our research questions. Furthermore, it evaluates the predisposition of Italian and Chinese cities to evolve towards a Smart city. It can monitor the Smart City's digital performance and track progress regarding its digital competitiveness. It is a structured index that assesses each Smart city's development state. The data processing was developed using a forecasting software package Statistical Package for Social Science (SPSS 26.0) which allows complete forecasts and analyses with multiple models for the estimation of trends, and methods for estimating regression functions.

#### 4. Results

As stated in the methodology, starting from OECD (2020) Functional Metropolitan Areas in OECD countries and Demographia World Urban Area (2020), the comparison, to be uniform, uses as a criterion, that of the comparability of population density, that is, inhabitants/surface (Km<sup>2</sup>). Tables 4 and 5 show the cities, texture, inhabitants and population density. Such choice allows us to create comparable significative sampling data that apply DESI.

DESI, applied to the Italian and Chinese cities, selects 10 cities for each Nation, so the total comparison amount to 20 cities. The Italian metropolitan areas are: Torino, Milano, Genova, Bologna, Firenze, Roma, Napoli, Reggio Calabria, Catania, Cagliari. The Chinese metropolitan areas are: Chongqing, Tianjin, Fujian, Henan, Shandong, Jiangsu, Guangdong, Shanghai, Pechino and Zhejiang.

**Table 3.** Italian metropolitan area

City (metropolitan area)	Surface in Km <sup>2</sup>	Inhabitants	Density (Inhabitants/ Km <sup>2</sup> )
Torino	6.827,00	2.277.857	334
Milano	1.575,65	3.218.201	2.043
Genova	1.833,79	850.071	464
Bologna	3.702,32	1.009.210	273
Firenze	3.513,69	1.014.423	289
Roma	5.363,28	4.353.738	812
Napoli	1.178,93	3.107.006	2.638
Reggio Calabria	3.210,37	553.861	173
Catania	3.573,68	1.113.303	312
Cagliari	1.248,68	431.657	346

Source: our elaboration on OECD dataset (2020)

**Table 4.** Chinese metropolitan area

City (metropolitan area)	Surface in Km <sup>2</sup>	Inhabitants	Density (Inhabitants/ Km <sup>2</sup> )
Chongqing	82.401	30.484.300	369
Tianjin	11.760	15 621 200	1.328
Fujian	121.400	38 565 000	317
Henan	167.000	95 590 000	572
Shandong	6.340	29 863 300	4.709
Jiangsu	102.600	80 400 000	783
Guangdong	179.800	113 460 000	631
Shanghai	6.340	29 863 300	4.709

Pechino	16.808	24 516 000	1.458
Zhejiang	101 800	57 370 000	563

Source: Our elaboration on the Demographia World Urban Area data set (2020)

It is interesting to note that from Tables 3 and 4, above, the 10 Italian cities have a territorial surface and a population significantly lower than the 10 Chinese cities. Nevertheless, the demographic density is comparable to the urban realities of both countries. In line with this result, the authors believe that the DESI and its dimensions and sub-dimensions can be applied to the total of cities in the two tables, 20 cities.

**4.1 Connectivity**

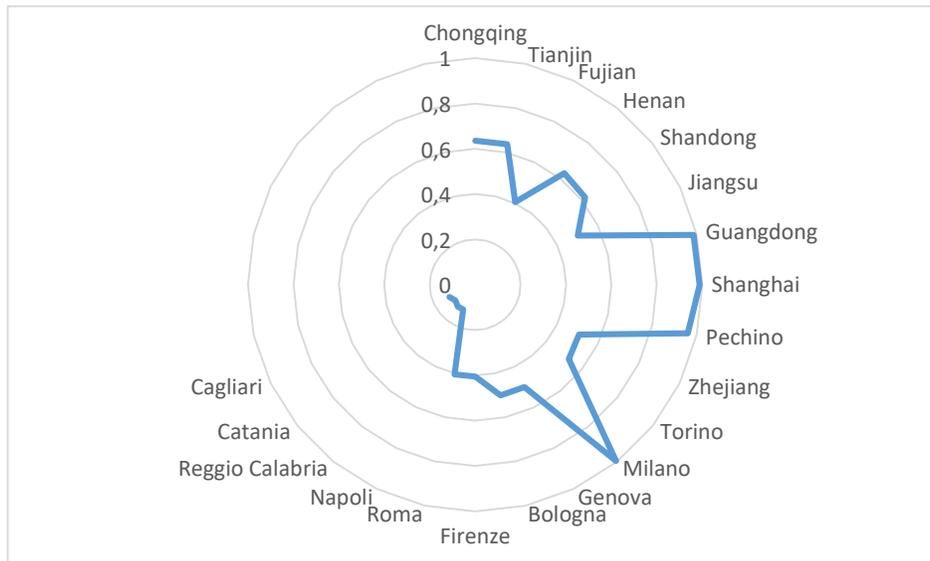
The Connectivity contains four sub-dimensions, as displayed in Table 3: fixed broadband, mobile broadband speed and affordability. In this dimension, Guangdong, Shanghai and Pechino for China and Milano for Italy indicate all the potential to consolidate and develop the implemented smart city. Furthermore, the other Italian and Chinese cities are included in the range between 0,8 and 0,4. Specifically, the remaining seven Chinese cities rank between 0,6 – 0,8. Italian cities Torino, Roma, Genova, Bologna and Firenze rank between 0,6 – 0,4. Although the cities of southern Italy, Reggio Calabria, Catania and Cagliari are between 0 and 0.2 with Naples, another city in southern Italy is close to the range of the others.



**Figure 2.** Connectivity  
Source: our elaboration

**4.2 Human Capital**

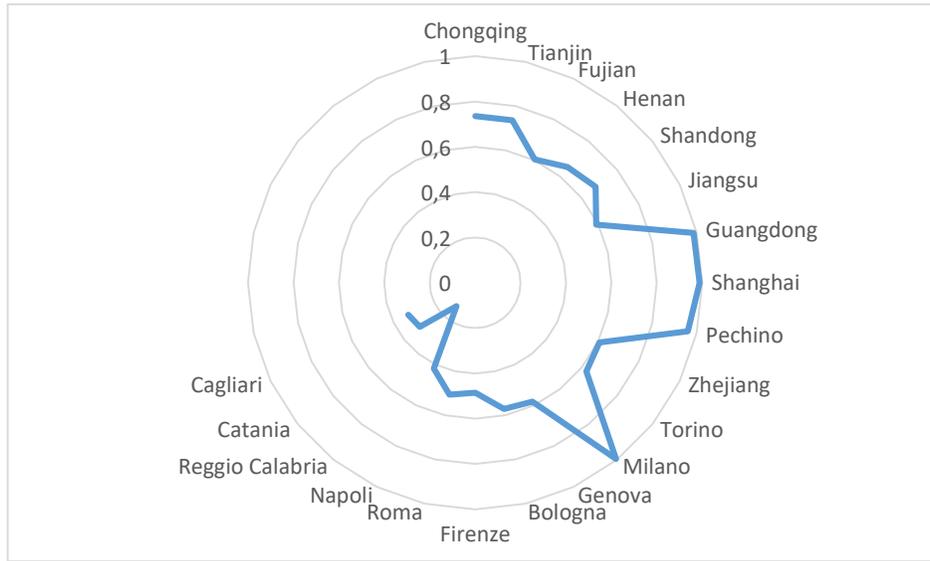
Human capital contains two sub-dimensions, as shown in Table 3: essential and advanced skills and usage. In this dimension, Guangdong, Shanghai and Pechino for China and Milano for Italy display all the potential to consolidate and develop the implemented smart city. Furthermore, the other Italian and Chinese cities are included in the range between 0,8 and 0,4. Specifically, the remaining seven Chinese cities Tianjin, Fujian, Henan, Shandong, Jiangsu, Zhejiang, Chongqing rank between 0,4 – 0,6. Italian cities Torino, Genova, Roma, Bologna and Firenze rank between 0,6 – 0,4. Although the cities of southern Italy, Reggio Calabria, Catania and Cagliari are between 0 and 0.2 with Naples, another city in southern Italy is close to the range of the others.



**Figure 2.** Human Capital  
*Source:* our elaboration

#### 4.3 Use of internet services

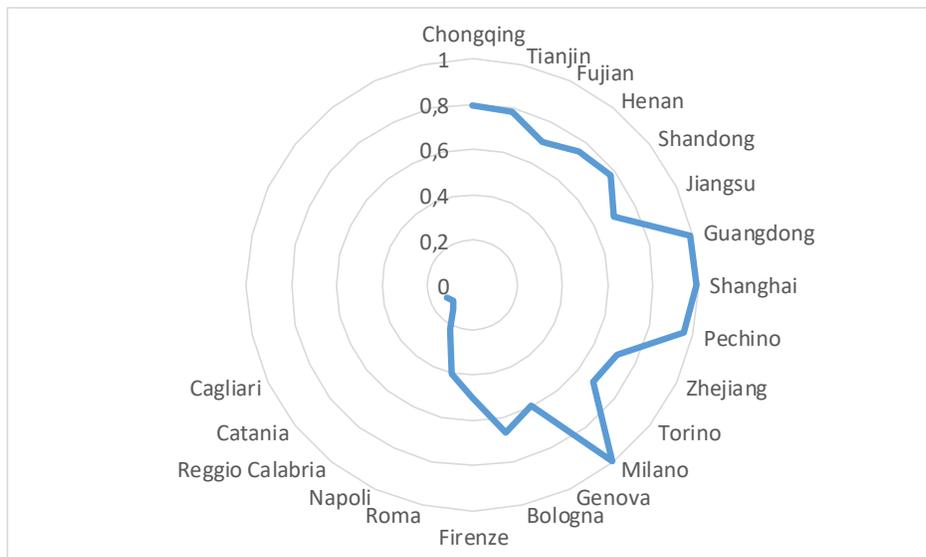
The use of internet services contains three sub-dimensions, as displayed in Table 3: content, communication, and transactions. In this dimension, Guangdong, Shanghai and Pechino for China and Milano for Italy demonstrate all the potential to consolidate and develop the implemented smart city. Furthermore, the other Italian and Chinese cities are included in the range between 0,8 and 0,4. Specifically, the remaining seven Chinese cities Tianjin, Fujian, Henan, Shandong, Jiangsu, Zhejiang, Chongqing rank between 0,6 – 0,8. Italian cities Torino, Genova, Roma, Bologna and Firenze rank between 0,6 – 0,4. Although the cities of southern Italy, Reggio Calabria, Catania and Cagliari are between 0 and 0.2 with Naples, another city in southern Italy is close to the range of the others.



**Figure 4.** Use of Internet services  
*Source:* our elaboration

*4.4 Integration of digital technology*

The subdimensions are two as displayed in Table 3: business digitization and E-commerce. In this dimension, Guangdong, Shanghai and Pechino for China and Milano for Italy demonstrate all the potential to consolidate and develop the implemented smart city. Furthermore, the other Italian and Chinese cities are included in the range between 0.8 and 0.4. Specifically, the remaining Chinese cities are distributed as follows: Tianjin, Fujian, Henan, Shandong, Jiangsu, Chongqing close to 0.8 and Zhejiang between 0.6 – 0.8. Italian cities Torino, Genova, Bologna and Firenze, rank between 0.6 – 0.8, Roma rank between 0.4 – 0.6. Although the cities of southern Italy, Reggio Calabria, Catania and Cagliari are between 0 and 0.2 with Naples, another town in south Italy is close to the range of the others.



**Figure 5.** Integration of Digital technology  
*Source:* our elaboration

4.5 Digital public services

The subdimensions are two, as displayed in Table 3: E-Government and E-Health. In this dimension, Guangdong, Shanghai and Pechino for Chine and Milano for Italy demonstrate all the potential to consolidate and develop the implemented smart city. Furthermore, the other Italian and Chinese cities are included in the range between 0.8 and 0.4. Specifically, the remaining Chinese cities are distributed as follow: Tianjin, Fujian, Henan, Shandong, Jiangsu, Chongqing rank between 1 – 0,8 and Zhejiang between 0,6 – 0,8. Italian cities, Torino, Bologna, Firenze, rank between 0,6 – 0,8 and Rome 0,4 – 0,6. Although the cities of southern Italy, Reggio Calabria, Catania and Cagliari are between 0 and 0.2, with Naples, another town in south Italy, is close to the range of the others.

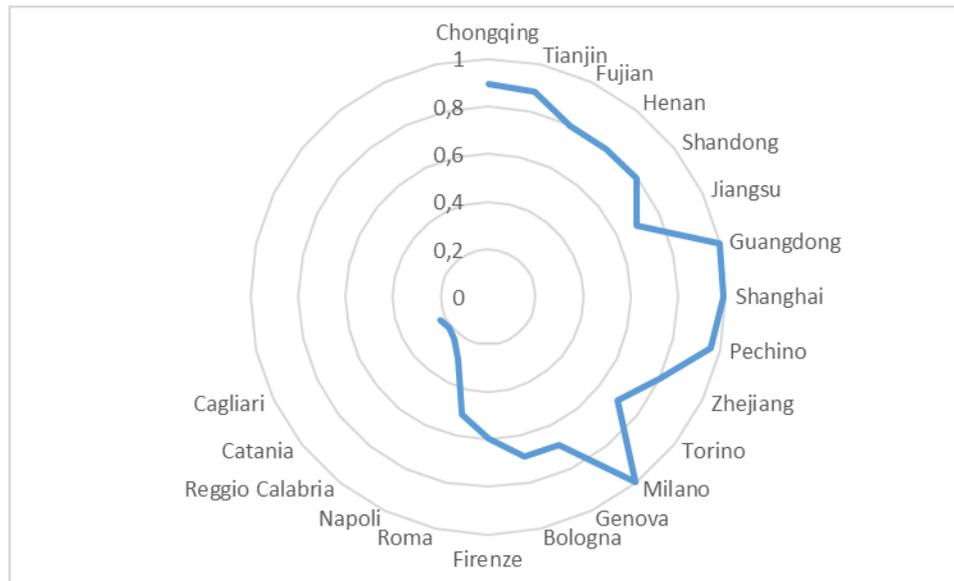


Figure 6. Digital Public services

Source: our elaboration

The subdimensions are two, as displayed in Table 3: E-Government and E-Health. In this dimension, Guangdong, Shanghai and Pechino for Chine and Milano for Italy demonstrate all the potential to consolidate and develop the implemented smart city. Furthermore, the other Italian and Chinese cities are included in the range between 0.8 and 0.4. Specifically, the remaining Chinese cities

The results in Table 5 highlight structured profiles for three Chinese cities and one Italian, with few changes of position in the five dimensions. Firm Smart city profiles are highlighted, such as those of Guangdong, Shanghai, Pechino and Milano, other mediums and a group of cities in southern Italy, Napoli, Reggio Calabria, Catania and Cagliari with a fragile profile and severe bottlenecks to overcome for each of the five dimensions considered.

Table 5. Smart city profiles'

Cities	Connectivity	Human capital	Use of internet services	Integration of digital technology	Digital public services
Guangdong	✓	✓	✓	✓	✓
Milano	✓	✓	✓	✓	✓
Pechino	✓	✓	✓	✓	✓
Shanghai	✓	✓	✓	✓	✓
Zhejiang	•	•	•	•	•
Torino	•	•	•	•	•
Genova	•	•	•	•	•
Bologna	•	•	•	•	•
Firenze	•	•	•	•	•
Roma	❖	❖	❖	❖	•
Chongqing	•	•	•	•	✓
Tianjin	•	•	•	•	✓
Fujian	❖	❖	•	•	•
Henan	•	•	•	•	•
Shandong	•	•	•	•	•
Jiangsu	•	•	•	•	•
Cagliari	❖	❖	❖	❖	❖
Catania	❖	❖	❖	❖	❖
Napoli	❖	❖	❖	❖	❖
Reggio Calabria	❖	❖	❖	❖	❖

Source: our elaboration

Legend:

✓ = structured profile in relation to DESI;

• = evolving profile in relation to DESI;

❖ = weak profiles in relation to DESI;

Starting from these results and considering the literature review developed, is possible to answer the three RQ formulated in the paper.

## 5. Discussion

Starting from three research questions formulated in the paper, concerning RQ1 comparison figure 2, Connectivity, figure 3 human capital, figure 4 use of internet services, figure 5 integration of digital technology and figure 6 digital public services, we can observe that the cities have made the greatest connection between IT and IS in China and Italy are: Guangdong, Shanghai, Pechino and Milano. In this context, the strength of Smart cities deriving from the strict implementation of IT and IS (Li et al., 2014; Gao et al., 2014) is confirmed in 4 cities, one of which is Italian in 10 and always 1 in 20. The remaining cities are positioned in an intermediate range and

the specific investments particularly for Chinese cities and related metropolitan areas. These specific investments are linked to speed and affordability for the connectivity dimension, advanced skills for the human capital dimension, communication, and transactions for internet use. Integrating digital technology and digital public services in the 10 Chinese cities present good profiles with possible room for improvement. Still, they can be classified as actions that are mostly carried out. Compared with the Italian reality, this profile of the 10 Chinese cities shows that only Milan follows the trend. The other 9 are positioned in an intermediate profile, with the need for specific investments in all sub-dimensions, with a strategic focus on the cities of southern Italy where the technological delay highlights a strong digital divide with the rest of Italy and with the trends of Chinese cities. In this area, there is not a robust implementation of IT and IS as a development process, and the absence of this strategic action determines heavy economic and social disadvantages. Following this consideration, it is possible to argue that these cities have not made the greatest connection between IT and IS. The RQ2 comparison of the five figures lets states that the government action realized sufficient management capabilities (human capital) and robust technology strategies (integration of digital technology and use of internet services) (Pelizza 2020; Tsohou et al., 2020), has been realized in a minimum number of the 20 cities evaluated. Failure to achieve these dimensions can be analyzed either as a decision-making absence by local governments or as a weakness in implementing decisions. This double explanation becomes clear if we look at the current achievement of results by, for example, the cities of southern Italy, 4 cities: the complete absence of the development of Smart cities. Beyond these extreme cases, as regards Italy, except for Milan, the remaining 5 have a weak profile in the different dimensions, particularly for dimensions 2, 3, 4. The response to RQ2 highlights a large area of improvement for most cities and a high distance concerning the 4 good practices; therefore, the government decisions linked to IT and IS to create Smart City are weak, poorly coordinated, and to be developed. The main weakness of this implementation by local governments is the absence of collecting and disseminating large amounts of data to improve their public services delivery (Willcocks et al., 2020). The RQ3 comparison of the five figures states that the quality of life linked to implementing a Smart city has been achieved in a limited number of cities. In a world economy that highlights the growth of the digital economy, both in the production and consumption market and innovations that quickly make products, procedures and processes obsolete, cities such as those of southern Italy must recover from the gap well and quickly. A deep and settled gap over time precludes a decent quality of life. In cities where the process of creating Smart cities has advanced, the quality of life is high. In particular, the dimension digital public services (figure 6) with sub-dimension E-Government and E-Health, highlight interesting profiles for Guangdong, Shanghai, Pechino and Milano. In these cities, the level of quality of life has been achieved. In most cities, almost all Italian, included in the range between 0.6 and 0.2, there is a need for continuous and constant improvement work by local and national public decision-makers to implement actions that improve the inhabitants' quality of life. Information capability and value creation strategy (Wiener et al., 2020) represent two trajectories for the local governments of these Italian cities to strengthen their Smart city profile or create it. The answers elaborated from the three research questions can be summarized as follows: a Smart City is an integrated system that interacts with human capital using ICT-based solutions. It aims to create digital development and high quality of life based on a multi-stakeholder, municipally-based partnership. Starting from this synthesis, it can be observed that the Italian and Chinese Smart Cities have the importance of innovation in common. The results also show that the Italian and Chinese Smart Cities differ according to how the investments in infrastructures, the government and the services provided by the Smart City are configured. Examining the results, the authors noted that the crucial aspect on which the Italian and Chinese experiences diverge is the cause-effect relationships that give rise to the Smart City. In this regard, it is interesting to note that beyond this synthesis, Italian cities have a profile of weakness regarding the digital divide (Di Martino, et al., 2020). The studies on the digital divide, starting from a technological point of view, highlight the strategic role of IT and the strategic services role of IS, indicating the lack of opportunities and well-being in the absence of this process. The IT-IS process is a complex social process. Failure to carry out this complex process fuels the breadth of the digital divide. The gap is given both by the absence of investments in infrastructure and Connectivity and the absence of investment in human capital in terms of advanced and basic skills. Moreover, the digital divide is linked to a gap identified as a social issue. The information society's development is incompatible with cities

characterized by the digital divide. Digital poverty feeds economic poverty and vice versa. These poverties structure a vicious circle from which it is difficult to escape, not impossible but difficult (Van Deursen et al., 2019). This approach is more complex than the digital divide as a technological divide and grows the concept of the information society. In this case, reflecting on the economic and social development and accumulation of knowledge to distribute is strategic. Whole regions of the world, such as southern European Countries, Italy included, and internal regions of China, which have digital poverty, are on the fringes of the information society and distribute a fragmented, non-systemic material and knowledge wealth. The government must overcome the function of those who provide services, paying attention to the public sector reform in which the digital divide is a strategic bottleneck to improve access to communication between stakeholders. In this logic, implementing a Smart city means evolving from being an overseer providing direction for an enabling environment to one that creates actively equal opportunities for all. This is the design of inclusion. A new logic of thinking focused on inclusion is required, particularly in this phase, that will not be short. The need for a research agenda on the digital divide emerges from the answers to the three research questions. This gap must be declined in its different technological and social-economic dimensions.

DESI, applied to the Italian and Chinese cities, selects 10 cities for each Nation, so the total comparison amount to 20 cities. The Italian metropolitan areas are: Torino, Milano, Genova, Bologna, Firenze, Roma, Napoli, Reggio Calabria, Catania, Cagliari. The Chinese metropolitan areas are: Chongqing, Tianjin, Fujian, Henan, Shandong, Jiangsu, Guangdong, Shanghai, Pechino and Zhejiang.

## **6. The research agenda**

The smart city offers many opportunities, but many challenges have yet to be solved. The Research agenda linked to the digital divide underlines multi aspects that have yet to be resolved. We need to fully enact a transition to a modern model of cities, which must mandatorily envisage that full social, economic and digital inclusion must be achieved. The phenomenon must be investigated and studied in all its parts to propose appropriate solutions.

## **7. Conclusion**

The concept of the Smart City presents everyday actions in the 20 cases evaluated but also assumes different characteristics. The different economic-political-social contexts condition the success factors, leaving room for further studies and research. From the international literature on Smart Cities, it is possible to notice a dichotomy between what is proposed at the academic level and the empirical reality analyzed: at the theoretical level, reference is often made to an approach that sees in the national strategy, Smart city guidelines to be declined in the cities, the key winning element, while at a practical level, there are more frequent cases of smart cities that follow an approach that does not include national guidelines, but starting from specific local experiences, implementation paths are activated. This approach needs to manage its resources better and, in the cases of Italian cities, causes severe delays in investments in infrastructure and, therefore, in the large dimension of the digital divide. In this regard, bridging this dichotomy between national guidelines and specific local experiences is essential. In this logic, the topic must still be studied and deepened to create an accumulation of knowledge suitable for understanding the future development of Smart cities.

**References**

- Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities?. *Cities*, 60, 234-245. <https://doi.org/10.1016/j.cities.2016.09.0099>
- Al-Turjman, F., Zahmatkesh, H., & Shahroze, R. (2022). An overview of security and privacy in smart cities' IoT communications. *Transactions on Emerging Telecommunications Technologies*, 33(3), e3677. <https://doi.org/10.1002/ett.3677>
- Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology*, 22(1), 3-21. <https://doi.org/10.1080/10630732.2014.942092>
- Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics*, 214(1), 481-518. <https://doi.org/10.1140/epjst/e2012-01703-3>
- Capone, V. Marino, L. & Donizzetti, A.R. (2020) The English version of the health profession communication collective efficacy scale (Hpcce scale) by Capone and Petrillo. *European Journal of Investigation in Health, Psychology and Education*, 10(4), 1065-1079. <https://doi.org/10.3390/ejihpe10040075>
- Caragliu, A., del Bo, C., & Nijkamp, P. (2009). Smart cities in Europe. 3rd Central European Conference in Regional Science – CERS, <https://doi.org/10.1080/10630732.2011.601117>
- Correia, L.M. (2011) Smart Cities Applications and Requirements, White Paper. Net Works European Technology Platform [https://grow.tecnico.ulisboa.pt/wp-content/uploads/2014/03/White\\_Paper\\_Smart\\_Cities\\_Applications.pdf](https://grow.tecnico.ulisboa.pt/wp-content/uploads/2014/03/White_Paper_Smart_Cities_Applications.pdf)
- De Reuver, M., Sørensen, C., & Basole, R. C. (2018). The digital platform: a research agenda. *Journal of Information Technology*, 33(2), 124-135. <https://journals.sagepub.com/doi/pdf/10.1057/s41265-016-0033-3>
- Di Martino, B., Marino, A., Rak, M., Pariso, P. (2020). Optimization and Validation of eGovernment Business Processes with Support of Semantic Techniques. In: Barolli, L., Hussain, F., Ikeda, M. (eds) *Complex, Intelligent, and Software Intensive Systems. CISIS 2019. Advances in Intelligent Systems and Computing*, vol 993. Springer, Cham. [https://doi.org/10.1007/978-3-030-22354-0\\_76](https://doi.org/10.1007/978-3-030-22354-0_76)
- European Commission (2018) [https://ec.europa.eu/information\\_society/newsroom/image/document/2018-20/desi-2018-methodology\\_E886EDCA-B32A-AEFB-07F5911DE975477B\\_52297.pdf](https://ec.europa.eu/information_society/newsroom/image/document/2018-20/desi-2018-methodology_E886EDCA-B32A-AEFB-07F5911DE975477B_52297.pdf) (March 2023)
- Eurostat, 2020 [file:///Users/paoloparisio/Downloads/desi\\_2020\\_methodology\\_22D0C35E-EEEE-4040-476273E94A25F68A\\_67082.pdf](file:///Users/paoloparisio/Downloads/desi_2020_methodology_22D0C35E-EEEE-4040-476273E94A25F68A_67082.pdf)
- Gao, P., Lee, H., Lyytinen, K., & Wang, K. (2014). Special issue on information technology in China. *Journal of Information Technology* 29, 206-207 <https://journals.sagepub.com/doi/pdf/10.1057/jit.2014.14>
- Giffinger, R. Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E. J. (2007) Smart Cities: Ranking of European Medium-Sized Cities. Vienna, Austria: Centre of Regional Science (SRF), Vienna University of Technology. <https://doi.org/10.34726/3565>
- Hall, R.E. (2000). The vision of a smart city. 2nd international Life Extension Technology Workshop. Paris, France. September 28. <https://www.osti.gov/servlets/purl/773961>
- Henfridsson, O., Mathiassen, L., & Svahn, F. (2014). Managing technological change in the digital age: the role of architectural frames. *Journal of Information Technology*, 29(1), 27-43. <https://doi.org/10.1057/jit.2013.30>
- Hislop, D. (2002). Mission impossible? Communicating and sharing knowledge via information technology. *Journal of Information Technology*, 17(3), 165-177. <https://doi.org/10.1057/jit.2013.30>
- Komninos N., Ratti C., & Schaffers H. (2012). Special Issue on Smart Applications for Smart Cities – New Approaches to Innovation: Guest Editors' Introduction. *Journal of Theoretical and Applied Electronic Commerce Research*, 7(3). Universidad de Talca, Chile. <10.4067/S0718-18762012000300005>
- Lacity, M. C., Khan, S., Yan, A., & Willcocks, L. P. (2010). A review of the IT outsourcing empirical literature and future research directions. *Journal of Information Technology*, 25(4), 395-433. <https://doi.org/10.1057/jit.2010>

- Lai, C. S., Jia, Y., Dong, Z., Wang, D., Tao, Y., Lai, Q. H., & Lai, L. L. (2020). A review of technical standards for smart cities. *Clean Technologies*, 2(3), 290-310. <https://doi.org/10.3390/cleantechnol2030019>
- Lau, B. P. L., Marakkalage, S. H., Zhou, Y., Hassan, N. U., Yuen, C., Zhang, M., & Tan, U. X. (2019). A survey of data fusion in smart city applications. *Information Fusion*, 52, 357-374. <https://doi.org/10.1016/j.inffus.2019.05.004>
- Li, L., Gao, P., & Mao, J. Y. (2014). Research on IT in China: a call for greater contextualization. *Journal of Information Technology*, 29(3), 208-222. <https://doi.org/10.1057/jit.2014.15>
- Luftman, J., Zadeh, H. S., Derksen, B., Santana, M., Rigoni, E. H., & Huang, Z. (2013). Key information technology and management issues 2012-2013: an international study. *Journal of Information Technology*, 28(4), 354-366. <https://doi.org/10.1057/jit.2013.22>
- Lyytinen, K. (2019). Commentary on the “Trends in the conduct of information systems research. *Journal of Information Technology*, 34(2), 184-187. <https://doi.org/10.1177/0268396219834137>
- Marino, A., Pariso, P., (2022) The Digital Platform Experience of a Leading Country in Wine Tourism: From COVID-19 to the New Era. *International Journal of Innovation and Technology Management*, 19(7) <https://doi.org/10.1142/S0219877022500213>
- Marino, A., Pariso, P., (2021) Human resource management in public transports: organizational typologies and research actions, *VINE Journal of Information and Knowledge Management Systems*, 53(2) <https://doi.org/10.1108/VJIKMS-01-2021-0006>
- Marino A., (2001) The tourist sector: public versus private—the Italian and Spanish experience. *Tourism Management*, 22(1), 43-48 [https://doi.org/10.1016/S0261-5177\(00\)00023-6](https://doi.org/10.1016/S0261-5177(00)00023-6)
- Marino, A., & Pariso, P. (2022a). The impact of ICT on the tourist economy of a southern Italian region. *International Journal of Services Technology and Management*, 28(1-2), 68-85 <https://doi.org/10.1504/IJSTM.2022.123506>
- Medaglia, R., Eaton, B., Hedman, J., & Whitley, E. A. (2021). Mechanisms of power inscription into IT governance: Lessons from two national digital identity systems. *Information Systems Journal*. <https://doi.org/10.1111/isj.12325>
- Meijer, A., Rodríguez Bolívar, M., P. (2013). Governing the Smart Sustainable City: Scaling-Up the Search for Socio-Techno Synergy. T EGPA 2013 (Edinburgh, September) Permanent Study Group on E-Government. <https://content.iospress.com/articles/information-polity/ip190128>
- Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The internet of things is the backbone. *IEEE Consumer Electronics Magazine*, 5(3), 60-70. <https://doi.org/10.1109/MCE.2016.2556879>
- Niculescu, R., Huth, M., Radanliev, P., & De Roure, D. (2018). Mapping the values of IoT. *Journal of Information Technology*, 33(4), 345-360. <https://journals.sagepub.com/doi/pdf/10.1057/s41265-018-0054-1>
- OCSE (2020) <https://www.oecd.org/regional/regional-statistics/Italy-Regions-and-Cities-2020-it.pdf> (March 2023)
- Øvrelid, E., & Bygstad, B. (2019). The role of discourse in transforming digital infrastructures. *Journal of Information Technology*, 34(3), 221-242. <https://doi.org/10.1177/0268396219831994>
- Pang, M. S., Lee, G., & DeLone, W. H. (2014). IT resources, organizational capabilities, and value creation in public-sector organizations: a public-value management perspective. *Journal of Information Technology*, 29(3), 187-205. <https://doi.org/10.1057/jit.2014.2>
- Pardo, T. A., & Nam, T. (2011). Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. The Proceedings of the 12th Annual International Conference on Digital Government Research. <https://doi.org/10.1145/2037556.2037602>
- Pariso P., & Marino A., (2019) ICT skills development: analyzing effectiveness issues on government actions in Europe ICERI Proceedings, 3285-3288. [10.21125/iceri.2019.0831](https://doi.org/10.21125/iceri.2019.0831)
- Pariso, P., & Marino, A. (2019a). STEM and its impact on national economic development: a case study concerning southern Italy. In ICERI Proceedings, 3281-3284. [10.21125/iceri.2019.0831](https://doi.org/10.21125/iceri.2019.0831)
- Pelizza, A. (2020). Towards a sociomaterial approach to inter-organizational boundaries: How information systems elicit relevant knowledge in government outsourcing. *Journal of Information Technology*, <https://doi.org/10.1177/0268396220934490>

Ruhlandt, R. W. S. (2018). The governance of smart cities: A systematic literature review. *Cities*, 81, 1-23. <https://doi.org/10.1016/j.cities.2018.02.014>

Su K., Li J., & Fu H. (2012). Smart City and the applications, IEEE International Conference on Electronics, Communications and Control (ICECC), pp. 1028-1031, IEEE Xplore. [10.1109/ICECC.2011.6066743](https://doi.org/10.1109/ICECC.2011.6066743)

Tsohou, A., Siponen, M., & Newman, M. (2020). How does information technology-based service degradation influence consumers' use of services? An information technology-based service degradation decision theory. *Journal of Information Technology*, 35(1), 2-24. <https://journals.sagepub.com/doi/pdf/10.1177/0268396219856019>

Tumbas, S., Berente, N., & Brocke, J. V. (2018). Digital innovation and institutional entrepreneurship: Chief Digital Officer perspectives of their emerging role. *Journal of Information Technology*, 33(3), 188-202. <https://doi.org/10.1057/s41265-018-0055-0>

Van Deursen, A. J., & van Dijk, J. A. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society*, 21(2), 354-375. <https://journals.sagepub.com/doi/pdf/10.1177/1461444818797082>

Veiga, J. F., Floyd, S., & Dechant, K. (2001). Towards modelling the effects of national culture on IT implementation and acceptance. *Journal of Information Technology*, 16(3), 145-158. <https://doi.org/10.1080/02683960110063654>

Wiener, M., Saunders, C., & Marabelli, M. (2020). Big-data business models: A critical literature review and multi perspective research framework. *Journal of Information Technology*, 35(1), 66-91. <https://journals.sagepub.com/doi/pdf/10.1177/0268396219896811>

Willcocks, L. (2020). Robo-Apocalypse cancelled? Reframing the automation and future of work debate. *Journal of Information Technology*, 35(4), 286-302. <https://journals.sagepub.com/doi/pdf/10.1177/0268396220925830>

World Urban Area (2020) <http://www.demographia.com/db-worldua.pdf> (March 2023)

Wu, Y. J., & Chen, J. C. (2021). A structured method for smart city project selection. *International Journal of Information Management*, 56, 101981. <https://doi.org/10.1016/j.ijinfomgt.2019.07.007>

**Funding:** As part of the Research Program V:ALERE – Università della Campania Luigi Vanvitelli, Italy. We declare that, the work has not been published previously, that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. The authors contributed equally; all of them agreed on the final version of the manuscript.

**Alfonso MARINO**, professor circular economy, (Università della Campania – Luigi Vanvitelli, Italy) degree in business economics with specific competencies in sustainability and circular economy.

ORCID ID: <https://orcid.org/0000-0003-1722-0539>

**Paolo PARISO**, PhD in business economics, (Università della Campania – Luigi Vanvitelli, Italy) degree in business economics, with specific competences in SMEs.

ORCID ID: <https://orcid.org/0000-0003-1066-4102>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810



Publisher

<http://jssidoi.org/esc/home>



---

**\*DEVELOPMENT OF TRANSPORT INFRASTRUCTURE AND ITS IMPACT ON TERRITORIAL PRODUCTION<sup>†</sup>**

**Vera Komarova <sup>1\*</sup>, Edmunds Čižo <sup>2</sup>, Janis Balodis <sup>3</sup>, Anita Kokarevica <sup>4</sup>, Oksana Ruza <sup>5</sup>, Janis Kudins <sup>6</sup>**

<sup>1,2,3,5,6</sup> *Daugavpils University, Vienibas street 13, Daugavpils, Latvia*

<sup>4</sup> *Riga Stradinsh University, Dzirciema street 16, Riga, Latvia*

*E-mails: <sup>1\*</sup>[vera.komarova@du.lv](mailto:vera.komarova@du.lv) (Corresponding author); <sup>2</sup>[edmunds.cizo@du.lv](mailto:edmunds.cizo@du.lv); <sup>3</sup>[janisbalodis100@gmail.com](mailto:janisbalodis100@gmail.com); <sup>4</sup>[anita.kokarevica@rsu.lv](mailto:anita.kokarevica@rsu.lv); <sup>5</sup>[oksana.ruza@du.lv](mailto:oksana.ruza@du.lv)*

*Received 14 February 2023; accepted 14 June 2023; published 30 June 2023*

**Abstract.** The purpose of this article is the conceptualization and empirical interpretation of the notions of a developed transport infrastructure and developed production, as well as the identification of tools for their measurement in a territory. The main research questions to which the authors intend to find answers in this article are the following: (1) what does it mean (conceptually and empirically) ‘developed transport infrastructure’ and ‘developed production’ in a given territory? (2) how to measure the state of development (i.e., the static level of development) of transport infrastructure and production in a given territory? The article uses the following research methods: a systemic analysis of theoretical findings and empirical evidence from previous studies, a method of means for identifying developed / underdeveloped transport infrastructure/production, and a mapping method to assess the strengths and weaknesses of the country’s transport infrastructure. The results of this study show that, firstly, there are two main approaches to the conceptual understanding of transport infrastructure and production – traditional (narrower) and innovative (wider); secondly, developed transport infrastructure and developed products in the EU country are interpreted empirically with scores above the EU average, thirdly, almost all EU countries demonstrate a developed or undeveloped transport infrastructure and production, regardless of their measurement tools, i.e. different measurement tools show nearly the same result. The results of this study will help the authors in the future, based on quantitative empirical data and case studies, to answer the ‘umbrella’ research question about what is a priority for the economic development of the territory: a developed transport infrastructure or a developed production, i.e. what is the focus for investments in the conditions of objectively limited resources?

**Keywords:** transport infrastructure; territorial production; developed transport infrastructure; developed production.

**Reference** to this paper should be made as follows: Komarova, V., Čižo, E., Balodis, J., Kokarevica, A., Ruza, O., Kudins, J. 2023. Development of transport infrastructure and its impact on territorial production. *Entrepreneurship and Sustainability Issues*, 10(4), 338-356. [http://doi.org/10.9770/jesi.2023.10.4\(21\)](http://doi.org/10.9770/jesi.2023.10.4(21))

**JEL Classifications:** C43, L91, O52

---

<sup>\*</sup> *This research was funded by Daugavpils University, Latvia*

## 1. Introduction

The development of transport infrastructure, as well as the development of production in a territory, has been the subject of many economic studies. In particular, the development of transport infrastructure in the region is studied by economists specializing in transport economics (Melo et al., 2013; Boruch, 2014; Skorobogatova & Kuzmina-Merlino, 2017; Gherghina et al., 2018; Ferrari et al., 2019a, 2019b; Zhang & Qi, 2021). They distinguish several types of transport infrastructure in the territory – road, inland waterways, maritime, railway and air transport infrastructure, each of which may have a different significance for the economic development of a particular territory. In turn, the study of the development of production in the region is one of the main tasks of economists specializing in industrial economics (Garofoli, 1993; Kamols et al., 2014; Yong, 2021) and an additional 'background' task for economists working in the field of the post-industrial economics (Dwight Hines, 2011; Aamir et al., 2019; Orynassarova et al., 2019; Petrenko et al., 2019; Bole et al., 2022). And here, economists also distinguish different types of production – agricultural, industrial, and post-industrial, for each of which the transport infrastructure has a different meaning.

As for the relationship between the development of transport infrastructure and the development of production in a given territory, there are many studies devoted to the impact of transport infrastructure on long-term development / growth (Gherghina et al., 2018; Wang et al., 2018; Cigu et al., 2018; Prus & Sikora, 2021) or territory competitiveness (Purwanto et al., 2017). Most of the above studies show that transport infrastructure has an enormous impact on the sustainable development of the territory, especially in the urban part (Aamir et al., 2019), but not just on the development of production. Concerning investments in transport infrastructure, the results of empirical studies exhibit a positive impact on territory's economic growth for every type of transport, except inland waterways (Gherghina et al., 2018). The book “Economic Role of Transport Infrastructure: Theory and Models” (2019) analyzes transport infrastructure’s impact on economic growth using theoretical frameworks, including exogenous growth models, endogenous growth models, and new economic geography models (Ferrari et al., 2019a). However, the general scientific interest of the authors of this study is limited to the relationship between the state of development of transport infrastructure and the state of development of production (but not regional development or economic growth) in a territory.

The purpose of this article is the conceptualization and empirical interpretation of the notions of a developed transport infrastructure and developed production, as well as the identification of tools for their measurement in a territory. The main research questions to which the authors intend to find answers in this article are the following:

- (1) what does it mean (conceptually and empirically) “developed transport infrastructure” and “developed production” in a given territory?
- (2) how to measure the state of development (i.e., the static level of development – Selivanova-Fyodorova et al., 2019) of transport infrastructure and production in a given territory?

Based on the results of the above studies, the authors put forward a hypothesis that the priority for the economic development of the territory in the modern world is precisely the developed transport infrastructure, which, in turn, stimulates the growth of production, and not vice versa. However, the proof of the formulated hypothesis is more evident and unambiguous than it may seem at first glance. For example, the results of some global studies showed that the effect of transport infrastructure on the development of production in the territory is higher in the US than in European countries, it is higher for roads compared to other modes of transport, and it is higher for the primary sector, manufacturing, and construction (Melo et al., 2013). Research results show that the transport infrastructure & production growth nexus is mysterious, particularly in Africa, because many rural farmers need their transport means (Iimi et al., 2018).

Even those studies that prove the positive impact of developed transport infrastructure on the development of production but at the same time consider the environmental component of the industrial output in the territory,

however, indicate that transport infrastructure significantly contributes to industrial pollution emissions (Wang et al., 2022; Mesjasz-Lech & Włodarczyk, 2022). This aspect, according to the authors, to a certain extent devalues the development of territorial production based on the developed transport infrastructure, which is especially important given the fact that in the knowledge economy, the transfer of knowledge and high technology, as well as their successful adoption, assimilation, transformation and exploitation, depend on the absorptive capacity of enterprises (Šimelytė & Tvaronaviciene, 2022), and not on developed transport infrastructure.

For the authors to have the opportunity in their further research to scientifically clarify, prove or refute the hypothesis put forward about the priority of a developed transport infrastructure for the economic development of the territory in the modern world, it is necessary, first of all, to conceptualize and empirically interpret the notions of both a developed transport infrastructure and a developed production, as well as to develop tools for their measurement in the territory. This will be done in the framework of this article, which is a theoretical and methodological study, as a basis for the further empirical study of the direction and nature of the relationship between the developed transport infrastructure and developed production in the territory. The article uses the following research methods: a systemic analysis of theoretical findings and empirical evidence from previous studies, as well as a method of means for identifying developed/underdeveloped transport infrastructure/production and a mapping method to assess the strengths and weaknesses of the country's transport infrastructure.

## **2. Literature review**

The classical location theory emphasized the role of transport costs as a determinant of economic activity location (Weber, 1928; Moses, 1958; Alonso, 1964). The New Economic Geography (NEG) also highlights the role of transport costs as a location factor in imperfect competition and different degrees of interregional labour mobility (Fujita et al., 1999; Fujita & Thisse, 2002). Although, the theoretical basis for proving an 'umbrella' research hypothesis can be the macroeconomic theory of endogenous growth (Ferrari et al., 2019a) with its developed framework in which public infrastructure (including transport infrastructure) can be defined as a source of economic growth through its contribution to technical changes (Aschauer, 1990; Hulten & Schwab, 1991; Munnell, 1992; Garcia-Mila & McGuire, 1992) or smart technological changes, following the concept of intelligent transport (Chen & Silva, 2021), the innovative transportation system (Aamir et al., 2019) or smart transportation infrastructure (Ushakov et al., 2022).

Decision-makers have widely used investments in transport infrastructure to encourage economic growth, particularly during periods of economic downturn. There has been extensive research on the linkage between transport infrastructure and economic performance since the late 1980s, characterized by widely varying evidence (Melo et al., 2013). Following a break in popularity in the 1990s, industrial policy is again capturing attention worldwide as a driver of economic and broader societal goals. This is especially true in lower-income countries, where industrialization is still a crucial driver of economic growth (Yong, 2021), and the industrial past and industrial symbols well represent the present and are a matter of pride and collective identity for the residents (Bole et al., 2022). Although today in these countries, there is a positive trend of the emergence in the first place of the specific gravity and growth rate of engineering services, which generally corresponds to the direction of transition towards the post-industrial economy with its emphasis on services for all the sectors (Orynassarova et al., 2019).

Some other studies also show trends in the shift from landscapes of production to landscapes of consumption, which need another type and quality of transport infrastructure. For example, American researcher Dwight Hines focused on the relevant inter- and intra-class-based dynamics of an ongoing capitalist-Modernity in the contemporary American West as a result of the transition from the prior dominance of a regime of production/consumption of commodities/natural resources to the increasing ascendancy of the

production/consumption of 'experiences' (Dwight Hines, 2011). This process of 'rural gentrification' (Dwight Hines, 2011) facilitates the transition of rural areas from production to consumption landscapes with changing demands on transport infrastructure-

Latvian researchers-transport economists Skorobogatova and Kuzmina-Merlino (2017) state that there is a mutual connection between the quality of transport infrastructure and the country's macroeconomic performance. Developed transport infrastructure gives additional benefits through specific macroeconomic drivers of productivity. Therefore, the analysis of the interaction between transport infrastructure and the economy, as well as the measurement of the effect of this interaction, is a vital issue in the context of the implementation of the Strategic Development Plan Latvia 2030 adopted by the government of Latvia (Skorobogatova & Kuzmina-Merlino, 2017). Thus, transport plays and will continue to play an important economic role. Its role in Central and Eastern Europe has changed in adjusting the economies to the EU structures (Boruch, 2014). The studies of Latvian economists show how the development of the transport infrastructure of Latvia influenced the country's economic growth (Skorobogatova & Kuzmina-Merlino, 2017), mainly how investment in transport infrastructure affects the Latvian economic growth, which is measured by the GDP, as well as trade relations with foreign partners, especially with Poland (Boruch, 2014).

Latvian economists have done a lot to create a conceptual framework for defining the notion of transport infrastructure and developing a methodology for its study. Thus, Skorobogatova and Kuzmina-Merlino and their co-authors highlighted the role of the transportation industry in the economic development of Latvia, analyzed the notion of transport infrastructure as an essential part of the state transport system and estimated the approaches to the measurement of 'the transport infrastructure development performance' used in the global research space (Skorobogatova & Kuzmina-Merlino, 2017; Kotane & Kuzmina-Merlino, 2017; Kuzmina-Merlino et al., 2018). They focused on the necessity for the development of a methodology of measuring 'the transport infrastructure development performance' that should be applied systemically and that would be generally helpful to all responsible people making transportation-related decisions (Skorobogatova & Kuzmina-Merlino, 2017).

In the global scientific literature, there are two approaches to conceptual understanding transport infrastructure and production in a territory – the traditional narrow approach and the innovative broader approach. The following table presents them.

**Table 1.** Approaches to conceptual understanding of transport infrastructure and production in a territory

Approaches to conceptual understanding	Transport infrastructure	Production
Traditional narrow understanding	Infrastructure for air transport, rail transport, road transport, and water transport (as part of the global competitiveness of a territory)	Industrial production, which refers to the output of industrial establishments and covers sectors such as mining, manufacturing, electricity, gas and steam and air-conditioning
Innovative wider understanding	Trade- and transport-related infrastructure: ports, airports, roads, rail, warehousing/transloading and relevant ICT (as part of the logistics performance of a territory)	Gross Domestic Product (GDP) is the overall production in the territory, including IT and financial services, etc.

*Source:* elaborated by the authors based on Boruch, 2014; Grzelakowski, 2014; Skorobogatova & Kuzmina-Merlino, 2017; Jaramillo et al., 2018; Schwab, 2019; Orynbasarova et al., 2019; Komarova et al., 2022.

An analysis of the scientific literature shows that recent studies offer general approaches to conceptualizing transport infrastructure and production in a territory (Table 1). Still, there needs to be a detailed empirical interpretation of developed/underdeveloped transport infrastructure and territorial production, which is necessary to measure the state of development of transport infrastructure and production in a territory. The authors will fill this gap in the next section of the article, which describes the research methodology used in this particular study

for the empirical interpretation of the concepts of developed transport infrastructure and developed production and their measurement in a territory.

### 3. Research methodology

To empirically prove a positive influence of the developed transport infrastructure on the development of production, it is necessary to choose and argue the methodological approach for the empirical interpretation of transport infrastructure and production in general and empirical interpretation and measurement of the state of development of transport infrastructure and production in particular.

In the global analytical literature, different approaches are implemented to empirically interpret transport infrastructure and measure the state of transport infrastructure development (Table 2). The most famous are as follows (Skorobogatova & Kuzmina-Merlino, 2017):

- Measuring the state of development of transport infrastructure based on the calculation of the Global Competitiveness Index (GCI), which the World Economic Forum developed;
- Measuring the state of transport infrastructure development based on evaluating the Logistics Performance Index (LPI), which the World Bank developed.

The Global Competitiveness Index (GCI) measures an economy's competitiveness level, defined as the set of institutions, infrastructure, policies, and factors determining an economy's productivity level (Schwab, 2019). Measurement of the state of transport infrastructure development is one of the parts of the total evaluation of the GCI. In turn, the Logistics Performance Index (LPI) analyses countries' differences in customs procedures, logistics costs and the quality of the trade- and transport-related infrastructure (Jaramillo et al., 2018). One more approach to empirically interpret transport infrastructure and measure the state of its development is based on the Territory Transport Development Index (TTDI) developed by Latvian economists (Komarova et al., 2022).

**Table 2.** Approaches to empirical interpretation of the transport infrastructure in the territory

Within the Global Competitiveness Index (GCI)	Within the Logistics Performance Index (LPI)	Within the Territory Transport Development Index (TTDI)
The 2 <sup>nd</sup> pillar – Infrastructure (0–100) – involves the sub-pillar – Transport infrastructure (0–100) – with the following components: 2.01 Road connectivity 2.02 Quality of road infrastructure 2.03 Railroad density per 1000 km <sup>2</sup> 2.04 Efficiency of train services 2.05 Airport connectivity 2.06 Efficiency of air transport services 2.07 Liner shipping connectivity 2.08 Efficiency of seaport services	The 2 <sup>nd</sup> component – Infrastructure – measures the quality of trade- and transport-related infrastructure, rated from “very low” (1) to “very high” (5)	The 3 <sup>rd</sup> component of the Index is the quality of transport infrastructure (1–7 best) in a territory, including:* - quality of road infrastructure - quality of railroad infrastructure - quality of port infrastructure - quality of air transport infrastructure

\* The authors exclude one element, ‘road connectivity’, from the quality of transport infrastructure of the TTDI (Komarova et al., 2022).  
 Source: elaborated by the authors based on Jaramillo et al. 2018; Schwab, 2019; Komarova et al., 2022.

Based on the above analysis of the global and local research practice, the authors identify the following measurement tools for the development of transport infrastructure in a territory:

- Evaluation of transport infrastructure using the Global Competitiveness Index (GCI), which was developed by the World Economic Forum (Schwab, 2019);
- evaluation of the supply chain service delivery using the Logistics Performance Index (LPI), which was developed by the World Bank (Jaramillo et al., 2018);

- evaluation of the overall quality of transport infrastructure using the Territory Transport Development Index (TTDI) developed by Latvian economists (Komarova et al., 2022).

Cigu et al. (2018) developed one more measurement tool for developing transport infrastructure – the Index of transport infrastructure. However, the authors will not use it within this study due to this Index's extensive set of indicators. According to the authors of this study, some indicators of the Index of transport infrastructure (for example, cars per 1000 inhabitants, air transport of passengers and goods, etc. (Cigu et al., 2018)) cover the development of the transport industry as a whole rather than the development of transport infrastructure.

The approaches to the empirical interpretation of the transport infrastructure and measurement of the state of development of transport infrastructure based on the calculation of the Global Competitiveness Index (GCI), the Logistics Performance Index (LPI) and the Territory Transport Development Index (TTDI), applied at the international level, characterize the overall situation in a particular country and in a specific aspect; it is assessed in the context of globalization and allows tracing changes over time. In the framework of this study, the authors will measure the state of development of transport infrastructure of the EU countries based on the GCI, the LPI and the TTDI and analyze results in a comparative way only within the EU countries. This means that the state of development (developed / underdeveloped) of transport infrastructure will be evaluated relative to the mean state of development of transport infrastructure of the EU countries. For example, suppose country A has an underdeveloped transport infrastructure. In that case, this is true within the EU, in relation to other EU countries, but not concerning other countries (for example, African countries).

As for the state of development of production in a territory, the following main approaches to its conceptual understanding are in the global economic space (Table 1):

- Traditional narrow understanding: industrial production, which refers to the output of industrial establishments and covers sectors such as mining, manufacturing, electricity, gas and steam and air-conditioning (Boruch, 2014; Grzelakowski, 2014);
- innovative wider understanding: the Gross Domestic Product (GDP) as the overall production in the territory, including IT and financial services, etc. (Skorobogatova & Kuzmina-Merlino, 2017; Orynbassarova et al., 2019).

Thus, the measurement tools/techniques for the development of production are as follows: (1) evaluation of production based on the calculation of industrial output, using the indicator of real output in the manufacturing, mining, electric, and gas industries (NationMaster.com, 2023); (2) evaluation of production based on broader approach and calculation of total output of the territorial economy, using the Gross Domestic Product (GDP) (Schwab, 2019).

The final methodological question to be answered in this study is the following: what does 'developed' mean in relation to transport infrastructure and production? When can we say a country's transport infrastructure/production is developed or undeveloped? This study will use a simple method of means, i.e. the transport infrastructure/production in a country will be considered developed (within the EU) if its state of development is above the EU mean, and vice versa, the transport infrastructure/production in a country will be considered underdeveloped (within the EU) if its state of development is below the average across EU countries. To obtain more stable results, the authors will test all five of the above tools for measuring the development of transport infrastructure/production in a territory.

4. Results and discussion

Table 3 presents the results of measuring transport infrastructure development in the EU countries based on the sub-pillar of transport infrastructure, including the 2<sup>nd</sup> pillar 'Infrastructure' of the Global Competitiveness Index (GCI).

**Table 3.** Measurement of the state of development of transport infrastructure in a territory, the Global Competitiveness Index (GCI), n = 27\* EU countries, scores, \*\* 2019

EU countries	Components of the transport infrastructure, included in the 2 <sup>nd</sup> pillar, 'Infrastructure' of the GCI								Common transport infrastructure
	2.01***	2.02	2.03	2.04	2.05	2.06	2.07	2.08	
Austria	81.9	83.5	100.0	71.1	65.3	70.7	-	44.3	78.7
Belgium	90.9	56.4	100.0	51.5	62.0	76.7	91.1	76.0	75.6
Bulgaria	76.6	40.2	92.8	35.1	49.0	57.5	6.8	55.4	51.7
Croatia	78.6	76.7	100.0	23.9	55.2	62.6	38.4	61.0	62.1
Cyprus	68.7	67.7	No railroad		50.9	68.7	19.5	55.0	55.1
Czechia	92.2	48.5	100.0	58.3	56.5	67.5	-	36.6	70.5
Denmark	86.6	76.2	100.0	59.1	66.3	79.4	58.5	79.4	75.7
Estonia	87.0	61.4	59.4	60.9	33.3	60.0	7.2	76.1	55.7
Finland	91.6	71.0	48.7	75.6	59.4	88.3	13.4	89.5	67.2
France	96.6	73.9	100.0	65.9	95.8	74.9	84.0	69.4	82.6
Germany	95.1	71.7	100.0	65.3	100.0	74.5	97.1	70.6	84.3
Greece	75.8	60.7	43.4	33.5	77.2	72.6	59.4	62.5	60.6
Hungary	86.2	50.3	100.0	47.4	52.5	59.7	-	35.9	66.0
Ireland	88.4	56.7	68.5	49.3	68.1	74.7	10.7	66.7	60.4
Italy	85.9	56.8	100.0	52.0	97.1	65.4	67.2	61.1	73.2
Latvia	89.2	43.0	74.8	60.3	40.1	77.5	8.1	65.3	57.3
Lithuania	89.9	62.8	76.3	59.6	36.1	64.9	21.0	63.1	59.2
Luxembourg	71.3	75.6	100.0	66.4	37.8	77.0	-	57.2	71.4
Netherlands	89.0	90.5	100.0	78.5	77.0	89.9	98.0	90.8	89.2
Poland	88.0	55.2	100.0	48.4	64.7	63.9	63.1	58.8	67.8
Portugal	94.2	83.2	69.5	54.0	72.0	67.2	65.1	64.6	71.2
Romania	79.3	32.6	100.0	30.3	54.5	59.7	29.8	49.1	54.4
Slovakia	83.5	49.8	100.0	50.1	27.5	46.3	-	35.6	59.5
Slovenia	74.3	65.8	100.0	35.5	30.4	59.3	39.3	61.6	58.3
Spain	100.0	78.4	77.9	72.9	100.0	76.9	90.1	73.0	83.6
Sweden	95.9	71.9	59.4	49.3	66.9	78.6	59.7	71.3	69.1
United Kingdom	91.3	64.4	100.0	55.2	100.0	72.2	95.6	69.2	81.0
Mean	86.2	63.9	87.3	54.2	62.8	69.9	51.1	62.9	68.2

\* In 2019, the United Kingdom was the EU member state; Malta is not included due to its small territory.

\*\* Scores are on a 0 to 100 scale, where 100 represents the optimal situation or 'frontier'.

\*\*\* Components of the transport infrastructure, included in the 2<sup>nd</sup> pillar 'Infrastructure' of the GCI:

2.01 Road connectivity

2.02 Quality of road infrastructure

2.03 Railroad density

2.04 Efficiency of train services

2.05 Airport connectivity

2.06 Efficiency of air transport services

2.07 Liner shipping connectivity

2.08 Efficiency of seaport services

Source: compiled by the authors based on Schwab, 2019.

As noted above, within the research methodology, the EU countries with developed transport infrastructure scored above the mean, and the EU countries with underdeveloped transport infrastructure – scored below the mean. According to the GCI, the following table classifies the EU countries with developed and underdeveloped transport infrastructure. Also, it identifies those components of the transport infrastructure which are developed, intermediate or underdeveloped in each particular country of the EU.

**Table 4.** EU countries with developed and underdeveloped transport infrastructure according to the Global Competitiveness Index (GCI), n = 27 EU countries, 2019

Type of transport infrastructure in the territory	Road transport infrastructure (2.01 + 2.02)	Rail transport infrastructure (2.03 + 2.04)	Air transport infrastructure (2.05 + 2.06)	Sea transport infrastructure (2.07 + 2.08)	Common transport infrastructure
Developed transport infrastructure (above the mean)	Denmark, Finland, France, Germany, Netherlands, Portugal, Spain, Sweden, United Kingdom	Austria, Czechia, Denmark, France, Germany, Luxembourg, Netherlands	Austria, Denmark, France, Germany, Greece, Ireland, Netherlands, Spain, Sweden, United Kingdom	Belgium, Denmark, France, Germany, Netherlands, Portugal, Spain, Sweden, United Kingdom	Austria, Belgium, Czechia, Denmark, France, Germany, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom
Intermediate, i.e. one of the two indicators is above the mean; the other is below the mean	Austria, Belgium, Croatia, Cyprus, Czechia, Estonia, Ireland, Latvia, Lithuania, Luxembourg, Slovenia	Belgium, Bulgaria, Croatia, Estonia, Finland, Hungary, Italy, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, Spain, United Kingdom	Belgium, Finland, Italy, Latvia, Luxembourg, Poland, Portugal	Estonia, Finland, Greece, Ireland, Italy, Latvia, Lithuania, Poland	-
Underdeveloped transport infrastructure (below the mean)	Bulgaria, Greece, Hungary, Italy, Poland, Romania, Slovakia	Greece, Ireland, Portugal, Sweden	Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Lithuania, Romania, Slovakia, Slovenia	Austria, Bulgaria, Croatia, Cyprus, Czechia, Hungary, Luxembourg, Romania, Slovakia, Slovenia	Bulgaria, Croatia, Cyprus, Estonia, Finland, Greece, Hungary, Ireland, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia

Source: compiled by the authors based on the data from Table 3.

As Table 4 shows, the transport infrastructure of the 14 EU countries can be considered underdeveloped – generally, these are the countries of Central, Eastern and Southern Europe, including Latvia. However, Finland and Ireland, the countries of Northern and Western Europe, are also included in the list of countries with underdeveloped transport infrastructure – Finland due to relatively low (below the mean in the EU) railroad density, poor airport connectivity, and liner shipping connectivity (Table 3), Ireland due to relatively low quality of road infrastructure, low railroad density, low efficiency of train services and poor liner shipping connectivity (Table 3).

The following table presents a full mapping of the state of development of the transport infrastructure of Latvia (as an example) according to all components of the sub-pillar of transport infrastructure, including in the 2<sup>nd</sup> pillar, 'Infrastructure' of the GCI.

**Table 5.** Mapping of the state of development of transport infrastructure of Latvia according to the Global Competitiveness Index (GCI), 2019

Strengths (above the mean)	Weaknesses (below the mean)
2.01 Road connectivity	2.02 Quality of road infrastructure
2.04 Efficiency of train services	2.03 Railroad density
2.06 Efficiency of air transport services	2.05 Airport connectivity
2.08 Efficiency of seaport services	2.07 Liner shipping connectivity
State of development of transport infrastructure	
Road transport infrastructure (2.01 + 2.02)	Intermediate, i.e. one of the two indicators is above the mean; the other is below the mean
Rail transport infrastructure (2.03 + 2.04)	Intermediate
Air transport infrastructure (2.05 + 2.06)	Intermediate
Sea transport infrastructure (2.07 + 2.08)	Intermediate
Common transport infrastructure	Underdeveloped, i.e. below the mean

Source: compiled by the authors based on the data from Tables 3 and 4.

As Table 5 shows, Latvia occupies the intermediate position in all components of the sub-pillar of transport infrastructure, including the 2<sup>nd</sup> pillar, 'Infrastructure' of the GCI. This means that one of the two indicators of each component is above the mean, and the other is below the mean. For example, Latvia is developed in terms of road connectivity but underdeveloped in terms of the quality of road infrastructure; it is underdeveloped in terms of railroad density but set in terms of the efficiency of train services, etc. (Tables 3 and 4). This mapping method allows us to assess the strengths and weaknesses of the country's transport infrastructure. Latvia's transport infrastructure is generally considered underdeveloped, as its overall development is below the EU average.

Table 6 presents the results of measuring transport infrastructure development in the EU countries based on evaluating the quality of trade- and transport-related infrastructure covered by the 2<sup>nd</sup> component 'Infrastructure' of the Logistics Performance Index (LPI).

**Table 6.** Measurement of the state of development of transport infrastructure in a territory, the Logistics Performance Index (LPI), n = 27 EU countries, scores, \* 2019

EU countries	Quality of trade- and transport-related infrastructure covered by the 2 <sup>nd</sup> component, 'Infrastructure' of the LPI	Developed transport infrastructure (above the mean)	Underdeveloped transport infrastructure (below the mean)
Austria	4.18	Austria	-
Belgium	3.98	Belgium	-
Bulgaria	2.76	-	Bulgaria
Croatia	3.01	-	Croatia
Cyprus	2.89	-	Cyprus
Czechia	3.46	-	Czechia
Denmark	3.96	Denmark	-
Estonia	3.10	-	Estonia
Finland	4.00	Finland	-
France	4.00	France	-
Germany	4.37	Germany	-
Greece	3.17	-	Greece
Hungary	3.27	-	Hungary
Ireland	3.29	-	Ireland
Italy	3.85	Italy	-
Latvia	2.98	-	Latvia
Lithuania	2.73	-	Lithuania
Luxembourg	3.63	Luxembourg	-
Netherlands	4.21	Netherlands	-

Poland	3.21	-	Poland
Portugal	3.25	-	Portugal
Romania	2.91	-	Romania
Slovakia	3.00	-	Slovakia
Slovenia	3.26	-	Slovenia
Spain	3.84	Spain	-
Sweden	4.24	Sweden	-
United Kingdom	4.03	United Kingdom	-
Mean	3.50	-	-

\* Rated from “very low” (1) to “very high” (5).

Source: compiled by the authors based on Jaramillo et al., 2018.

As Table 6 shows, LPI scores of the quality of trade- and transport-related infrastructure are also relatively low in Central, Eastern and Southern Europe countries, which generally have underdeveloped transport infrastructure compared to the countries of Northern and Western Europe. The following table presents the results of measuring the state of transport infrastructure development in the EU countries based on evaluating transport infrastructure quality using the components included in the Territory Transport Development Index (TTDI).

**Table 7.** Measurement of the state of development of transport infrastructure in a territory, the Territory Transport Development Index (TTDI), n = 27 EU countries, scores,\* 2019

EU countries	Components of the quality of transport infrastructure				Overall quality of transport infrastructure**
	Quality of road infrastructure	Quality of railroad infrastructure	Quality of port infrastructure	Quality of air transport infrastructure	
Austria	6.0	5.3	3.7	5.2	5.1
Belgium	4.4	4.1	5.6	5.6	4.9
Bulgaria	3.4	3.1	4.3	4.5	3.8
Croatia	5.6	2.4	4.7	4.8	4.4
Cyprus	5.1	No railroad	4.3	5.1	4.8
Czechia	3.9	4.5	3.2	5.0	4.2
Denmark	5.6	4.5	5.8	5.8	5.4
Estonia	4.7	3.1	5.6	4.6	4.5
Finland	5.4	5.0	5.2	5.5	5.3
France	5.3	5.5	6.4	6.3	5.9
Germany	5.3	4.9	5.2	5.5	5.2
Greece	4.6	3.0	4.8	5.4	4.5
Hungary	4.0	3.8	3.2	4.6	3.9
Ireland	4.4	4.0	5.0	5.5	4.7
Italy	4.4	4.1	4.7	4.9	4.5
Latvia	3.6	4.6	4.9	5.7	4.7
Lithuania	4.8	4.6	4.8	4.9	4.8
Luxembourg	5.5	5.0	4.4	5.6	5.1
Netherlands	6.4	5.7	6.4	6.4	6.2
Poland	4.3	3.9	4.5	4.8	4.4
Portugal	6.0	4.2	4.9	5.0	5.0
Romania	3.0	2.8	3.9	4.6	3.6
Slovakia	4.0	4.0	3.1	3.8	3.7
Slovenia	4.9	3.1	4.7	4.6	4.3
Spain	5.7	5.4	5.4	5.6	5.5
Sweden	5.3	4.0	5.3	5.7	5.1
United Kingdom	4.9	4.3	5.2	5.3	4.9
Mean	4.8	4.2	4.8	5.2	4.8

\* Scores are on a 1 to 7 scale, where 7 represents the optimal situation or ‘frontier’.

\*\* The arithmetic mean of the components’ values of the quality of transport infrastructure in a territory.

Source: calculated and compiled by the authors based on Komarova et al., 2022.

Table 7 shows the scores of the EU countries for the components of the quality of transport infrastructure in a territory covered by the TTDI: (1) quality of road infrastructure; (2) quality of railroad infrastructure; (3) quality of port infrastructure; (4) quality of air transport infrastructure. According to the research methodology, the EU countries with developed transport infrastructure scored above the mean, and the EU countries with underdeveloped transport infrastructure – scored below the mean.

The following table classifies the EU countries with developed and underdeveloped transport infrastructure according to the TTDI. Also, it identifies those components of the quality of transport infrastructure which are developed or underdeveloped in each particular country of the EU.

**Table 8.** EU countries with developed and underdeveloped transport infrastructure according to the Territory Transport Development Index (TTDI), n = 27 EU countries, 2019

Type of transport infrastructure	Quality of road infrastructure	Quality of railroad infrastructure	Quality of port infrastructure	Quality of air transport infrastructure	Overall quality of transport infrastructure
Developed transport infrastructure (above the mean)	Austria, Croatia, Cyprus, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Portugal, Slovenia, Spain, Sweden, United Kingdom	Austria, Czechia, Denmark, Finland, France, Germany, Latvia, Lithuania, Luxembourg, Netherlands, Portugal, Spain, United Kingdom	Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Latvia, Lithuania, Netherlands, Portugal, Spain, Sweden, United Kingdom	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Latvia, Luxembourg, Netherlands, Spain, Sweden, United Kingdom	Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Lithuania, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom
Underdeveloped transport infrastructure (below the mean)	Belgium, Bulgaria, Czechia, Estonia, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Poland, Romania, Slovakia	Belgium, Bulgaria, Croatia, Estonia, Greece, Hungary, Ireland, Italy, Poland, Romania, Slovakia, Slovenia, Sweden	Austria, Bulgaria, Croatia, Cyprus, Czechia, Hungary, Italy, Luxembourg, Poland, Romania, Slovakia, Slovenia	Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Italy, Lithuania, Poland, Portugal, Romania, Slovakia, Slovenia	Bulgaria, Croatia, Czechia, Estonia, Greece, Hungary, Ireland, Italy, Latvia, Poland, Romania, Slovakia, Slovenia

Source: compiled by the authors based on the data from Table 7.

As Table 8 shows, the transport infrastructure of the 13 EU countries can be considered underdeveloped according to its quality. As with the case with the GCI, these are preferably the countries of Central, Eastern and Southern Europe countries, including Latvia. However, Finland's transport infrastructure measured by the TTDI (and the LPI (Table 6), as opposed to the GCI) is considered as developed. As for Ireland, this remains the only country in Western Europe, which is included in the list of countries with underdeveloped transport infrastructure (also according to the LPI (Table 6)) due to the relatively low quality of road and railroad infrastructure (Table 8).

The following table presents a complete mapping of the state of development of the transport infrastructure of Latvia (as an example) according to all components of the quality of transport infrastructure covered by the TTDI.

**Table 9.** Mapping of the state of development of transport infrastructure of Latvia according to the Territory Transport Development Index (TTDI), 2019

Strengths (above the mean)	Weaknesses (below the mean)
Quality of railroad infrastructure	Quality of road infrastructure
Quality of port infrastructure	-
Quality of air transport infrastructure	-
State of development of transport infrastructure	
Quality of road infrastructure	Underdeveloped transport infrastructure
Quality of railroad infrastructure	Developed transport infrastructure
Quality of port infrastructure	Developed transport infrastructure
Quality of air transport infrastructure	Developed transport infrastructure
Overall quality of transport infrastructure	Underdeveloped transport infrastructure

Source: compiled by the authors based on the data from Tables 7 and 8.

As Table 9 shows, Latvia generally has an underdeveloped transport infrastructure, and this result was also for the GCI and the LPI. Interestingly, this result is due only to the shallow quality of the road infrastructure – 3.6 in Latvia versus 4.8 on average in the EU (Table 7). However, all other types of transport infrastructure in Latvia are considered developed.

Thus, the results of the assessment of transport infrastructure in the EU countries are generally similar when using three different measurement tools – the GCI, the LPI and the TTDI. For example, Latvia has an underdeveloped transport infrastructure in all three indices. The situation is the same for assessments of the state of development of most EU countries' transport infrastructure in a particular country is developed, then in most cases, all three indices indicate this; if underdeveloped, this is also usually indicated by all indexes. As for Latvia, the results obtained differ from those of previous studies, which show that the business environment in Latvian regional towns has a developed multimodal transport network (Latviete, 2010).

The following two tables present the results of measuring the state of development of production in the EU countries based on the calculation of industrial output, using the indicator of real output in the manufacturing, mining, electric, and gas industries (Table 10), as well as based on the calculation of total output of the territorial economy, using the GDP (Table 11).

**Table 10.** Measurement of the state of development of territorial production, the industrial output, n = 27 EU countries, USD per capita, 2019

EU countries	Industrial production in the territory, measured by the real output in the manufacturing, mining, electric, and gas industries	Developed production (above the mean)	Underdeveloped production (below the mean)
Austria	10,224.8	Austria	-
Belgium	7,569.7	Belgium	-
Bulgaria	900.3	-	Bulgaria
Croatia	2,198.3	-	Croatia
Cyprus	2,062.9	-	Cyprus
Czechia	4,057.6	-	Czechia
Denmark	9,989.1	Denmark	-
Estonia	2,507.3	-	Estonia
Finland	9,439.6	Finland	-
France	6,307.3	France	-
Germany	9,082.7	Germany	-
Greece	3,754.3	-	Greece
Hungary	2,638.5	-	Hungary
Ireland	15,070.1	Ireland	-
Italy	7,253.0	Italy	-

Latvia	1,347.0	-	Latvia
Lithuania	2,267.5	-	Lithuania
Luxembourg	11,397.9	Luxembourg	-
Netherlands	8,296.0	Netherlands	-
Poland	2,141.9	-	Poland
Portugal	3,690.8	-	Portugal
Romania	1,404.6	-	Romania
Slovakia	2,530.9	-	Slovakia
Slovenia	5,099.6	-	Slovenia
Spain	6,842.2	Spain	-
Sweden	9,760.0	Sweden	-
United Kingdom	8,482.7	United Kingdom	-
Mean	5,789.5	-	-

Source: compiled by the authors based on NationMaster.com, 2023.

**Table 11.** Measurement of the state of development of territorial production, the Gross Domestic Product (GDP), n = 27 EU countries, USD per capita, 2019

EU countries	Overall production in the territory, including IT and financial services, etc., measured by the GDP per capita	Developed production (above the mean)	Underdeveloped production (below the mean)
Austria	51,509.0	Austria	-
Belgium	46,724.3	Belgium	-
Bulgaria	9,267.4	-	Bulgaria
Croatia	14,815.9	-	Croatia
Cyprus	28,339.9	-	Cyprus
Czechia	22,850.3	-	Czechia
Denmark	60,692.4	Denmark	-
Estonia	22,989.9	-	Estonia
Finland	49,845.0	Finland	-
France	42,877.6	France	-
Germany	48,264.0	Germany	-
Greece	20,407.9	-	Greece
Hungary	15,923.8	-	Hungary
Ireland	76,098.6	Ireland	-
Italy	34,260.3	-	Italy
Latvia	18,032.0	-	Latvia
Lithuania	19,143.4	-	Lithuania
Luxembourg	114,234.2	Luxembourg	-
Netherlands	53,106.4	Netherlands	-
Poland	15,430.9	-	Poland
Portugal	23,186.3	-	Portugal
Romania	12,285.2	-	Romania
Slovakia	19,581.6	-	Slovakia
Slovenia	26,234.3	-	Slovenia
Spain	30,697.3	-	Spain
Sweden	53,873.4	Sweden	-
United Kingdom	42,558.0	United Kingdom	-
Mean	36,045.5	-	-

Source: compiled by the authors based on Schwab, 2019.

The following table compares the estimates of the state of development of production based on the two measurement tools: the industrial output (Table 10) and the GDP (Table 11).

**Table 12.** Comparison of the state of development of production in a territory, the industrial output and the Gross Domestic Product (GDP), n = 27 EU countries, USD per capita, 2019

State of development of production in a territory	Measured by the industrial output per capita	Measured by the GDP per capita
Developed production (above the mean)	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden, United Kingdom	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, Netherlands, Sweden, United Kingdom
Underdeveloped production (below the mean)	Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia, Slovenia	Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia, Slovenia, Spain

*Source:* compiled by the authors based on Tables 10 and 11 data.

Table 12 shows that the only difference between the set of the EU countries with developed and underdeveloped production measured by the industrial output per capita and by the GDP per capita is Italy and Spain, which are considered to have a developed production measured by the industrial output and underdeveloped production measured by the GDP. All other EU countries have developed or underdeveloped production, regardless of the measurement tool (Tables 10 and 11), and this situation is analogous to measuring the state of development of transport infrastructure.

As for Latvia, it has underdeveloped production in terms of industrial production per capita and GDP per capita (Tables 10 and 11), which is in line with the results of other studies. For example, Voronov concludes that most enterprises in Latvian towns, financed by local capital (usually up to 20,000 euros), cannot switch to high-value-added production, which requires considerable investment (over 100,000 euros) (Voronov, 2022). Therefore, the need for external investors, internal financial savings, and top specialists leads to the preponderance of mid and low-tech enterprises in regional towns. Most such businesses involved in construction, metalworking, woodworking, maintenance and services generate low value added (Voronov, 2022).

The approaches to the empirical interpretation of the transport infrastructure and measurement of the state of development of transport infrastructure based on the calculation of the GCI, the LPI and the TTDI, applied at the international level, cannot be applied within a country for measuring the productivity effects of transport infrastructure activity and for measuring the return on transport infrastructure investments. This is the main limitation of the research findings within this article. As mentioned in the Introduction to this article, in scientific space and Latvia, attempts are being made to solve this methodological weakness.

For example, the analysis of the spatial determinants of productivity in the regions of Great Britain introduced by Rice and Venables (Rice & Venables, 2004; Rice et al., 2006) can be mentioned here. They divided regional space into commuting zones (in relation to the cities – centres of the ‘economic mass’), i.e. < 30-minute commuting zone, 30-40 minute commuting zone, 40-50 minute commuting zone, etc. In their research, they found that a robust and quantitatively important determinant of variations in productivity between NUTS3 regions of Great Britain is the proximity of each area to the centre of the ‘economic mass’ – the presence of a large population of working age within 80 minutes or less driving time (Rice & Venables, 2004; Rice et al., 2006). Thus, the concept of reachability of the territory – the time required to achieve the goal of relocation ‘from door to door’, using various types of relocation, including transport – was used for measuring the state of development of transport infrastructure in the mezo- and micro-territorial level. In Latvia, territorial reachability was used for measuring the state of development of transport infrastructure at the level of counties. To assess territorial

reachability, Latvian researchers Niedole and Averyanov used the graphic-analytical method based on isochronograms (Niedole & Averyanov, 2011).

## 5. Conclusions

In global scientific practice, there are two approaches to conceptual understanding transport infrastructure and production in a territory – the traditional narrow approach and the innovative broader approach. According to the first one, transport infrastructure is understood traditionally as the infrastructure for air transport, rail transport, road transport, water and inland transport (as part of the global competitiveness of a territory), but the production – as an industrial production, which refers to the output of industrial establishments and covers sectors such as mining, manufacturing, electricity, gas and steam and air-conditioning. In turn, the innovative approach refers to the trade- and transport-related infrastructure: ports, airports, roads, rail, warehousing / translating and relevant ICT (as part of the logistics performance of a territory). As for production, this broader approach refers to the Gross Domestic Product (GDP) as the overall production in the territory, including IT and financial services, etc.

The assessment results of the state of transport infrastructure development in the EU countries are generally similar when using three different measurement tools – the GCI, the LPI and the TTDI. For example, Latvia has an underdeveloped transport infrastructure in all three indices. The situation is the same for assessments of the state of development of most EU countries' transport infrastructure in a particular country is developed, then in most cases, all three indices indicate this; if underdeveloped, this is also usually indicated by all indexes used. As for the state of development of production, the only difference between the set of the EU countries with developed and underdeveloped production measured by the industrial output per capita and by the GDP per capita in Italy and Spain, which are considered to have a developed production measured by the industrial output and underdeveloped production measured by the GDP. All other EU countries have developed or underdeveloped production, regardless of the measurement tool. For example, Latvia has underdeveloped production both in terms of industrial output and the GDP.

Thus, the results of this study show that, firstly, there are two main approaches to the conceptual understanding of transport infrastructure and production – traditional (narrower) and innovative (wider); secondly, developed transport infrastructure and developed products in the EU country are interpreted empirically with scores above the EU average, thirdly, almost all EU countries demonstrate a developed or underdeveloped transport infrastructure and production, regardless of their measurement tools, i.e. different measurement tools show nearly the same result. Based on the analysis of previous studies, the authors put forward a hypothesis that the priority for the economic development of the territory in the modern world is precisely the developed transport infrastructure, which, in turn, stimulates the growth of production, and not vice versa. However, this hypothesis cannot yet be tested using the data obtained in the present study.

The novelty of the obtained results lies in the empirical interpretation of the notions of transport infrastructure and production in a territory within the traditional and innovative approaches to conceptual understanding of transport infrastructure and production offered in the scientific literature. The authors' empirical interpretation of the transport infrastructure and territorial production is more relevant concerning the above notions than previous attempts (for example, such as the Index of transport infrastructure (Cigu et al., 2018)), and can be used by other researchers. Furthermore, the existing measurement tools are tested and compared. The results of this study, based on the use of various tools for measuring the state of development of transport infrastructure and production in the EU countries, can be used to implement policies in the transport and industrial sectors. The results obtained will also help the authors in the future, based on quantitative empirical data and case studies, to answer the 'umbrella' research question about what is a priority for the economic development of a territory: a developed transport infrastructure or a developed production, i.e. what is the priority for investments in the conditions of objectively limited resources? A limitation of this study is the macro-territorial level of analysis (especially regarding

transport infrastructure), which means that transport infrastructure development is empirically interpretable and measurable for countries as a whole rather than for their internal regions. However, attempts are being made to solve this methodological weakness in scientific space and Latvia.

In further research on the development of tools for measuring the state of development of transport infrastructure and production in a territory, it is necessary to pay attention to the internal regions of countries to identify the direction and nature of the relationship between the developed transport infrastructure and developed production in a territory at the mezzo-level. This is easier to implement in relation to output than transport infrastructure since tools for measuring the state of development of production in a territory, the industrial output and the GDP per capita are usually available for the countries' internal regions (Boronenko et al., 2014; Dauderstädt, 2021). Another important aspect for future research is that transport infrastructure must be viewed both as a whole and by the types of transport. Moreover, some traditionally industrial territories (countries or regions) in the Eastern and Central Europe faced falling industrial production and transition to the new smart specialization approach, which provides a better understanding of the region's specifics and the highest return on investment in innovation. As a result, some territories become more profitable to focus on applied research and transmit them into practice in relation to existing products and technological processes (Petrenko et al., 2019), but not on industrial production. Consequently, the purpose and type of transport infrastructure in such territories are also changing in a 'smart direction'.

## References

- Aamir, M., Masroor, S., Ali, Z. A., & Ting Ting, B. 2019. Sustainable Framework for Smart Transportation System: a case study of Karachi. *Wireless Transport Communications*, 106(2). <https://doi.org/10.1007/s11277-019-06259-4>
- Alonso, W. 1964. *Location and Land Use*. Massachusetts: Harvard University Press. <https://doi.org/10.4159/harvard.9780674730854>
- Aschauer, D. A. 1990. Highway capacity and economic growth. *Economic Perspectives*, 14, 14-24.
- Bole, D., Kumer, P., Gašperič, P., Kozina, J., Pipan, P., & Tiran, J. 2022. Clash of two identities: what happens to industrial identity in a post-industrial society? *Societies*, 12(2), 49. <https://doi.org/10.3390/soc12020049>
- Boronenko, V., Mensikovs, V., & Lavrinenko, O. 2014. The impact of EU accession on the economic performance of the countries' internal (NUTS 3) regions. *Journal of Economics and Business (Proceedings of Rijeka Faculty of Economics)*, 32(2), 313-341.
- Boruch, A. 2014. Development of transport infrastructure and economic growth of Latvia. *Proceedings of the 53rd International Scientific Conference of Daugavpils University*. Retrieved from [https://dukonference.lv/files/proceedings\\_of\\_conf/53konf/ekonomika/Boruch.pdf](https://dukonference.lv/files/proceedings_of_conf/53konf/ekonomika/Boruch.pdf)
- Chen, Y., & Silva, E. A. 2021. Smart transport: a comparative analysis using the most used indicators in the literature juxtaposed with interventions in English metropolitan areas. *Transportation Research Interdisciplinary Perspectives*, 10, 100371. <https://doi.org/10.1016/j.trip.2021.100371>
- Cigu, E., Agheorghiesei, D. T., Gavriluță, A. F., & Toader, E. 2018. Transport infrastructure development, public performance and long-run economic growth: a case study for the EU-28 countries. *Sustainability*, 11(1). <https://doi.org/10.3390/su11010067>
- Dauderstädt, M. 2021. Cohesive growth in Europe: a tale of two peripheries. *Intereconomics*, 56(2), 120–126. <https://doi.org/10.1007/s10272-021-0964-y>
- Dwight Hines, J. 2011. The post-industrial regime of production/consumption and the rural gentrification of the New West Archipelago. *Antipode*, 44(1), 74-97. <https://doi.org/10.1111/j.1467-8330.2011.00843.x>
- Ferrari, C., Bottasso, A., Conti, M., & Tei, A. 2019a. *Economic Role of Transport Infrastructure: Theory and Models*. Elsevier Inc. <https://doi.org/10.1016/C2016-0-03558-1>

- Ferrari, C., Bottasso, A., Conti, M., & Tei, A. 2019b. The economics of transport infrastructure. *Economic Role of Transport Infrastructure: Theory and Models*, Chapter 2, 5–38. <https://doi.org/10.1016/B978-0-12-813096-4.00002-0>
- Fujita, M. M., Krugman, P., & Venables, A. J. 1999. *The Spatial Economy – Cities, Regions and International Trade*. Cambridge, Massachusetts and London. <https://doi.org/10.7551/mitpress/6389.001.0001>
- Fujita, M. M., Thisse, J. F. 2002. *Economics of Agglomeration – Cities, Industrial Location and Regional Growth*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511805660>
- Garcia-Mila, H. C., McGuire, T. J. 1992. The contribution of publicly provided inputs to states' economies. *Regional Science and Urban Economics*, 22, 229–241. [https://doi.org/10.1016/0166-0462\(92\)90013-Q](https://doi.org/10.1016/0166-0462(92)90013-Q)
- Garofoli, G. 1993. Economic development, organization of production and territory. *Revue d'économie industrielle*, 64, 22–37. <https://doi.org/10.3406/rei.1993.1475>
- Gherghina, Ș. C., Onofrei, M., Vintilă, G., & Armeanu, D. Ș. 2018. Empirical evidence from EU-28 countries on resilient transport infrastructure systems and sustainable economic growth. *Sustainability*, 10(8). <https://doi.org/10.3390/su10082900>
- Hulten, C. R., & Schwab, R. M. 1991. Public capital formation and the growth of regional manufacturing industries. *National Tax Journal*, 44, 121–134. <https://doi.org/10.1086/NTJ41788927>
- Imi, A., You, L., Wood-Sichra, U. 2018. Crop production, transport infrastructure, and agribusiness nexus: evidence from Madagascar. *Policy Research Working Paper No. 8486*. Washington, DC: World Bank. <https://doi.org/10.1596/1813-9450-8486>
- Jaramillo, C. F., Freund, C., Reis, J. G., Arvis, J. F., Wiederer, Ch. K., Ojala, L. M., Shepherd, B. A., Raj, A. U. L., Dairabayeva, K. S., & Kiiski, T. M. M. 2018. *Connecting to Compete 2018: Trade Logistics in the Global Economy – The Logistics Performance Index and its Indicators*. Washington, D.C.: World Bank Group. Retrieved from <http://documents.worldbank.org/curated/en/576061531492034646/Connecting-to-compete-2018-trade-logistics-in-the-global-economy-the-logistics-performance-index-and-its-indicators>
- Kamols, U., Ivanova, S., & Kamola, L. 2014. Industrial development of Latvia and its major cities and towns. *Proceedings of the XII International Scientific Conference “Management and Engineering '14”*, Riga Technical University.
- Komarova, V., Balodis, J., Čižo, E., Kokarevica, A., & Selivanova-Fyodorova, N. 2022. Elaboration of the Territory Transport Development Index for the world countries. *Social Sciences Bulletin*, 35(2), 37-58. [https://doi.org/10.9770/szv.2022.2\(2\)](https://doi.org/10.9770/szv.2022.2(2)) [in Russian]
- Kotane, I., & Kuzmina-Merlino, I. 2017. Analysis of small and medium-sized enterprises' business performance evaluation practice in the transportation and storage services sector in Latvia. *Procedia Engineering*, 178, 182-191. <https://doi.org/10.1016/j.proeng.2017.01.093>
- Kuzmina-Merlino, I., Skorobogatova, O., Schmidtko, N., & Behrendt, F. 2018. The financial and economic aspects of transport infrastructure development in Latvia. *Transport and Telecommunication*, 19(3), 203-212. <https://doi.org/10.2478/ttj-2018-0017>
- Latviete, I. 2010. Assets of the European Union funds on the regional development in Latvia, *Research for Rural Development*, 2, 55–62. Retrieved from [https://llufb.llu.lv/conference/Research-for-Rural-Development/2010/LatviaResearchRuralDevel2010-16th\\_volume2-55-62.pdf](https://llufb.llu.lv/conference/Research-for-Rural-Development/2010/LatviaResearchRuralDevel2010-16th_volume2-55-62.pdf)
- Melo, P. C., Graham, D. J., & Brage-Ardao, R. 2013. The productivity of transport infrastructure investment: a meta-analysis of empirical evidence. *Regional Science and Urban Economics*, 43(5), 695-706. <https://doi.org/10.1016/j.regsciurbeco.2013.05.002>
- Mesjasz-Lech, A., & Włodarczyk, A. 2022. The role of logistics infrastructure in the development of sustainable road transport in Poland. *Research in Transportation Business and Management*, 44(S1), 100841. <https://doi.org/10.1016/j.rtbm.2022.100841>
- Moses, L. N. 1958. Location and the theory of production. *Quarterly Journal of Economics*, 78, 259-272. <https://doi.org/10.2307/1880599>
- Munnell, A. H. 1992. Policy watch: infrastructure investment and economic growth. *Journal of Economic Perspectives*, 6, 189-198. <https://doi.org/10.1257/jep.6.4.189>
- NationMaster.com. 2023. Countries Compared by Industry – Value added – Current US\$ per capita. *International Statistics*. Retrieved from [https://www.nationmaster.com/country-info/stats/Industry/Value-added/Current-US\\$-per-capita](https://www.nationmaster.com/country-info/stats/Industry/Value-added/Current-US$-per-capita)

- Niedole, I. & Averyanov, D. 2011. The significance of the development of transport infrastructure for the use of territorial resources. *Sustainable Spatial Development*, 3, 20-25. Retrieved from <https://ortus.rtu.lv/science/lv/publications/12593> [in Latvian]
- Orynbassarova, Y., Abzalbek, E., Pritvorova, T., & Petrenko, Y. 2019. Regional and product profile of post-industrial services in the economy of Kazakhstan. *Insights into Regional Development*, 1(4), 343-355. [https://doi.org/10.9770/ird.2019.1.4\(5\)](https://doi.org/10.9770/ird.2019.1.4(5))
- Petrenko, Y., Vechkinzova, E., & Antonov, V. 2019. Transition from the industrial clusters to the smart specialization: a case study, *Insights into Regional Development*, 1(2), 118-128. [https://doi.org/10.9770/ird.2019.1.2\(3\)](https://doi.org/10.9770/ird.2019.1.2(3))
- Prus, P., & Sikora, M. 2021. The impact of transport infrastructure on the sustainable development of the region – case study. *Agriculture*, 11, 279. <https://doi.org/10.3390/agriculture11040279>
- Purwanto, A. J., Heyndrickx, Ch., Kiel, J., Betancor, O., Socorro, M. P., Hernandez, A., Eugenio-Martin, J. L., Pawlowska, B., Borkowski, P., & Fiedler, R. 2017. Impact of transport infrastructure on the international competitiveness of Europe. *Transportation Research Procedia*, 25, 2877-2888. <https://doi.org/10.1016/j.trpro.2017.05.273>
- Rice, P., & Venables, A. 2004. Spatial determinants of productivity: analysis for the regions of Great Britain. *CEP Discussion Paper No. 642*. <https://doi.org/10.1016/j.regsciurbeco.2006.03.006>
- Rice, P., Venables, A., & Patacchini, E. 2006. Spatial determinants of productivity: analysis for the regions of Great Britain. *Regional Science and Urban Economics*. <https://doi.org/10.1016/j.regsciurbeco.2006.03.006>
- Selivanova-Fyodorova, N., Komarova, V., Lonska, J., & Mietule, I. 2019. Differentiation of internal regions in the EU countries. *Insights into Regional Development*, 4(1). [https://doi.org/10.9770/ird.2019.1.4\(7\)](https://doi.org/10.9770/ird.2019.1.4(7))
- Skorobogatova, O., & Kuzmina-Merlino, I. 2017. Transport infrastructure development performance. *Procedia Engineering*, 178, 319-329. <https://doi.org/10.1016/j.proeng.2017.01.056>
- Schwab, K. (Ed.) 2019. *The Global Competitiveness Report 2019*. Geneva: World Economic Forum. Retrieved from [https://www3.weforum.org/docs/WEF\\_TheGlobalCompetitivenessReport2019.pdf](https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf)
- Šimelytė, A., & Tvaronaviciene, M. 2022. Technology transfer from Nordic capital parenting companies to Lithuanian and Estonian subsidiaries or joint capital companies: the analysis of the obtained primary data. *Data*, 7(10), 139. <https://doi.org/10.3390/data7100139>
- Ushakov, D., Dudukalov, E., Mironenko, E., & Shatila, Kh. 2022. Big data analytics in smart cities' transportation infrastructure modernization. *Transportation Research Procedia*, 63, 2385-2391. <https://doi.org/10.1016/j.trpro.2022.06.274>
- Voronov, V. V. 2022. Small towns of Latvia: disparities in regional and urban development. *Baltic Region*, 14(4), 39-56. <https://doi.org/10.5922/2079-8555-2022-4-3>
- Wang, L., Xue, X., Zhao, Z., & Wang, Z. 2018. The impacts of transportation infrastructure on sustainable development: emerging trends and challenges. *International Journal of Environmental Research and Public Health*, 15(6), 1172. <https://doi.org/10.3390/ijerph15061172>
- Wang, X., Dong, F., Pan, Y., Liu, Y. 2022. Transport infrastructure, high-quality development and industrial pollution: fresh evidence from China. *International Journal of Environmental Research and Public Health*, 19, 9494. <https://doi.org/10.3390/ijerph19159494>
- Weber, M. 1928. *Theory of the Location of Industries*. Chicago: University of Chicago.
- Yong, L. 2021. Why industrial development matters now more than ever before. *Industrial Analytics Platform*. Retrieved from <https://iap.unido.org/articles/why-industrial-development-matters-now-more-ever>
- Zhang, B.S., & Qi, R.K. 2021. Transportation Infrastructure, Innovation Capability, and Urban Economic Development. *Transformations in Business & Economics*, Vol. 20, No 3C (54C), pp.526-545.

**Funding:** This research was funded by Daugavpils University, Latvia.

**Author Contributions:** V. Komarova – developing the plan and design of the research, theoretical justification of methodological approach to conceptualization, empirical interpretation and measurement of the developed transport infrastructure and developed production in a territory; E. Čižo – literature review, theoretical justification of methodological approach to conceptualization, empirical interpretation and measurement of the developed transport infrastructure and developed production in a territory, collection and preparation of empirical material for quantitative analysis; J. Balodis – development of methodology for the empirical study, selection and justification of research methods, collection and preparation of empirical material for quantitative analysis; A. Kokarevica – literature review, analysis of the obtained data, writing and translation of the text into English; O. Ruza – selection and justification of research methods, analysis of the obtained data, proofreading and technical editing of text, tables and figures, correction of errors and typos; J. Kudins – analysis of the obtained data, proofreading and technical editing of text, tables and figures, correction of errors and typos. All authors have read and agreed to the published version of the manuscript.

**Vera KOMAROVA** is Dr.oec., Mg. transl., the Leading researcher at the Social Investigations Centre of the Institute of Humanities and Social Sciences of Daugavpils University (Latvia). She is the expert of the Latvian Council of Science in the field of economics and entrepreneurship, economic and social geography, sociology and social work, and other social sciences, as well as the external expert of the COST Association. Research interests: regional economics, sustainable development, economic research methodology, quantitative methods.

**ORCID ID:** <https://orcid.org/0000-0002-9829-622X>

**Edmunds ČIŽO** is a Science Doctor (PhD) in Economics and Business, Assistant professor at the Department of Economics of Daugavpils University (Latvia). He is the expert of the Latvian Council of Science in the field of economics and entrepreneurship. Research interests: industrial and regional economics, sustainable economic development, economic research methodology.

**ORCID ID:** <https://orcid.org/0000-0003-0654-2962>

**Janis BALODIS** is a Doctoral student at the Faculty of Social Sciences at Daugavpils University (Latvia). Research interests: regional development, economy of transport, quantitative research methods, data analysis.

**ORCID ID:** <https://orcid.org/0000-0001-5668-8041>

**Anita KOKAREVICA** is a Science Doctor (Ph.D.) in Economics and Business, Assistant professor at the Department of Public Health and Epidemiology of the Faculty of Public Health and Social Welfare of Riga Stradinsh University (Latvia). Research interests: regional economics, sustainable economic development, quantitative research methods.

**ORCID ID:** <https://orcid.org/0000-0001-6173-0910>

**Oksana RUZA** is Dr.oec., Assistant professor, Researcher at the Social Investigations Centre of the Institute of Humanities and Social Sciences of Daugavpils University (Latvia). She is the expert of the Latvian Council of Science in the field of economics and entrepreneurship, sociology and social work. Research interests: regional economics, industrial economics, finances.

**ORCID ID:** <https://orcid.org/0000-0002-6194-3841>

**Janis KUDINS** is a Science Doctor (Ph.D.) in Economics and Business, Assistant professor at the Department of Economics of Daugavpils University (Latvia). Research interests: economic data analysis, sustainable development, production theory.

**ORCID ID:** <https://orcid.org/0000-0002-7028-1835>

To make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810



Publisher

<http://jssidoi.org/esc/home>



---

## THE RISKS OF MISUSING SOCIAL NETWORKS IN THE CONTEXT OF HYBRID THREAT\*

Bohuslava Mihalčová <sup>1</sup>, Antonín Korauš <sup>2</sup>, Stanislav Šišulák <sup>3</sup>, Peter Gallo <sup>4</sup>, Jozef Lukáč <sup>5</sup>

<sup>1,5</sup> Faculty of Business Economy of the University of Economics in Bratislava with seat in Košice, Tajovského 13, 04001 Košice, Slovak Republic

<sup>2,3</sup> Academy of the Police force in Bratislava, Sklabinská 1, 835 17 Bratislava, Slovak Republic

<sup>4</sup> University of Presov, Faculty of Art, St. 17, Novembra č.15 080 01 Prešov, Slovak Republic

E-mails:<sup>1</sup> [bohuslava.mihalcova@euba.sk](mailto:bohuslava.mihalcova@euba.sk); <sup>2</sup> [antonin.koraus@minv.sk](mailto:antonin.koraus@minv.sk); <sup>3</sup> [stanislav.sisulak@akademiazp.sk](mailto:stanislav.sisulak@akademiazp.sk);  
<sup>4</sup> [peter.gallo1@unipo.sk](mailto:peter.gallo1@unipo.sk); <sup>5</sup> [jozef.lukac@euba.sk](mailto:jozef.lukac@euba.sk)

Received 11 February 2023; accepted 14 June 2023; published 30 June 2023

**Abstract.** The world today is ceaselessly under the influence of changing conditions and threats. The contemporary digital age enables the provision of information that serves not only as common information but also as disinformation and hoaxes. This risk is high, specifically on social networks, dramatically impacting society. The paper's main objective is to point out the danger of misusing social networks to spread disinformation as a hybrid threat to influence people's thinking and behaviour, thus endangering democratic processes in developed democratic countries. The study, which focused on the risks of misusing social networks, was conducted using the questionnaire method and was subsequently assessed using statistical tests. The results indicate no link between age and the ability to distinguish disinformation, and that age does not influence the effects of disinformation. However, we did find the opposite result in terms of education, where people with lower education share hoaxes and disinformation more. Alternative media, whose posts are shared by more than 20% of social network users, have a relatively strong presence in our environment. The possibilities of spreading disinformation are also evident in the social impacts on users, who, according to our study, fear lowering their economic well-being. The study focuses on the effects of social networks on individuals' thinking and behaviour. Because we consider this issue insufficiently studied thus far, attention must also be paid to it in the future.

**Keywords:** disinformation; hoaxes; social impacts; social networks; economic well-being.

**Reference** to this paper should be made as follows: Mihalčová, B., Korauš, A., Šišulák, S., Gallo, P., Lukáč, J. 2023. The risks of misusing social networks in the context of hybrid threat. *Entrepreneurship and Sustainability Issues*, 10(4), 357-371. [http://doi.org/10.9770/jesi.2023.10.4\(22\)](http://doi.org/10.9770/jesi.2023.10.4(22))

**JEL Classifications:** H55, O35, Z13

---

\* The contribution was created as a result of the project: Research of educational concepts in the field of hybrid threats within selected EU countries with the subsequent elaboration of the education concept for SR conditions project code in ITMS 2014+: 314011CDW7

## 1. Introduction

Misusing social media as an instrument for hybrid threats and modern hybrid warfare is unsurprising (Tvaronavičienė et al., 2020; Milbradt et al., 2023). And it is specifically Internet technology that has been developed to meet the needs of information age warfare. Around 2006, Web 2.0 began allowing Internet users to create "news" content instead of just consuming it online. An individual can thus decide what is essential for them to know. Users not only choose news and media but also create these things themselves, declaring their own views, often without considering their truth and their effect on individuals and society. The social nature of people ultimately led also to the creation of virtual networks in the past.

On the one hand, social networks are necessary in today's digital age; on the other hand, they have become a node for information operations and cyber warfare. Social networks enable people who share interests and activities across political, economic and geographic spectra to connect. An ever-increasing number of individuals are searching the Internet and social media to fulfil cognitive, affective, personal, integrational, and social integrational needs in a stress-free way. Aside from fulfilling such requirements, social networks impact everyday life, including relationships, school, religion, entertainment and family. People use social networks to obtain information about the personalities and behaviours of potential employees, and a presence on social networks also contributes to a new form of abusive communication. Academic research has pointed out many socio-technological explanations for this behaviour, including the anonymity provided through interpersonal communication, factors related to boredom or attention-seeking, or the result of more polarised online discussions. The impact of this abuse has been manifested in the rise in online cyberbullying and so-called trolling, and there has also been a significant increase in political violence through the misuse of social media platforms (Hawi & Samaha, 2017). To understand the given issue, the authors decided to examine the impact that the modern trend of using social media is having on people. The authors' primary objective is to point out the danger of misuse of social networks for spreading disinformation as a hybrid threat aimed at influencing people's thinking and behaviour, thus endangering democratic processes in developed democratic countries.

## 2. The current state of domestic and foreign knowledge

Hybrid threats and disinformation are not new concepts; they are not even an achievement of the 21st century or the current information age. The famed Chinese general Sun Tzu refers to the strategy of indirect combat using lies and fraudulent messages as early as in the 6th century BCE in his work *The Art of War*, where he states that the best war is the one that has not even started. In his view, military art is a struggle for advantage or gain without the clatter of weapons. Sun Tzu is considered the most significant military strategist of all time. His strategic art rested in the proposition, "Never declare battle tactics in advance. Herein lies the mastery of the victors of wars". In his work, Sun Tzu focuses much more on alternatives to war than on armed battle, considering such alternatives as robbery, delay, spies, lies and false, deceptive information or forming and maintaining alliances. Palau-Sampio et al. (2022) point out that we can also find textbook examples of the use of disinformation in ancient Greece from the period of the Greco-Persian wars, when the Athenian duke Themistocles, for example, defeated the Persian king Xerxes in some battles with the help of false messages sent through supposedly escaped enslaved people.

Another excellent strategist was Philip II of Macedonia, who implemented significant military reforms during his reign and initiated the most glorious period of old Macedonia. He succeeded in stabilizing the situation domestically and abroad and gradually launched Macedonia's expansionist policy using military force, especially diplomacy. A significant strategist of the 18th century was Napoleon Bonaparte, a renowned French duke and later emperor who conquered much of Europe in the early 19th century and changed the world. Napoleon was born on the island of Corsica and rose quickly by serving in the army during the French Revolution. After gaining political power in France, he was crowned emperor in 1804. His strategic strength consisted not only in the

military might of his army but also in four fundamental strategic innovations, one of which was a circumvention strategy based on information about the enemy, deceiving him with fake news and diplomacy. We can also observe hybrid threats or elements of them in the practices of Germany during the Second World War. The Germans used not only political means but also propaganda, information and resources of an economic nature (Lukáčová, 2019). The modern history of the 21st century relating to this concept began in 2008 when Russia and separatists declared the independence of two regions of Georgia (Abkhazia and South Ossetia). The Russians began using hybrid threats on a larger scale in 2014, when they annexed Crimea. This involved deploying unmarked soldiers (green men), mobilizing domestic paramilitary groups supported by the intelligence services and the cyber and information operations that have become typical tactics used in eastern Ukraine. At present, the importance of such a hybrid threat in Russia's military conflict in Ukraine is deepening, while the dimension of direct military conflict between the armed forces of these two countries is also increasing. The significance of the hybrid threat is multiplied by aerial missile and artillery attacks on schools, hospitals, residential buildings and essential infrastructure. These methods cast a shadow over the free-thinking of the citizens of the war-stricken regions, limit the resolution of the resistance and disrupt the completeness of Ukraine's offensive activities. The crucial goal of Russian hybrid threats is to disrupt the spontaneous will of the Ukrainian people to defend themselves against the aggressor.

The development and ever-increasing use of digital technologies have revolutionized how we acquire information and make a wide range of decisions. Spreading news via the Internet or updating statuses on social networks can be done by almost anyone through social networks. A prerequisite for effective research in this area is a thorough analysis of the environment, the region, the European Union or a global comment (Linkov, 2019). Hybrid threats of the 21st century are a challenge for all countries, and we are generally seeing a growing sense of insecurity and friction in communities. The reach and impact of hybrid threats are asymmetric, complex and ambiguous (Treverton, 2018). The users of social networks, and not only in Un-recognized countries, enter personal and private information (e.g. family status, date of birth, name of work/school, e-mail address, telephone numbers and even residential address) onto these networks, and this information can fall into the wrong hands and be used to harm users in both the virtual and real worlds (Fire et al., 2014). Privacy threats can be generally categorized as threats to the privacy of information, physical privacy, and state privacy (O'Brolcháin et al., 2016). The misuse of social media is causing increased levels of harm for larger populations and groups of users compared to previous decades, as we registered a record amount of social media use during the COVID-19 pandemic (Luo et al. 2022).

To reduce security risks on social networks, combinations of five solutions, the simultaneous use of which will help the user, have been proposed. This is mainly in restricting the sharing of certain information, setting the personal data of the social network user, securing access to applications, or thinking twice about how you use the social network approach (Sadeghian et al., 2013). The result of Atkinson and Chiozza (2021) research is that women (rather than men) and internationalists (rather than nationalists) are the people who make a more critical distinction between targeted surveillance, which is acceptable to them, and blanket surveillance, which they are unwilling to respect. In their research, Kirichenko et al. (2018) focus on the basic methods of graph theory and data mining, which he uses to analyze social networks. He examines the security risks of social networks, concentrating on detecting network communities, community leaders, network detection experts and text information clustering, among others.

Popularizing social networks among users also influences public administration, intending to create a system of open administration, thus changing the relationship between a government and its citizens. The consequences of using social networks and security in e-government should become a subject of research. The security threats a citizen can find on social networks are methodically assessed and classified according to selected criteria. The essential criteria are the gathering of confidential information, a loss of reputation in government-to-citizen (G2C) relations and the organizing of socio-political conflicts (Alguliyev et al., 2018). For example, based on a study by

Pathe Duarte (2020), cyber-attacks in Portugal by foreign groups aiming to collect information and data have increased in recent years, which causes governmental and private critical infrastructure to become vulnerable.

Dragos et al. (2020) report on studies that used different approaches to identify hidden patterns in social media texts, where the text is highly unstructured, arrives with a mixture of modalities and potentially has incorrect spatiotemporal errors. The study states that the uncoupled use of machine-learning models and semantically driven approaches in social media data mining has several areas for improvement. Tagarev and Sharkov (2016) address the proactive identification of advanced hybrid threats in modern social networks. Since these threats are invisible and require the long-term comprehensive monitoring of technologies and users, a mixed methodological framework is proposed for them. Mareš and Mlejnková (2023) state that pan-Slavism and Slavophilia are being used to mobilize specific actors within Czech politics who undermine the official, pro-Western orientation of the Czech Republic.

Hybrid threats are one of the new security challenges in Europe and can shape the continent's future in terms of current geopolitical developments. The policy of the EU is that the primary responsibility for combatting them lies with member states and that NATO's mandate for the security of Europe makes it an essential partner for the military and conventional aspects of deterrence when handling hybrid threats (Lonardo, 2021). Hybrid threats are also monitored from the viewpoint of media, which starts with recognizing the extent of such threats. The target here is society, not armies, and they examine how the cyber dimension and social media offer new, low-cost methods of attack (Treverton et al., 2018). Research by Tagarev and Sharkov (2016) outlines a general model of the hybrid nature of terrorism, accenting the role of modern cyberspace and reminding institutions to look deeper into the issue from both the technological and human sides to contribute to a more secure future for the world. In the view of Bodnar-Pidhurska et al. (2022), the battle against hybrid challenges should focus on developing and implementing new innovative technologies intended to reduce the release of harmful information into the environment while also updating the issue of the still forming ecological awareness of employees and the ecological code of businesses, which affect the environment of their social networks. Industry 4.0 and intelligent manufacturing are associated with cybernetic systems housing and controlled by collective intelligence. Research in this area has found a particular analogy between the (cognitive) resistance of human and artificial intelligence towards mental hacks (particular hybrid adversary activity) and proposed approaches to teaching resistance using special training techniques (Kaiková et al., 2022).

### **3. Selected social network platforms and ways of spreading disinformation there**

Among the most crucial social network platforms are Facebook, Instagram and Twitter. Facebook, founded in 2004 by Mark Zuckerberg, is currently the largest social network in the world, with roughly 3 billion active users. It allows users to connect with people, companies, and organizations. It can be used to post updates, react to the posts of others, share photos and links to online content, chat live and record and share videos. Users can communicate directly with each other via Facebook's Messenger app. They can, join groups with similar interests and stay informed about the activities of friends and the pages they choose to follow. Facebook was designed to be open and social.

Instagram, founded in 2010 by Kevin Systrom and Mike Krieger, is a similar social network and can even be called a direct relative. It is focused on the sharing of visual media. It allows users to upload media that can be edited with filters and organized employing hashtags and geotags. Posts can also be shared publicly. Instagram today has about 1.5 billion active users.

In 2006, Jack Dorsey, Noah Glass, Biz Stone and Evan Williams founded Twitter, a social network that allows people to communicate using short message posts called "tweets". Tweeting is also sometimes referred to as microblogging. Twitter allows users to scan and distribute content quickly, conveniently and easily, which may be

why it is popular among those who want to get a lot of news out into the world and those who wish to follow such users quickly. According to Paradowski et al. (2021), Twitter had about 430 million users in 2021, expected to grow to nearly 500 million users and followers by 2025.

Disregarding the positive sides of using social media, it can also become a tool for disinformation. Selected employees of Twitter and Facebook are responsible for the algorithms that analyze words, phrases and the most discussed topics in order of importance. Thus, Social media algorithms can create echo chambers in which polarised discussions occur and share polarised information. Political "bots" (software agents used to generate simple messages and "conversations" on social networks) pretending to be fundamental movements serve to manipulate public opinion. By using existing online networks combined with an automated "bot", foreign agents can also "insert" disinformation into social media, thus creating a platform and a trend to spread the message as quickly and cheaply as possible, and they can do it at a lower cost than through any other medium. "Bots" are computer algorithms that operate on social networking sites and perform tasks autonomously and repeatedly. They simulate people's behaviour on the social network, interacting with other users and sharing information and posts. On Twitter, for example, "bots" can mimic social interactions, making them appear "regular" people. They seek out Twitter influencers (Twitter users with a lot of followers), and users contact them by sending questions to be noticed and gain their trust and the trust of other users. They react to posts or questions from others based on pre-programmed scripts and also spark debates by posting news on trending topics (Sheoran & Yadav, 2021).

Disinformation algorithms contain three essential components: technical, social and financial. The technical component is computational disinformation, which represents an autonomous grouping of social media platforms whose task is to manipulate public opinion. The social element is focused on the way people think. This type of propaganda has existed in our political systems for millennia. It represents a way of communication that deliberately presents misleading information and disinformation intending to appeal to our base emotions and prejudices and bypass rational thinking to achieve the specific goals of its distributors. Financial disinformation also plays a significant role, manipulating people's thinking about finances and often can even trick them out of their savings.

The spreading of disinformation on social networks is also made possible with the help of so-called trolling and cyberstalking. Trolling is an IT term that represents harassing activity, whether in discussions, chats or posts. A troll intends to spark conflict and controversy, for example, by initiating provocative debates, using insults and sending offensive messages. Trolls operate on forums, social networks and in any other online format, and in general, they adopt false identities that make them feel comfortable on social media. They do not know their victims directly, but as with cyberbullying, they can act at any time. Given their increasing number and danger, many discussion forums are ongoing in governments in the US and the old continent. An organization was even founded in the USA to deal with this issue.

Rainie and Wellman (2012) note that trolls are people with severe sociological, mental and deeply rooted psychological problems that arise from regulatory transgression, mental illnesses and issues with their sexual identity. Garton et al. (2006) state that we also study the idea of cyberstalking – the use of social networks to follow or harass a private person or company – concerning trolling. A cyberstalker is a person who posts deceptive or scurrilous statements about their target on social media to incite the victim to respond. Like trolls, they often create profiles and social network pages in the name of the victim with scandalous or pornographic content (Dino, & Gustilo, 2018; Aral, 2020; Winkler et al., 2021).

#### **4. Methodology of the paper**

The main objective of our survey was to point out the danger of spreading hoaxes and disinformation and to analyze selected aspects of such application on social networks. The stated aim of the study was defined in

connection with the determined hypotheses, which we subsequently verified through statistical methods. We decided on a questionnaire as the primary method of obtaining data for our study, as this is suitable for this type of research. The questionnaire comprised predetermined questions and answers associated with the issue of spreading hoaxes and disinformation on social networks, and we also used the possibility of combining open and closed questions. The questions on the questionnaire were also presented in the form of the Likert scale. Our research subjects were respondents of different demographic characteristics from public administration. For research purposes, we divided the questionnaire into two parts. The first was demographic, and the second was empirical, which was made up of questions and responses related to the issue of spreading disinformation and hoaxes on social networks. The demographic questions addressed the gender of the respondents, their age, the highest level of education, place of residence and work and social status, while the empirical part focused on questions specifically addressing hoaxes and disinformation on social networks. In the questionnaire, we asked about what type of social networks the respondents use for obtaining information, expressing their views on individual statements, with a focus on hoaxes and disinformation on social networks, on the trustworthiness of personal social networks, the monitoring of a person's information on social networks in terms of mainstream and alternative media and the possibilities which, in their view, prevent the spread of disinformation and hoaxes on social networks. Along with open and closed questions, we also used to queries in the form of a five-point Likert scale, with options ranging from agree to disagree completely. We presented this method of expressing opinions mainly when the respondents stated that they agreed or did not agree with individual statements aimed at the possibilities of combatting disinformation and hoaxes on social networks.

The questionnaire survey was conducted from October 2022 to February 2023. We approached 643 total respondents this way; however, only some were willing to participate in our survey. Only 171 completed questionnaires were returned to us, representing a 27% response rate. However, we consider this a standard return for this type of survey. For the needs of our study, we processed the data from the respondents using research methods such as descriptive statistics, contingency tables, and others, as well as analysis, comparison, synthesis, selection, induction and deduction. We verified the determined hypotheses using Pearson's Chi-square test of independence. We then compared the Chi-square calculation with the critical tabular value for our selected probability of error and the detected degree of freedom. We processed the hypothesis verification using the Chi-square test in Statistica statistical program from StatSoft version 12.0.

*H1: We assume that there is a statistically significant relationship between age and the ability to distinguish disinformation.*

*H2: We assume a statistically significant relationship between education achieved and the sharing of verified information.*

*H3: We assume that more than 20% of respondents share the information reported by alternative media.*

*H4: We assume a statistically significant relationship between education achieved and people's behaviour under the influence of disinformation and hoaxes.*

*H5: We assume a statistically significant relationship exists between the spreading of information on social networks and users' concerns about social impacts on economic well-being.*

## **5. Survey results**

In the study, we dealt with the issue of hoaxes and disinformation on social networks, focusing on the ability to distinguish disinformation depending on the age of the user of social networks. In this context, we set a hypothesis in which we verified the dependence between the respondents' age and their ability to distinguish disinformation and hoaxes. Based on the data obtained, we assessed the presented hypothesis using the Chi-square test of independence. The test results are shown in Tab. 1.

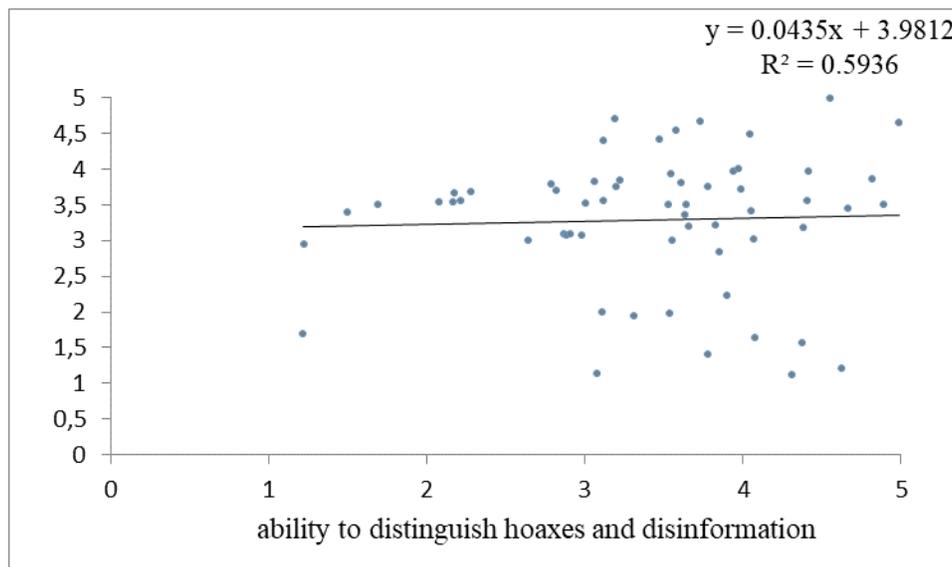
**Table 1.** The results of testing the hypothesis

<i>Pearson's Chi-square Test of Independence</i>			
Calculated value	Error profitability	Degree of freedom	Critical value
p = 0.5936	$\alpha = 5\% (0.05)$	DF = 1.00	$\chi^2 = 0.01$

Source: own processing

The value calculated using the Chi-square test of independence was  $p = 0.5936$ , which, because it is more significant than 0.05, means that there is no statistically significant relationship between the respondent's age and the ability to distinguish disinformation and hoaxes. The presented data show that the respondent's age plays a minor role in the knowledge of social network users to determine whether the information is a hoax. We do not accept this hypothesis.

Figure 1 shows the hypothesis aimed at exploring the relationship between a respondent's age and the ability to distinguish disinformation and hoaxes.



**Figure 1.** Dependencies between age and the ability to distinguish disinformation

Source: own processing

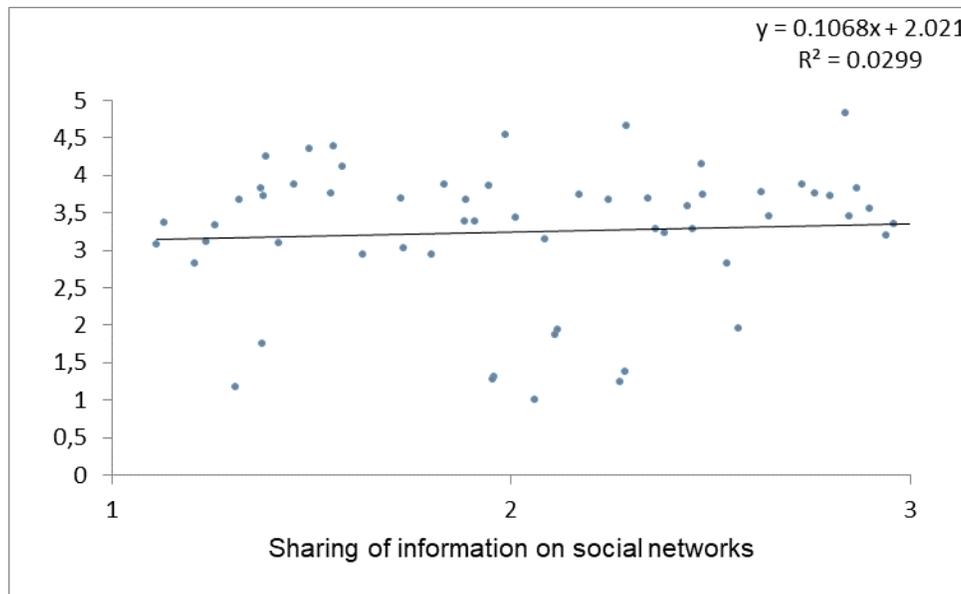
The education achieved by social network users also dramatically influences the spreading of disinformation and hoaxes. The subject of our research was also obtaining data that examines the respondents' education in terms of their dissemination of information on social networks. In this context, for our study, we determined a hypothesis to explore the dependence between respondents' education and the sharing of verified information on social networks. To verify the given hypothesis, we used the Chi-square test of independence method. The test results are shown in Tab. 2.

**Table 2.** The results of testing the hypothesis

<i>Pearson's Chi-square Test of Independence</i>			
Calculated value	Error profitability	Degree of freedom	Critical value
p = 0.0299	$\alpha = 5\%$ (0.05)	DF = 1.00	$\chi^2 = 0.01$

Source: own processing

Based on data obtained from respondents, in verifying this hypothesis, our assumption was confirmed, as the test gave a calculated value of  $p=0.0299$ . This value is lower than 0.05, indicating a statistically significant relationship between education achieved and sharing verified information on social networks. When examining the responses from respondents in more detail, education plays an important role, which means that the higher the level of education, the more users share verified information. In this case, we accept the presented hypothesis. Figure 2 shows the relationship between education achieved and the sharing of verified information.



**Figure 2.** Dependencies between achieved education and the sharing of verified information

Source: own processing

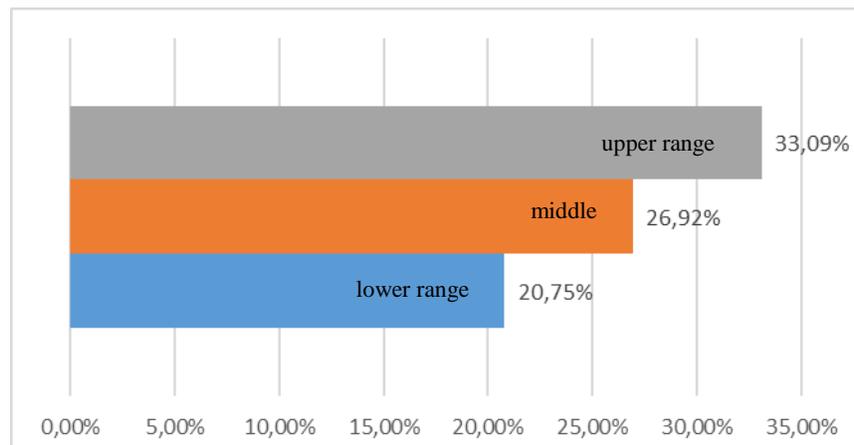
In connection with various negative factors, such as the pandemic and the war in Ukraine, more alternative media are getting into the online space on social networks. In this regard, our study was interested in how information from this media type is shared on social networks. Therefore, we specified a hypothesis in which we assumed that information from alternative media on social networks is shared by more than 20% of the research respondents. The test results are shown in Tab. 3.

**Table 3.** Method of the proportion of the given phenomenon in the population

Indicator	Formula	Explanatory note
Method of proportion of a given phenomenon in population	$\hat{p} = 0.26923$ $\hat{q} = 0.67033$	$p = 0.26923 \pm 1.96 * \sqrt{\frac{0.26923 * 0.67033}{182}}$ $p = 0.26923 \pm 0.03149$ 0.2075% to 0.3309%

Source: own processing

When verifying the hypothesis focused on the sharing of alternative media information on social networks, we used the method of the proportion of the given phenomenon in the population, which is suitable for use in the mentioned type of study, as we do not have data from all respondents. In this case, we set the probability coefficient value at 1.96, meaning validity at 96%. This calculation shows that sharing information from alternative media on social networks ranges from 20.75% to 33.09%. Fig. 3 shows the range of users who share alternative media content on social networks.



**Figure 3.** Range of users sharing alternative media content

Source: own processing

The hypothesis was confirmed because the stated values are above the set value of 20%. More than 20% of the study respondents shared information from alternative media. Thus, we accept the stated premise. The spread of disinformation and hoaxes also significantly impacts people's actions. Hoaxes influence many people to such an extent that changes occur in their actions that affect their society and family relationships.

The more educated a society is, the more resistant it is to disinformation and hoaxes. In this context, we examined the relationships between education and people's behaviour. We determined a hypothesis for the study looking at the assumption that there is a statistically significant relationship between education achieved and the way people act under the influence of disinformation and hoaxes. The results from the statistical verification of this hypothesis are shown in Tab. 4

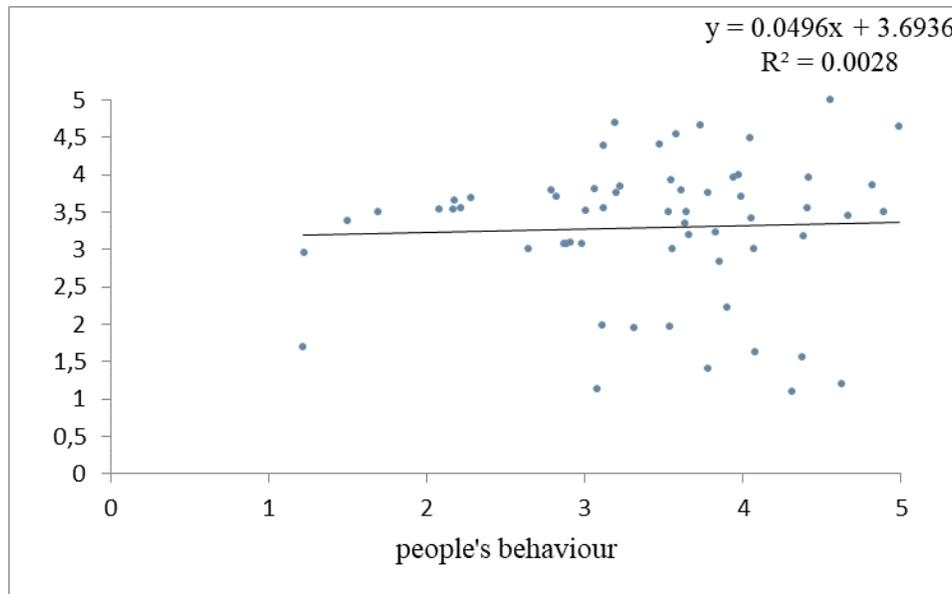
**Table 4.** The results of testing the hypothesis

<i>Pearson's Chi-square Test of Independence</i>			
Calculated value	Error profitability	Degree of freedom	Critical value
p = 0.0163	$\alpha = 5\% (0.05)$	DF = 1.00	$\chi^2 = 0.01$

Source: own processing

From the presented results, in verifying this hypothesis, our assumption was confirmed, as the test determined a calculated value of  $p=0.00163$ . The stated value is lower than 0.05, meaning there is a statistically significant relationship between education achieved and how people act under the influence of disinformation and hoaxes. A more detailed examination of the data from the respondents confirms that the lower the respondents' education, the more significant the effects of disinformation and hoaxes on their behaviour. In this case, we accept the stated hypothesis.

Figure 4 shows the relationship between education achieved and people's behaviour under the influence of disinformation and hoaxes.



**Figure 4.** Dependencies between achieved education and people's behaviour

Source: own processing

Disinformation and hoaxes aim to cause people to panic, fear and worry about the future. One of these fear factors is the social impact that affects users of social networks. Many users need clarification on whether sufficient energy will be provided for the comfortable functioning of households in winter and whether there will be enough oil for motor vehicles and various energy machines and devices. Based on this, we specified a hypothesis, the main idea of which is the assumption that there is a statistically significant relationship between the dissemination of information on social networks and users' concerns about social impacts on economic well-being. The results from the statistical verification of the hypothesis are shown in Tab. 5

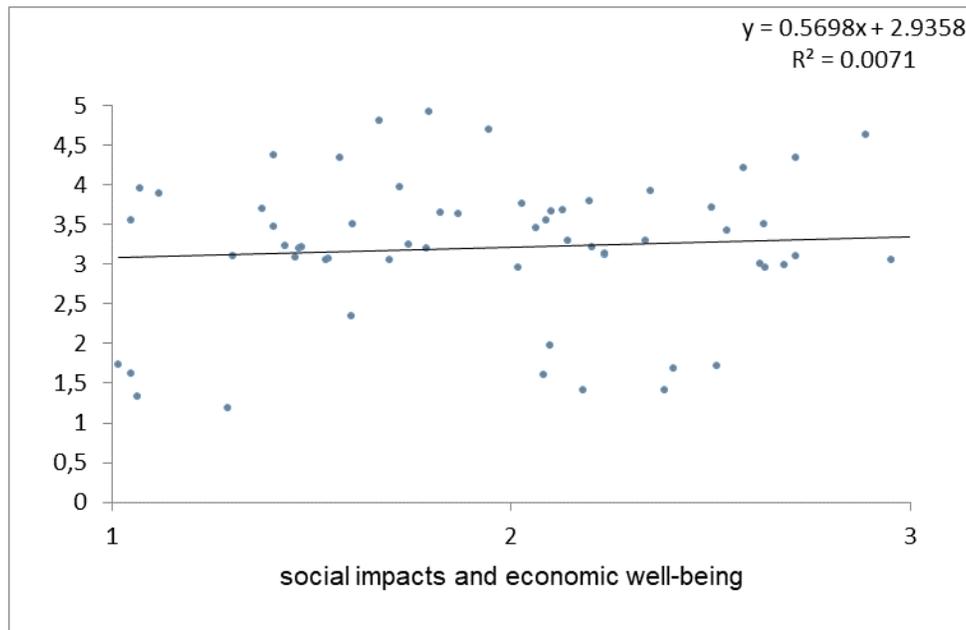
**Table 5.** The results of testing the hypothesis

<i>Pearson's Chi-square Test of Independence</i>			
Calculated value	Error profitability	Degree of freedom	Critical value
p = 0.0487	α = 5% (0.05)	DF = 1.00	x <sup>2</sup> = 0.01

Source: own processing

In the statistical evaluation of the data obtained from the respondents, this assumption was also confirmed, though very narrowly. The calculated value of p=0.0487 is lower than 0.05, meaning there is a statistically significant relationship between the dissemination of information on social networks and users' fears about social impacts on economic well-being. Therefore, in this case, we accept the stated hypothesis.

Figure 5 shows the relationship between information spread on social networks and users' concerns about social impacts on economic well-being.



**Figure 5.** The dependencies between the dissemination of information on social networks and users' concerns about social impacts on economic well-being

Source: own processing

## 6. Discussion and conclusion

When combatting hybrid threats on social networks, it becomes essential to take note of their nature, which is diverse. These threats are versatile, variable and highly adaptable to individuals concerning their digital footprint. The problem is that it is impossible to significantly check them because government authorities still need to adopt a framework for identifying, deterring or restricting the negative impacts of threats, for example, on juveniles.

Naturally, it is also necessary to educate people so that they can thoroughly understand such threats and how to reduce their effects or prepare users of social networks to resist them. It is also necessary to create a trustworthy

relationship between the users of a social network and the authority that will monitor, control and receive information and suggestions from the users in case of suspicion of possible threats spreading in this environment.

In our study, we focused on testing hypotheses and came to some interesting results. The first part was the assumption that a statistically significant relationship exists between age and the ability to distinguish disinformation. This hypothesis was rejected, concluding that age plays no role in a hybrid threat or hoax on a social network.

Suppose we consider the user's age a damaging social network threat. In that case, young students are exposed to such hazards more often, as they primarily use social networks to strengthen their social ties within their residence, school or university. From this point of view, Facebook is a social network that provides a low level of self-disclosure, and the risk of creating fictitious accounts designed not only to track users but also to spread disinformation to influence other young people, is growing. Despite the advantages that social networks bring, we have to say that the frequent use of social networks by young people results in a deficit of social skills, which can lead users to information overload from these sources, the absence of real-world communication skills and helping them to avoid school and family obligations. With adult users of social platforms, the aim of their activity on a social network is mainly social contact with their surroundings and family and sharing and accepting their interests or attitudes.

We can further state that there is a statistically significant relationship between achieved education and the sharing of verified information. The assumption is that, depending on the education achieved, we perceive a lower number of spreading hoaxes, disinformation and links with the character of propaganda. Based on our sample, we can confirm this trend among all age groups. The decline of the digital divide between individuals and the development of social networks links young and older users with different communities and can significantly affect their behaviour.

There are known facts that reflect the behaviour of individuals gathered into social platform groups, where individual members brag about publishing videos of fights, insults or threats, and the identification factor is the education achieved by the social network user. This is linked to the growth of so-called Internet bashing, and the implications for preventing violence and criminal investigation caused by challenges on various social platforms are being discussed.

We perceive the use of social networks and the threats they bring with them, specifically at this time, when we are now at the end of the COVID-19 pandemic and war is just over our borders, as essential factors that influence the development of young people, shape their thinking and no doubt are capable of controlling their decision-making, opinions and attitudes. We confirm through statistical testing the hypothesis that more than 20% of respondents share information reported by alternative media. In the present time, when military operations are taking place in various parts of the world, much has been done in recent years during the course of these conflicts to strengthen the issue of spreading false information on the Internet, particularly on social networks.

The credit for this goes to the European Union and NATO. These two organizations perceive the field of hybrid threats as being very serious. Still, with the current development of information and communication technologies, hybrid threats are constantly changing their character, pace and intensity of spread and influence. The goal for the future would be to create a strategic approach to combat hybrid threats and to implement national legislation aimed not only at eliminating disinformation, threats and hoaxes from social networks but also at educating individuals in this area.

Young people today need measures in this area that will help them prevent mental and physical health problems related not only to the long-lasting pandemic or current wars but because, in the last years of their adolescence,

the content offered by social networks, among other things, which is full of disinformation, hoaxes and politically or otherwise motivated opinions, has affected them. For both young people and the rest of the population, it is necessary to analyze the causes and reasons why they feel it is essential to share information whose content shows signs of hoax or disinformation.

With the fourth hypothesis, we tested whether there is a statistically significant relationship between education achieved and people's behaviour under the influence of disinformation and hoaxes, and we can state that social networks substantially influence people's ability to detect fake news. The ability to recognize disinformation depends on the education of the individual. Furthermore, other studies have shown that the most critical factors in detecting hoaxes and disinformation that influence a person's behaviour are education, income, interest in politics, time spent on social networks and confirmation bias, while age, as stated above, has no influence on the behaviour of an individual under the influence of hoaxes. Someone spreads disinformation as a text, image or video concerning digital literacy. We assume that, as with education, the higher the literacy, the less disinformation and hoaxes can influence an individual.

We likewise state that there is a statistically significant relationship between spreading information on social networks and users' concerns about social impacts on economic well-being. Among the effects of hoaxes, individuals perceive harmful content distributed through social networks as affecting their social and economic well-being. This is primarily the case with the young generation, who most often use social networks. Another group, for example, comprises mothers on maternity leave and pensioners, who, due to limited contacts, spend more time on social platforms and thus take information related to the development of the economy or political issues as accurate, causing them to fear their social or economic future.

The use of social networks leads to many opinions on the effects of social networks on individuals. The influence of social networks on the thinking and behaviour of individuals has yet to be sufficiently explored; therefore, it is necessary to pay attention to this issue in the future. In any case, there is a significant lack of regulation and control in social networks concerning the spreading of hoaxes, disinformation and propaganda.

## References

- Alguliyev, R., Aliguliyev, R., & Yusifov, F. (2018). Role of social networks in E-government: Risks and security threats. *Online Journal of Communication and Media Technologies*, 8(4), 363-376. <https://doi.org/10.12973/ojcm/3957>
- Atkinson, C., & Chiozza, G. (2021). Hybrid threats and the erosion of democracy from within: US surveillance and European security. *Chinese Political Science Review*, 6(1), 119-142. <https://doi.org/10.1007/s41111-020-00161-2>
- Aral, S. (2020). *The Hype Machine: How Social Media Disrupts Our Elections, Our Economy, and Our Health—and How We Must Adapt*. Currency. ISBN 978-0-525-57451-4.
- Bondar-Pidhurska, O.V., Karangwa, Ch., & Ammar, A.O.A. (2022). Management of competitiveness of enterprises in conditions of hybrid threats of sustainable development: innovative technologies and ecosconsciousness. 2022. <http://dspace.puet.edu.ua/handle/123456789/11588>
- Dino, C., & Gustilo, L. (2018). FB Digitalking: Standard, Non-Standard, or Hybrid? 3rd International Conference on Education (ICOED). Melaka, Malaysia, 24(11), 8328-8331. <https://doi.org/10.1166/asl.2018.12554>
- Dragos, V., Forrester, B., & Rein, K. (2020). Is hybrid AI suited for hybrid threats? Insights from social media analysis. 2020 IEEE 23rd International Conference on Information Fusion (FUSION). IEEE, 2020. p. 1-7. <https://doi.org/10.23919/FUSION45008.2020.9190465>

- Fire, M., Goldschmidt, R. & Elovici, Y. (2014). Online social networks: threats and solutions. *IEEE Communications Surveys & Tutorials*, 16(4), 2019-2036. <https://doi.org/10.1109/COMST.2014.2321628>
- Garton, L., Haythornthwaite, C., & Wellman, B. (2006). Studying Online Social Networks. *Journal of Computer-Mediated Communication*, 3(1) <https://doi.org/10.1111/j.1083-6101.1997.tb00062.x>
- Hawi, N. S., & Samaha, M. (2017). The Relations among Social Media Addiction, Self-Esteem, and Life Satisfaction in University Students. *Social Science Computer Review*, 35(5), 576–586. <https://doi.org/10.1177/0894439316660340>
- Palau-Sampio, D., Carratala, A., Tarullo, R., & Crisostomo, P. (2022) Quality recognition as a prescriber against disinformation. *Comunicar*, 30(72). <https://doi.org/10.3916/C72-2022-05>
- Luo, T., Chen, W., & Liao, Y.H. (2021). Social media use in China before and during COVID-19: Preliminary results from an online retrospective survey. *Journal of Psychiatric Research*, 140, 35-38. <https://doi.org/10.1016/j.jpsychires.2021.05.057>
- Kaiková, O., et al. (2022). Hybrid threats against Industry 4.0: adversarial training of resilience. In: E3S Web of Conferences. EDP Sciences, 2022. <https://doi.org/10.1051/e3sconf/202235303004>
- Kirichenko, L., Radivilova, T. & Carlsson, A. (2018). Detecting cyber threats through social network analysis: short survey. arXiv preprint arXiv:1805.06680, 2018. <https://doi.org/10.48550/arXiv.1805.06680>
- Linkov, I., et al. (2019). Applying resilience to hybrid threats. *IEEE Security & Privacy*, 17(5), 78-83. <https://doi.org/10.1109/MSEC.2019.2922866>
- Lonardo, L., (2021). EU law against hybrid threats: A first assessment. *European Papers-A Journal on Law and Integration*, 6(2), 1075-1096. <https://doi.org/10.15166/2499-8249/514>
- Lukáčová, J., (2019). Hybridné hrozby a ich vplyv na bezpečnostné prostredie - teória, vývoj, prax. *Vojenské reflexie*. Liptovský Mikuláš: Akadémia ozbrojených síl M.R. Štefánika. 2020, XV, no. 1/2020. ISSN: 1336-9202.
- Mareš, M., & Mlejnková, P. (2023). Pan-Slavism and Slavophilia in the Czech Republic within the Context of Hybrid Threats. In: Pan-Slavism and Slavophilia in Contemporary Central and Eastern Europe: Origins, Manifestations and Functions. Cham: Springer International Publishing, p. 309-327. [https://doi.org/10.1007/978-3-031-17875-7\\_15](https://doi.org/10.1007/978-3-031-17875-7_15)
- Milbradt, D., et al. (2023). A Hybrid Robust Adaptive Sliding Mode Controller for partially modelled systems: Discrete-time Lyapunov stability analysis and application. *Nonlinear Analysis: Hybrid Systems*, 48, 101333. <https://doi.org/10.1016/j.nahs.2023.101333>
- O’Brocháin, F., Jacquemard, T., Monaghan, D. et al. (2016). The Convergence of Virtual Reality and Social Networks: Threats to Privacy and Autonomy. *Science and Engineering Ethics*, 22, 1-29. <https://doi.org/10.1007/s11948-014-9621-1>
- Paradowski, M., Andrzej Jarynowski, A., Jelińska, M& Czopek, K (2021). Out-of-class peer interactions matter for second language acquisition during short-term overseas sojourns: The contributions of Social Network Analysis. *Language Teaching*, 54(1), 12-24. <https://doi.org/10.1017/S0261444820000580>
- Pathe Duarte, F., (2020). Non-kinetic hybrid threats in Europe—the Portuguese case study (2017-18). *Transforming Government: People, Process and Policy*, 14(3), 433-451. <https://doi.org/10.1108/TG-01-2020-0011>
- Rainie, L., & Wellman, B. (2012). *Networked: The New Social Operating System*. Cambridge, Mass.: MIT Press. ISBN 978-0262017190. <https://doi.org/10.7551/mitpress/8358.001.0001>
- Sadeghian, A., Zamani, M., & Shanmugam, B (2013). Security threats in online social networks. In: 2013 International Conference on Informatics and Creative Multimedia. IEEE, p. 254-258. <https://doi.org/10.1109/ICICM.2013.50>
- Sheoran, S., K., & Yadav, P. (2021). An Extended Work Architecture for Online Threat Prediction in Tweeter Dataset. *International Journal of Computer Science and Network Security*, 21(1), 97-106. <https://doi.org/10.22937/IJCSNS.2021.21.1.14>

Tagarev, T., & Sharkov, G. (2016). Multi-stakeholder Approach to Cybersecurity and Resilience. *Information & Security: An International Journal*, 34(1), 59-68. <https://doi.org/10.11610/isij.3404>

Tvaronavičienė, M., Plėta, T., Della Casa, S., & Latvys, J. (2020). Cyber security management of critical energy infrastructure in national cybersecurity strategies: cases of USA, UK, France, Estonia and Lithuania. *Insights into Regional Development*, 2(4), 802-813. [http://doi.org/10.9770/IRD.2020.2.4\(6\)](http://doi.org/10.9770/IRD.2020.2.4(6))

Treverton, G.F. et al. (2018). Addressing hybrid threats. ISBN 978-91-86137-73-1

Treverton, G.F. (2018). The intelligence challenges of hybrid threats: Focus on cyber and virtual realm. 2018. ISBN 978-91-86137-75-5

Winkler, S., Körner, A., & Breitenecker, F. (2021). Modelling framework for artificial hybrid dynamical systems. *Nonlinear Analysis: Hybrid Systems*, 42, 101072. <https://doi.org/10.1016/j.nahs.2021.101072>

**Funding:** The contribution was created as a result of the project: Research of educational concepts in the field of hybrid threats within selected EU countries with the subsequent elaboration of the education concept for SR conditions project code in ITMS 2014+: 314011CDW7

**Author Contributions:** The authors contributed equally. All authors have read and agreed to the published version of the manuscript.

**prof. Ing. Bohuslava MIHALČOVÁ**, PhD. & PhD. EUR ING, Department of Management, Faculty of Business Economy, University of Economics in Bratislava, 852 35 Košice, Slovakia.

ORCID ID: <https://orcid.org/0000-0001-7958-3429>

**prof. Ing. Antonín KORAUŠ**, PhD., LL.M., MBA, Academy of the Police Force in Bratislava, Sklabinská 1, 835 17 Bratislava, Slovakia.

ORCID ID: <https://orcid.org/0000-0003-2384-9106>

**assoc. prof. Ing. Stanislav ŠIŠULÁK**, PhD., MBA, Academy of the Police Force in Bratislava, Sklabinská 1, 835 17 Bratislava, Slovakia;

ORCID ID: <https://orcid.org/0000-0003-4727-9582>

**Ing. Peter GALLO**, PhD, Faculty of Arts, Institute of Educology and Social Work, University of Prešov in Prešov, 080 01 Prešov, Slovakia.

ORCID ID: <https://orcid.org/0000-0001-5193-1997>

**Ing. Lukáč JOZEF**, PhD. Department of Management, Faculty of Business Economy, University of Economics in Bratislava, 852 35 Košice, Slovakia

ORCID ID: <https://orcid.org/0000-0003-2513-4390>

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





Publisher

<http://jssidoi.org/esc/home>



---

**INDUSTRY AND PERFORMANCE IN THE PORTUGUESE LISTED COMPANIES: THE MEDIATING ROLE OF THE ENVIRONMENTAL INFORMATION DISCLOSURE\***

**Albertina Paula Monteiro <sup>1</sup>, Francisco Barbosa <sup>2</sup> Amélia Silva <sup>3\*</sup>, Catarina Cepêda <sup>4</sup>**

<sup>1,3</sup> Porto Accounting and Business School, Polytechnic of Porto, CEOS.PP, Porto, Portugal

<sup>2,4</sup> Porto Accounting and Business School, Polytechnic of Porto, Porto, Portugal

E-mails: <sup>1</sup> [amonteiro@iscap.ipp.pt](mailto:amonteiro@iscap.ipp.pt); <sup>2</sup> [franciscommanuel96@hotmail.com](mailto:franciscommanuel96@hotmail.com); <sup>3</sup> [acfs@iscap.ipp.pt](mailto:acfs@iscap.ipp.pt) (Corresponding author); <sup>4</sup> [clmc@iscap.ipp.pt](mailto:clmc@iscap.ipp.pt)

Received 18 February 2023; accepted 19 June 2023; published 30 June 2023

**Abstract.** Based on the legitimacy and stakeholders' theories, this research aims to analyze the environmental information disclosure of Portuguese companies. Specifically, this study aims to explore the environmental information disclosure level, whether the industry (environmentally sensitive) influences the level of ecological matters disclosure, and whether this impacts the companies' performance/profitability. Using the content analysis technique, we developed two indices to assess the level of environmental disclosures in companies' mandatory and voluntary reporting. In addition, for the relationship between variables analysis, we applied the Process Macro of SPSS software. Study results show that (1) there is a positive evolution in the level of environmental disclosure by Lisbon stock exchange listed companies between the years 2015 and 2017, (2) the industry has no significant relationship with profitability; (3) the environmental disclosure acts as a mediator variable in the relationship between industry and profitability. This research presents differences in the tendency of environmental matters disclosure when prepared under an accounting framework or voluntarily and assesses the mediating role of the environmental disclosure index in the relationship between industry and performance.

**Keywords:** environmental accounting; environmental disclosure; performance; industry-listed companies; Portugal

**Reference** to this paper should be made as follows: Monteiro, A.P., Barbosa, F., Silva, A., Cepêda, C. 2023. Industry and performance in the Portuguese listed companies: the mediating role of the environmental information disclosure. *Entrepreneurship and Sustainability Issues*, 10(4), 372-389. [http://doi.org/10.9770/jesi.2023.10.4\(23\)](http://doi.org/10.9770/jesi.2023.10.4(23))

**JEL Classifications:** M49, M14

---

\*This research was supported by Portuguese national funds through FCT – Fundação para a Ciência e Tecnologia, under the project UIDB/05422/2020

## 1. Introduction

Environmental pollution is a primary global concern requiring worldwide action by citizens, businesses, and governments to lower the number of contaminants generated and mitigate their environmental impact. Thus, it is an issue that has been on economic decision-makers agenda for several decades. Indeed, the 1960s witnessed a remarkable growth in public awareness of environmental problems, resulting in several movements and initiatives for preserving the environment (Wilkinson and Mangalagiu, 2012). Therefore, many companies now publish sustainability reports to communicate the measures taken to protect the environment, i.e., reporting on their environmental performance.

The magnitude of the recent branch of accounting, environmental accounting, has been recognized worldwide (Zrnić, Starčević and Mijoč, 2020). Environmental accounting plays an essential role in environmental information disclosure. According to Yakhou and Dorweiler (2004), society's increasing attention towards the environment has made accounting take a leading role in measuring environmental performance. Businesses increasingly engage with stakeholders, including customers, employees, and local communities, to promote sustainability. The environmental reports allow companies to disclose their environmental performance and gain further support for their environmental initiatives.

Environmental accounting has been encouraged in companies. In the European Union (EU), environmental and social accounting has been regulated by directive 2014/95/EU, recently amended by directive 2022/2464/EU. In Portugal, Directive 2014/95/EU requires public interest companies with more than 500 employees to prepare a non-financial statement. Recently, directive 2022/2464/EU has extended the scope to all listed companies, except micro-entities, indicating in more detail the information to be disclosed by companies requires that auditors carry out limited assurance work in sustainability reporting. This EU regulation highlights the importance of disclosing information on environmental, social and corporate governance issues.

This study, based on legitimacy and stakeholder theories, has two objectives. The first is to analyze the environmental information disclosed by companies in the annual report and sustainability report to identify the disclosure level evolution between 2015 and 2017. We selected the period from 2015 to 2017 so that the European directive's introduction does not influence the results. Previous studies suggest that the industry affects environmental information disclosure (Monteiro, Pereira and Barbosa, 2021; Elshabasy, 2018; Clarkson, Overell and Chapple, 2011), improving the business performance. In this context, the second study objective is to analyze the relationship between industry, environmental disclosure index (EDI), and profitability, i.e., whether EDI is a mediating variable between industry and profitability.

Previous studies analyze the environmentally sensitive industry effect on financial performance but do not assess the mediating impact of environmental information disclosure on the relationship between both variables. This study aims to fill this gap in the literature, confirming that the industries most likely to harm the environment companies tend to improve their financial performance if they disclose environmental information, either in annual or voluntary reports (sustainability report).

This study begins with a topic introduction, followed by a structured literature review that includes the study's theoretical framework. The following section sets out the methodology used in this research. Subsequently, the analysis and discussion of the results are presented. The last section is dedicated to the conclusions.

## 2. Theoretical framework

### 2.1. Environmental accounting and regulations on environmental matters

Following Accounting Normalization System (ANS) Conceptual Structure (Aviso no. 8254/2015, of July 29, published in *Diário da República*, 2<sup>nd</sup> series no. 146, of July 29) and according to the academic literature, the leading accounting objectives are to provide valuable and relevant information for all stakeholders on decision-making (Cepêda and Monteiro, 2020; Akhtar and Liu, 2018; Eierle and Schultze, 2013; Akdere, 2011). Accounting is a science that prepares and provides financial and non-financial information and is essential for corporate transparency (Ribeiro and Gúzman, 2010; Schwartz, 2016). There is a growing consensus that timely and broad-based stakeholder involvement is vital for effective environmental assessment (Enríquez-de-Salamanca, 2018). The environmental impact assessment is a process where several stakeholders take part with different interests and expertise, which may lead to intentional or unintentional bias in their opinions (Enríquez-de-Salamanca, 2018).

The companies' stakeholders need information related to the companies' activity environmental impact and expose the results of all initiatives developed to minimize them (Saremi and Nezhad, 2014), so their accounting system should provide helpful information for environmental management purposes and external reporting. Environmental accounting presents an opportunity for companies to address regulations cost-efficiently, avoid exposure to future regulations, and even prove to the public that additional regulations are not always necessary (Schaltegger Schaltegger and Burritt, 2017, p.13).

Environmental accounting is a branch of accounting whose function is to register and disclose the companies' actions with an environmental impact. This tool provides accurate information in the financial statements about the estimated social cost caused to the environment by the externalities of production (Anand and Srineevasa, 2014). According to Bebbington and Thomson (2007), environmental accounting is a field of accounting that records environmental events that arise from the organizations' economic actions. Schaltegger and Burritt (2000) consider that environmental accounting was born in the process of pressure exerted by stakeholders, as they considered that they would thus have greater control over the companies' environmental performance and that environmental accounting would be an essential management tool, as it would facilitate the environmental aspects integration in the strategies and decision-making definitions.

On the other hand, there are limitations and obstacles to environmental accounting. For instance, Álvarez-García and del Río Rama (2016) state that the complexity of *International Organization for Standardization* (ISO) standards, legal requirements, lack of incentives to implement the systems, lack of management commitment, lack of employee involvement and high implementation costs prevent the actual application of this branch of accounting.

In 2001, the European Community (EC) issued Recommendation 2001/453/EC on 30 May to promote greater harmonization in the annual reports of European companies on environmental matters. The Recommendation was prepared to support Single Market related policies and contribute to financial statements users receiving important and comparable information regarding environmental issues, thus reinforcing Community initiatives in the natural environment protection area. The same document indicates that the quantity, transparency and comparability of environmental information included in companies' annual accounts and management reports should also be improved. To achieve these objectives, and considering the growing importance attached to environmental problems, the EU Commission intends to clarify the current rules and provide more specific guidelines regarding the recognition, measurement and environmental matters disclosure in companies' annual accounts and management reports (Accounting Standards Committee, 2002).

This Recommendation was based on several International Accounting Standards (IAS) issued by the *International Accounting Standards Committee* (IASC) and the *International Accounting Standards Board* (IASB), which include environmental information: IAS 1; IAS 16; IAS 34; IAS 36; IAS 37 and IAS 38 (Eugénio, 2004). After the Recommendation, the Portuguese Accounting Guideline (DC) 29 - Environmental Matters, later approved by the Accounting Normalization Commission, on June 5, 2002, and published in the Official Gazette on April 18, 2005, came into force in 2006 and it was an essential step for the national regulation on environmental matters. In January 2010, there was a new change after the ANS came into force (Decree-Law No. 158/2009 of July 13, amended by Decreto-Lei No. 98/2015 of June 2). Consequently, FRAS 26 - Environmental Matters was introduced to replace DC 29 (Aviso no. 15655/2009 amended by Aviso no. 8256/2015).

FRAS 26 aims, according to paragraph 1 *"to prescribe the criteria for the recognition, measurement and disclosure of environmental expenditures, environmental liabilities and risks and related assets resulting from transactions and events that affect, or are likely to affect, the financial position and results of the reported entity"*. According to paragraph 3 of FRAS 26, *"this Standard shall be applied to the information to be provided in the financial statements and management report of the entities or as to environmental matters"*. Besides FRAS 26, other FRAS refer to environmental matters: FRAS 1, FRAS 3, FRAS 7, FRAS 19 and FRAS 21. Companies should treat environmental matters in an accounting manner to disclose correct and relevant information to *stakeholders*.

## **2.2. Environmental matters disclosure**

Mandatory and voluntary disclosure are different ways of communicating business performance to stakeholders. Consoni and Douglas (2016, p. 659) refer that *"the nature of the relationship between mandatory and voluntary disclosure is ambiguous and may be seen as complementary or substitute"*. Environmental information disclosure is mandatory when it derives from accounting standards or the law. The information is voluntary when it results from the companies' will and not from the obligation to apply the law. Consoni and Douglas (2016) indicate that, in a regulatory logic, voluntary disclosure exceeds the information recommended by standards or law and represents a choice of managers or company directors.

The increased sensitivity of stakeholders to environmental and social issues has led companies to improve the quality of information disclosure in these areas of interest. For these reasons, there is an increasing interest in non-financial information, which makes it as relevant as financial information to all users of this information (stakeholders) (Monteiro, Garcia-Sanchez and Aibar-Guzmán, 2022; Ribeiro and Gúzman, 2010).

The ANS specifies that companies should disclose information on environmental matters when it is materially relevant for decision-making. In this case, companies must disclose information in the annual report (Notes to the Financial Statements and management report). Although Portuguese-listed companies are not subject to FRAS 26, as they apply IAS/IFRS adopted by the EU, they may disclose information in accordance with this accounting standard.

In this respect, Eugénio (2004) highlights the necessity to prepare an income statement that contains environmental expenditures and income indicators to make an accounting analysis separate from the "environmental result". The FRAS 26 is the only one that does not come from an IAS. However, listed companies apply IAS 37, which defines what companies should disclose in environmental terms concerning provisions, contingent liabilities and contingent assets.

Sustainability, social responsibility, or integrated reports emerge as a means of voluntary disclosure to stakeholders of companies' social, environmental and economic performance. Garg (2010) questions whether the content of this report should be included in the annual report or whether it should be presented independently.

However, the fact that there is no legislation requiring its preparation leads to a lack of homogeneity in form and content (Eugénio and Gomes, 2013), at least until the EU Directive 2014/95/EU entry into force.

Sustainability reporting consists in measuring, disclosing, and reporting practices to various stakeholders on environmental and social issues, offering a balanced and sensible description of companies' sustainability performance reporting, including both positive and negative information, according to the Global Report Initiative (GRI, 2007). According to GRI (2012), several reasons lead companies to voluntarily prepare a sustainability report to demonstrate commitment and be transparent; demonstrate the capacity to participate in competitive markets; plan activities; become more sustainable and position the companies and follow the legislation.

The GRI is a non-profit organization created in 1997 with the cooperation of the *Coalition for Environmentally Responsible Economies* (CERES) and the *United Nations Environment Programme* (UNEP), which issues and aims to use guidelines in the realization of sustainability reports to promote the three preambles of sustainable development rigorously and globally ([www.globalreporting.org](http://www.globalreporting.org)). The GRI guidelines, now called standards, are of voluntary application, and each one is composed of specific indicators qualitatively and quantitatively. These guidelines increase the transparency of the information disclosed about the companies' social and environmental impacts (Gauthier, 2005).

In 2000, the primitive guidelines version, G1, was launched, becoming the first global framework for sustainability reporting. The G1 was the target of several improvements in the following years, culminating in the emergence of the G2 in 2002, a new guideline with guidelines for reporting. Later, in 2006, the third generation of Guidelines (G3) appeared a version emphasizing the quality assurance of reported information. In 2011 the G3.1 guideline was launched to complete and update the G3 guidelines, with guides on reporting the impact of business actions on the local community, human rights and gender. The latest guidelines (G4), launched in 2013, aim to increase adherence to sustainability reporting for all types of organizations (KPMG, 2013). This version of the GRI comprises three universal standards (GRI 101 - Fundamentals, GRI 102 - General Content and 103 - Management Approach) and three specific topics (economic, environmental, and social).

It should be noted that in this study, namely the empirical part, the indicators of the G4 guideline were used, given that the sample period is between 2015 and 2017. Regarding the G4 guideline, the GRI Standards present similar environmental indicators. The G4 emerges with 27 new disclosures, a new structure of guidance documents and two levels to report according to the new guidelines. For those reporting on sustainability, the G4 can lead to shorter but more focused reports on materially relevant aspects, reducing information but improving quality (KPMG, 2013). Given this, the concepts of essential and comprehensive disclosure levels are considered. According to Neto and Pereira (2018), the essential information in a sustainability report contains the fundamental elements, providing a scenario about the economic, environmental, social and corporate governance impacts through indicators by area. Concerning the comprehensive information, it discloses additional clarifications regarding the organization's strategy, analysis, ethics and integrity in addition to the criteria addressed in the so-called essential information.

### **2.3. Theoretical approach**

The literature suggests several theories to explain why companies disclose information voluntarily, including environmental information. Numerous studies have examined the changing state of information disclosure in the business sector, offering various theories on the tendency of business organizations to disclose information. The most commonly discussed theories include agency theory (Masum *et al.*, 2020), legitimacy theory (Serrano *et al.*, 2009; Monteiro *et al.*, 2023), stakeholder theory (Waheed and Yang, 2019), signalling theory (Monteiro *et al.*, 2023) and institutional theory (Griffin and Youm, 2018; Oliveira *et al.*, 2019). According to these theories, political, historical, socio-organizational, institutional, and cultural environments influence behavioural patterns

because an organization must justify its existence and actions to persist in these environments. This study is based on two theories widely used in environmental disclosure studies: legitimacy theory and stakeholder theory.

The legitimacy theory derives from the concept of organizational legitimacy, granting a company the right to conduct its operations according to the interests of the company (Ofoegbu, Odoemelam and Okafor, 2018). According to the same author, the main feature of the legitimacy theory is that companies can only survive if they act according to the structure of society's norms and values. The foundations of legitimacy theory argue that organizations are part of a broader social system in which they operate as an active part, i.e., organizations impact and are impacted by society and therefore need to be perceived as legitimate by society to ensure their survival (Dowling and Pfeffer, 1975; Suchman, 1995). To gain and maintain legitimacy, organizations adopt strategic orientations such as conforming to social norms and values, behaving in a socially responsible manner, disclosing information to legitimize their activities, and maintaining legitimacy in the eyes of stakeholders. Researchers have been studying the relationship between legitimacy theory and corporate social responsibility (CSR) practices. This includes examining how organizations use CSR initiatives to gain legitimacy, the role of legitimacy in shaping CSR reporting practices, and the effects of CSR on organizational legitimacy (Thomas and Lamm, 2012; Chauvey *et al.* 2015; Bachmann and Ingenhoff, 2016). Legitimacy theory is a widely used theoretical framework in accounting research (Tilling, 2004; Deegan, 2014; Deegan, 2019). It suggests that organizations have a social contract with their stakeholders, including the expectation that the organization behaves responsibly. In accounting research, legitimacy theory is often used to explain how and why organizations voluntarily disclose information, including environmental data. At the end of the 20th century, the legitimacy theory began to be used in the study of annual reports and later extended to sustainability reporting. Researchers began to explore the drivers and determinants of environmental and social disclosure, the role of legitimacy in defining reporting practices, and the impact of sustainability reporting on the legitimacy and performance of organizations.

For Hogner (1982), the social information disclosure by companies is a response to what society expects from the behaviour of the business world. According to legitimacy theory, organizations disclose information to legitimize their activities and maintain their legitimacy in the eyes of stakeholders. This is particularly relevant in the case of environmental disclosure, where organizations may be subject to public scrutiny and criticism for their environmental impact. By disclosing information about their environmental practices and performance, organizations can demonstrate that they take their environmental responsibilities seriously and are committed to sustainability. Overall, legitimacy theory provides a useful framework for understanding the motivations and implications of environmental disclosure in accounting research. It recognizes the importance of organizations' social and environmental responsibilities and the role of disclosure in fulfilling those responsibilities.

Stakeholder theory is another relevant theoretical framework used in accounting research, particularly social and environmental accounting. This theory suggests that organizations have multiple stakeholders with competing interests, including employees, customers, suppliers, and the environment. Freeman (1984) develops this theory in the organizational context considering the companies' stakeholders, referring more specifically to any person or group that may affect or be affected by the organization's actions. According to the same author, social and environmental disclosure is considered a means that helps the company better manage its relations with social and business partners. Thus, it can be seen that contrary to the legitimacy theory, where society is seen as a "whole", the stakeholder theory assumes the existence of several aggregates with different expectations (Mitchell, Agle, and Wood, 1997; Clarkson, 1995). For Deegan (2002), the stakeholder theory is more framed with the concerns of specific groups of society and the ability of different stakeholders to pressure companies to disclose environmental information. According to Ofoegbu *et al.* (2018), to survive and perform well, companies need a good relationship with their stakeholders, and one of the ways to maintain this relationship is to provide information through voluntary social and environmental disclosures to get support and connection with these same partners.

In accounting research, stakeholder theory is often used to explain why organizations make environmental disclosures and how these disclosures affect stakeholder relationships (Huang and Kung, 2010), to investigate the factors that influence environmental disclosure practices (Nassreddine, 2022), including stakeholder demands and organizational characteristics (Maon, Lindgreen and Swaen, 2010), to examine the effects of green disclosure on stakeholder relationships such as trust, satisfaction and loyalty (Kang and Hur, (2012). Thus, environmental and social topics disclosure in annual reports is a critical condition for an organization to respond to the increasing information needs of its stakeholders. In this sense, meeting the information needs of its stakeholders has become the primary reason for organizations to disclose information. Stakeholders may be interested in information about the environmental organization's footprint, its steps to reduce it, and the effectiveness of these efforts. By responding to the information interests of their stakeholders, organizations gain their trust and engagement, which favourably boosts their long-term performance. Using this theory, accounting researchers can better understand the factors that influence environmental disclosure practices and the effects of disclosure on stakeholder relationships and organizational outcomes. There has been increased focus on understanding stakeholder involvement and participation in corporate decision-making processes (Edelenbos and Klijn, 2006), the stakeholders' importance and prioritization (Boesso and Kumar, 2009), consideration of their power and legitimacy, and how organizations manage conflicting stakeholder interests (Rawlins, 2006). At the same time, there has been increasing attention to stakeholder influence and activism, particularly in corporate social responsibility and sustainability (Doh, and Guay, 2006). Thus, under this theory, the environmental and social matters disclosure in annual reports is a fundamental requirement for a company to meet the growing information needs of its stakeholders.

Although both theories recognize the (i) importance of organizational legitimacy; (ii) the significance of social expectations and norms; (iii) the critical role of disclosure and transparency in organizational behaviour; and (iv) the importance of organizations adopting socially and environmentally responsible behaviours, they differ on some key points, as shown in Table 1.

**Table 1.** Differences between Legitimacy Theory and Stakeholder Theory

Legitimacy theory	Stakeholders Theory
society, as a whole, is the primary stakeholder, and stakeholders are seen as part of a broader societal context	individual stakeholders are treated differently, with different and diverse interests and influence
takes a macro-level perspective and treats stakeholders as aggregates	takes a more granular approach, engaging with key stakeholders based on their power, legitimacy, and urgency
organizations derive their legitimacy from society's acceptance and acknowledgement of their actions	organizations derive their legitimacy from stakeholders themselves by meeting their expectations, demands, and needs
focuses on organizations' strategic decisions to respond to external pressures and the potential consequences of legitimacy threats	focuses on the inclusion of stakeholders in the decision-making process, their participation, and collaboration in shaping organizational decisions

*Source:* Authors

By combining these two theories, investigators can better understand the relationships between organizations, society, and stakeholders.

#### **2.4. Relationship between Industry and EDI**

In the last decades, several studies have been conducted on disclosing environmental issues and the factors influencing the EDI. Eugénio (2004) mentions that many Portuguese companies have materially relevant information on environmental matters, which is not disclosed anywhere in their reports and accounts. Later, Ribeiro

and Gúzman (2010) mention that given that environmental conservation requires both private and public entities to adopt a position of awareness and put into practice actions that lead to environmental conservation, there is an increase in interest, shown by a wide range of agents, in accounting information that goes beyond the mere financial dimension and includes information social and environmental type.

Previous studies verify that the social and environmental information disclosure level is influenced by several factors, internal and external to company (Monteiro, 2021; Mata, Fialho and Eugénio., 2018). Studies point out the activity sector as a factor that influences the companies' environmental disclosure practices (De Villiers and Staden, 2006; Monteiro and Guzmán, 2010). Empirical evidence shows that companies considered more sensitive to environmental issues tend to disclose more information about their environmental performance to obtain legitimacy with stakeholders (Monteiro and Guzmán, 2010; Monteiro, Pereira and Barbosa, 2021).

## **2.5. Relationship between EDI and Performance**

The literature on financial performance is vast. Financial performance is related to the achieved financial goals of a company. The term measures a company's financial health over time (Jihadi, Vilantika, Hashemi, Arifin, Bachtiar and Sholichah, 2021). Several authors use accounting information to assess profitability. The most common ones are, namely, return on equity (ROE), return on assets (ROA) and Earnings before interests and taxes (EBIT) (Janošová, 2018; Guillen, Natale and Polanco, 2015; Monteiro, Aibar-Guzmán, 2010).

Furthermore, Elshabasy (2018) and Pucheta-Martínez, Bel-Oms and Rodrigues (2020) state that previous empirical evidence shows mixed results because they used different indicators to assess the relationship between profitability and EDI. Numerous studies analyze the impact of financial performance on EDI; however, few studies examine the effect of the inverse relationship. In this regard, Chen, Hung and Wang (2018) state that mandatory CSR reporting firms experience a decrease in profitability using ROA and ROE; Haninun, Lindrianasari and Denziana (2018) founds that environmental reporting and performance positively impact financial information.

## **3. Methodology**

This study aims to analyze the disclosure of environmental information in corporate reports (annual and sustainability reports) and the relationship between industry and EDI and between EDI and profitability.

Considering that listed companies are the companies that disclose more information, this study is applied to Portuguese listed companies (Euronex Lisbon) ((Monteiro and Aibar-Guzmán, 2010). A total of 43 companies represented the sample by 70%, since sports corporations (4 companies) and companies that did not show any activity on the stock exchange in the last months (9 companies) were excluded. The reports period analysis is from 2015 to 2017, so the analysis is performed based on 90 observations.

Annual and sustainability reports, if any, were analyzed from 2015 to 2017. The content analysis technique is widely used in studies in the accounting area and has stood out even more in recent years in studies focused on sustainability disclosure.

As the objective is to analyze the disclosure of environmental information in mandatory reports (annual report) and voluntary reports (sustainability report, we developed two EDIs. One is called the environmental disclosure index in annual reports (EDI\_ar), and the other is the environmental disclosure index in sustainability reports (EDI\_sr).

EDI\_ar was developed based on the information required to be disclosed under FRAS 26 (Monteiro *et al.*, 2023). EDI\_rs, based on GRI guidelines, EDI\_rs includes the following categories: Materials, Energy, Water, Biodiversity, Emissions, Effluents and Waste, Products and Services. These categories comprise 34 indicators in total (Monteiro *et al.*, 2023).

EDI (EDI\_ar and EDI\_sr) is measured as follows:

$$EDI_n = \sum_{n=1}^e \frac{e_j}{e}$$

$e_j$  - Indicators disclosed in the reports (number)

$e$  - Maximum of indicators (number)

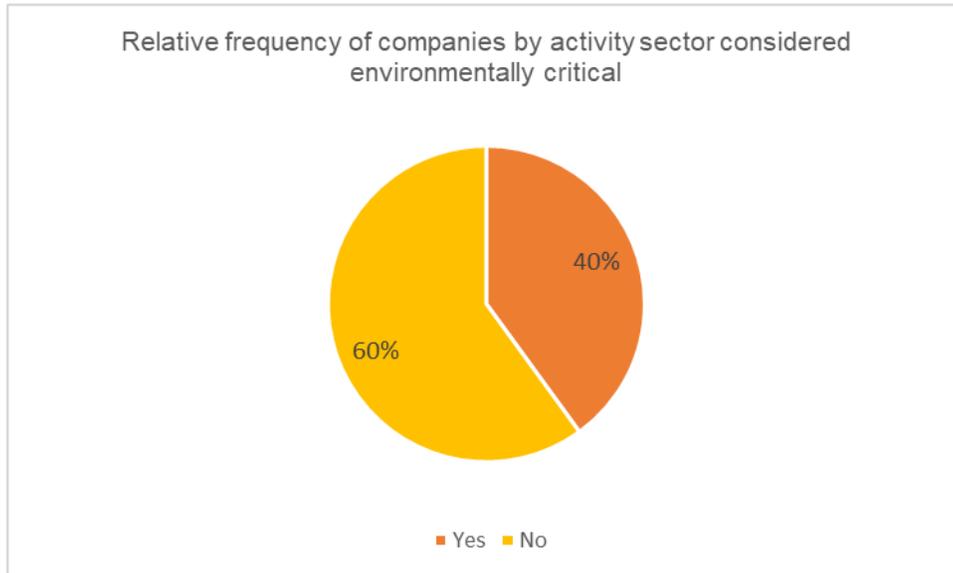
- A *Dummy* dichotomous variable will be used in the measurement of EDI variable. A specific indicator will have "1", if it is disclosed. However, if the indicator is not in the report, it will have "0".
- The industry is also a dichotomous variable that takes the value of 1 if the company belongs to an environmentally sensitive industry (energy, paper pulp and oil/gas) and 0 (zero) for all other companies (Monteiro *et al.*, 2023; Archel and Lizarraga, 2001).
- Financial performance (profitability) is measured through the indicator EBIT.

In this study, we analyzed two models: Model 1 - Analysis of the impact of industry and EDI\_ar on profitability; Model 2 Analysis of the effect of industry, EDI\_sr on profitability. Models 1 and 2 are analyzed in the Process Macro of SPSS Software.

#### 4. Analysis and discussion of results

Most Portuguese-listed companies analyzed in this study belong to the services, manufacturing and basic materials sectors (73.4%). The remaining companies operate in energy, technology, business, oil and gas and telecommunications.

For the analysis proposed, the activity sector is classified according to the proposal of Archel and Lizarraga (2001). Figure 1 shows that 40% of the companies operate in an environmentally critical sector.



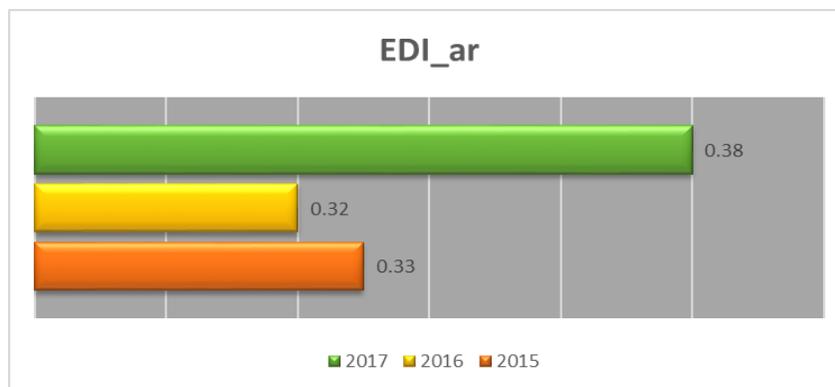
**Figure 1.** The relative frequency of companies by activity sector is considered environmentally critical.

From 2015 to 2017, we found that about 23% of the companies do not disclose environmental information in their corporate reports. Of those that do disclose information on this topic, most disclose it in the annual report, about one-tenth of the companies disclose it in the sustainability report and one third in both reports.

The first objective of this study is to analyze the evolution of EDI from 2015 to 2017 and to verify if there are differences between the evolution of EDI in the mandatory and voluntary documents.

Results show that the environmental information disclosure level is shallow in both the annual report and the sustainability report.

In the annual report, which is a mandatory document, the EDI varies from 0.33 (2015) to 0.38 (2017), showing a slight increase of 15%, although from 2015 to 2016 it has a practically insignificant negative variation (Figure 2).



**Figure 2.** EDI\_ar 2015, 2016 and 2017

EDI in sustainability reports, assessed according to the GRI indicators, show a positive evolution in all years (Figure 3). From 2015 to 2017, EDI\_sr grew by around 30%.

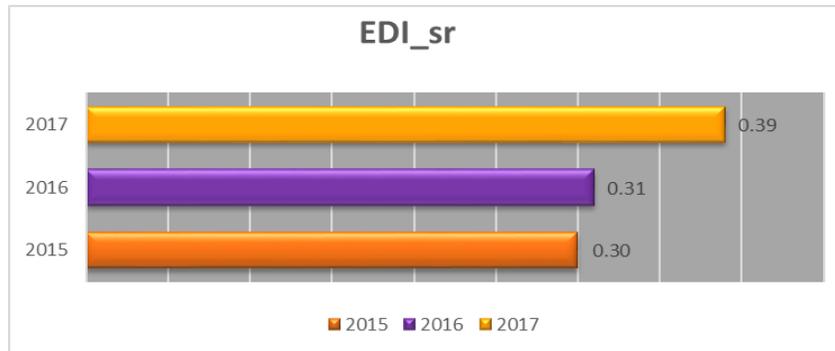
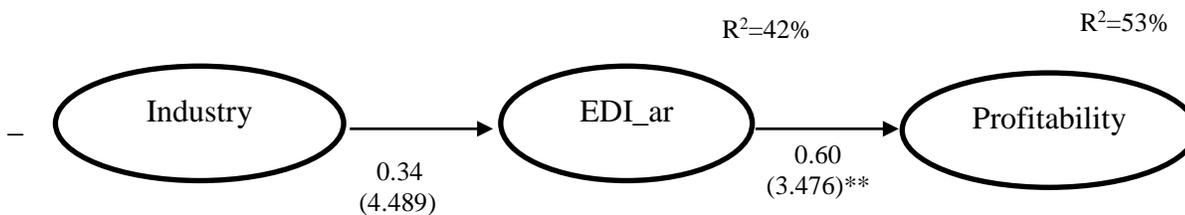


Figure 3. EDI\_sr in 2015, 2016 and 2017

Our empirical evidence reveals that EDI increased from 2015 to 2017, although the rise is more pronounced in sustainability reports (voluntary document). Results are consistent with those of Monteiro and Aibar-Guzmán (2010). These authors, for the period from 2002 to 2004, found an increase in EDI in the annual reports of large Portuguese companies.

The second study objective is to analyze the relationship between industry and EDI (in annual reports and sustainability reports) and this variable and companies' performance (profitably). Figure 4 shows the Model 1 results. In this study, the industry (environmentally sensitive) positively and significantly impacts the EDI\_ar ( $\beta=0.34$ ;  $t=4.489$ ;  $p=0.0001$ ;  $F=20.148$ ). The coefficient of determination indicates that the industry has an explanatory power of the variable EDI\_ar at 42%. Furthermore, it contributes favourably to the profitability of the analyzed companies ( $\beta=0.60$ ;  $t=3.476$ ;  $p=0.0017$ ;  $F=15.329$ ).  $R^2$  suggests that the industry and EDI\_ar variable explain a significant portion of the profitably variance (53%). Thus, EDI\_ar is a variable that mediates the relationship between industry and profitably. The results show that the industry does not have a significant and direct influence on the profitably of companies, but it has a positive impact through EDI\_ar variable ( $\beta=0.14$ ).



Note: \* significance at 0.1%; \*\* significance at 1%

Figure 4. Results to Model 1

Figure 5 presents the Model 2 results. Our empirical evidence suggests that the industry (environmentally sensitive) tends to disclose environmental information in sustainability reports ( $\beta=0.18$ ;  $t=2.091$ ;  $p=0.0457$ ). This variable variance is determined by industry in 14%. In turn, the EDI\_sr impacts profitably variance ( $\beta=0.33$ ;  $t=$

2.106;  $p=0.0447$ ). R2 suggests that a significant portion of profitability variance (42%) is explained by the EDI\_sr and industry variables. Thus, the results indicate that EDI\_sr is a variable that favours profitability. As for model 1, the industry variable did not show a significant and direct relationship with profitability, but it indirectly influences the dependent variable through EDI\_sr ( $\beta=0.6$ ).

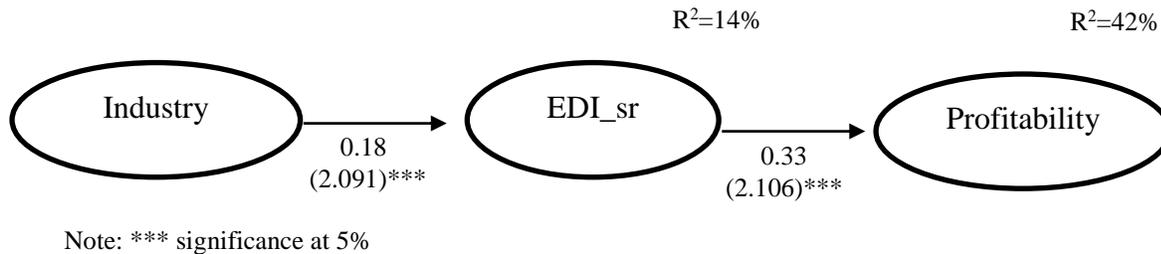


Figure 5. Results to model 2

## 5. Conclusions

Climate change and other current environmental problems put pressure on the business sector and other institutions to put into practice the notions of social responsibility and sustainable development. Thus, organizations can play a significant role in advancing the sustainable development agenda (Rosati and Faria, 2019). Moreover, accounting is essential regarding environmental sustainability because it prepares environmental information and its disclosure, which is paramount for stakeholders. The stakeholders are increasingly concerned with environmental issues and want companies to commit to these areas to benefit the company and society. Based on the stakeholder and legitimacy theories, this research aimed to investigate the disclosure of environmental information in a sample of companies listed on the stock exchange from 2015 to 2017, before Directive 2014/95/EU entered into force. In addition, it analyzed the relationship between the industry, disclosure of environmental information (EDI) and profitability, verifying whether the EDI enhances the companies' financial performance.

Regarding the environmental information disclosure evolution, the results obtained allow us to conclude that there is a positive evolution in the level of environmental disclosure by companies listed on the Lisbon stock exchange between the years 2015 and 2017. Specifically, the results show a positive variation in EDI\_ar of 5 % and EDI\_sr of 26% between 2015 and 2017. This conclusion is in line with what can be expected since environmental concerns are increasingly a prominent issue in society, so it is likely that companies develop environmentally friendly actions and disclose these same actions (Ribeiro and Gúzman, 2010, Monteiro, Pereira and Barbosa, 2021).

Deegan (2002) states that companies disclose information to legitimize an organization's operations. In the context of legitimacy and stakeholder theories, our results also show that companies that belong to industries considered sensitive in environmental terms present better levels of environmental information disclosure in their reports. In the same way, Mata *et al.* (2014), Deegan and Blomquist (2006), Deegan *et al.* (2002) found that companies that develop less environmentally friendly activities are those that disclose more environmental information in corporate reports. According to Doan and Sassen (2020), poor environmental performers have greater motivation to increase their disclosure level than solid environmental performers. Empirical evidence also indicates that companies with better EDI are the most profitable. Our results are not consistent with the study of Chen *et al.* (2018). In this study, we found that companies subject to more significant environmental risks seek to be more transparent, benefiting from the advantage of disclosure with effects on their financial performance.

The study is applied to a sample of listed companies in Euronext Lisbon. For this reason, it is not possible to generalize the results. In addition, the analysis period is limited (2015 to 2017). Finally, this research analyzes the extent of environmental information disclosure (whether disclosed or not) and not the quality of the information disclosed in corporate reports.

For future research, we suggest expanding the sample to other companies and more recent years. Future studies may also analyze the quality of environmental information disclosure in reports. This research is important for practice as it shows a positive trend in environmental information disclosure. It also provides empirical evidence that companies operating in environmentally critical industries disclose more information to legitimize their activity with stakeholders.

## References

- Accounting Standards Committee (2002). Directriz Contabilística nº 29 - Matérias Ambientais. [http://www.apotec.pt/fotos/editor2/DC\\_n\\_29.pdf](http://www.apotec.pt/fotos/editor2/DC_n_29.pdf)
- Akdere, M. (2011). An analysis of decision-making process in organizations: Implications for quality management and systematic practice. *Total Quality Management*, 22(12), 1317-1330. <https://doi.org/10.1080/14783363.2011.625180>
- Akhtar, S., & Liu, Y. (2018). SMEs' use of financial statements for decision making: Evidence from Pakistan. *Journal of Applied Business Research*, 34(2), 381-392. <https://doi.org/10.19030/jabr.v34i2.10138>
- Álvarez-García, J., & del Río Rama, M. (2016). Sustainability and EMAS: Impact of Motivations and Barriers on the Perceived Benefits from the Adoption of Standards. *Sustainability*, 8(10), 1057. <https://doi.org/10.3390/su8101057>
- Anand, M. B., & Srineevasa, D. L. (2014). Environmental Accounting-An Essential Tool for Long Run Survival. *International Journal of Current Research and Academic Review*, 2(3), 34-41.
- Archel, P., & Lizarraga, F. (2001). Some determinants of environmental information disclosed by listed Spanish companies. *Journal of Accounting*, 4(7), 129-153.
- Aviso n.º 15655/2009, publicado pelo Diário da República, 2.ª série - N.º 173 - 7 de Setembro de 2009 referente à homologação das Normas Contabilísticas e de Relato Financeiro do Sistema de Normalização Contabilística, aprovado pelo Decreto -Lei n.º 158/2009, de 13 de Julho.
- Aviso n.º 8254/2015, de 29 de julho, publicado no Diário da República, 2.ª série n.º 146, de 29 de julho. Estrutura Conceptual do Sistema de Normalização Contabilística.
- Bachmann, P., & Ingenhoff, D. (2016). Legitimacy through CSR disclosures? The advantage outweighs the disadvantages. *Public Relations Review*, 42(3), 386-394. <https://doi.org/10.1016/j.pubrev.2016.02.008>
- Bebbington, J., & Thomson, I. (2007). Social and environmental accounting, auditing, and reporting: a potential source of organizational risk governance? *Environment and Planning C: Government and Policy*, 25(1), 38-55. <https://doi.org/10.1068/c0616j>
- Boesso, G., & Kumar, K. (2009). An investigation of stakeholder prioritization and engagement: who or what really counts. *Journal of Accounting & Organizational Change*, 5(1), 62-80. <https://doi.org/10.1108/18325910910932214>
- CE (2001). Recomendação da Comissão 2001/453/CE de 30 de maio de 2001, respeitante ao reconhecimento, à valorimetria e à prestação de informações sobre questões ambientais nas contas anuais e no relatório de gestão das sociedades. *Jornal Oficial das Comunidades Europeias*, L156 de 13/06/2001, p. 33-42.

- Cepêda, C. L. M., & Monteiro, A. P. (2020). A percepção dos contabilistas sobre a utilidade da informação financeira na tomada de decisão-Um estudo em Portugal. *Revista Brasileira de Gestão de Negócios*, 22, 363-380.
- Chauvey, J. N., Giordano-Spring, S., Cho, C. H., & Patten, D. M. (2015). The normativity and legitimacy of CSR disclosure: Evidence from France. *Journal of Business Ethics*, 130, 789-803. <https://doi.org/10.1007/s10551-014-2114-y>
- Chen, Y. C., Hung, M., & Wang, Y. (2018). The effect of mandatory CSR disclosure on firm profitability and social externalities: Evidence from China. *Journal of Accounting and Economics*, 65(1), 169-190. <https://doi.org/10.1016/j.jacceco.2017.11.009>
- Clarkson, M. B. E. (1995). A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of Management Review*, 20(1), 92-117. <https://doi.org/10.2307/258888>
- Clarkson, P. M., Overell, M. B., & Chapple, L. (2011). Environmental reporting and its relation to corporate environmental performance. *Abacus*, 47(1), 27-60. <https://doi.org/10.1111/j.1467-6281.2011.00330.x>
- Companies Code. <https://dre.pt/dre/legislacao-consolidada/decreto-lei/1986-34443975>
- Consoni, S., & Douglas Colauto, R. (2016). Voluntary disclosure in the context of convergence with International Accounting Standards in Brazil. *Revista Brasileira de Gestão de Negócios*, 18(62), 658-677. <https://doi.org/10.7819/rbgn.v18i62.2242>
- DC (2002). Directriz Contabilística n.º 29 - Matérias Ambientais.
- De Villiers, C., & Van Staden, C. J. (2006). Can less environmental disclosure have a legitimizing effect? Evidence from Africa. *Accounting, Organizations and Society*, 31(8), 763-781. <https://doi.org/10.1016/j.aos.2006.03.001>
- Decreto-Lei n.º 158/2009, de 13 de julho, alterado pelo Decreto -Lei n.º 98/2015, de 2 de junho.
- Deegan, C. (2002). Introduction: The legitimizing effect of social and environmental disclosures-a theoretical foundation. *Accounting, Auditing & Accountability Journal*, 15(3), 282-311. <https://doi.org/10.1108/09513570210435852>
- Deegan, C. (2014). An overview of legitimacy theory as applied within the social and environmental accounting literature. *Sustainability Accounting and Accountability*, 248-272.
- Deegan, C. M. (2019). Legitimacy theory: Despite its enduring popularity and contribution, time is right for a necessary makeover. *Accounting, Auditing & Accountability Journal*, 32(8), 2307-2329. <https://doi.org/10.1108/AAAJ-08-2018-3638>
- Deegan, C., Blomquist, C. (2006). Stakeholder influence on corporate reporting: An exploration of the interaction between WWF-Australia and the Australian minerals industry. *Accounting, Organizations and Society*, 31(4-5), 343-372. <https://doi.org/10.1016/j.aos.2005.04.001>
- Deegan, C., Rankin, M., & Tobin, J. (2002). An examination of the corporate social and environmental disclosures of BHP from 1983-1997: A test of legitimacy theory. *Accounting, Auditing & Accountability Journal*, 15(3), 312-343. <https://doi.org/10.1108/09513570210435861>
- Doan, M. H., & Sassen, R. (2020). The relationship between environmental performance and environmental disclosure: A meta-analysis. *Journal of Industrial Ecology*, 24(5), 1140-1157. <https://doi.org/10.1111/jiec.13002>
- Doh, J. P., & Guay, T. R. (2006). Corporate social responsibility, public policy, and NGO activism in Europe and the United States: An institutional-stakeholder perspective. *Journal of Management studies*, 43(1), 47-73. <https://doi.org/10.1111/j.1467-6486.2006.00582.x>
- Dowling, J., & Pfeffer, J. (1975). Organizational legitimacy: Social values and organizational behavior. *The Pacific Sociological Review*, 18(1), 122-136. <https://doi.org/10.2307/1388226>
- Eierle, B., & Schultze, W. (2013). The role of management as a user of accounting information: implications for standard setting. *Journal of Accounting and Management Information Systems*, 12(2), 155-189.
- Edelenbos, J., & Klijn, E. H. (2006). "Managing stakeholder involvement in decision making: A comparative analysis of six interactive processes in the Netherlands. *Journal of Public Administration Research and Theory*, 16(3), 417-446. <https://doi.org/10.1093/jopart/mui049>

- Elshabasy, Y. N. (2018). The impact of corporate characteristics on environmental information disclosure: an empirical study on the listed firms in Egypt. *Journal of Business and Retail Management Research*, 12(2), 232-241. <https://doi.org/10.24052/JBRMR/V12IS02/TIOCCOEIDAESOTLFIE>
- Eugénio, T. (2004). Contabilidade e gestão ambiental. Lisboa: Áreas Editora.
- Freeman, R. E. (1984). Strategic Management: A stakeholder approach. Boston: Pitman.
- Garg, L. (2010). Assurance on Sustainability Reporting, The Institute of Chartered Accountants of India. [http://icai.org/post.html?post\\_id=2929](http://icai.org/post.html?post_id=2929)
- Gauthier, C. (2005). Measuring corporate social and environmental performance: the extended life-cycle assessment. *Journal of Business Ethics*, 59(1-2), 199-206. <https://doi.org/10.1007/s10551-005-3416-x>
- GRI (2007). G3: Diretrizes para a Elaboração de Relatórios de Sustentabilidade, Versión 3. [http://www.ipai.pt/fotos/gca/g3\\_pobr\\_rg\\_final\\_with\\_cover\\_1271097860.pdf](http://www.ipai.pt/fotos/gca/g3_pobr_rg_final_with_cover_1271097860.pdf)
- GRI (2012). Relatórios de Sustentabilidade da GRI: Quanto vale essa jornada. Series de aprendizagem da GRI. <https://docplayer.com.br/767501-Relatorios-de-sustentabilidade-da-gri.html>
- GRI (2015). G4 - Diretrizes para Relato de Sustentabilidade: Princípios para Relato e Conteúdos Padrão. [https://edisciplinas.usp.br/pluginfile.php/3368600/mod\\_resource/content/1/Brazilian-Portuguese-G4-Part-One.pdf](https://edisciplinas.usp.br/pluginfile.php/3368600/mod_resource/content/1/Brazilian-Portuguese-G4-Part-One.pdf)
- Griffin, J.J., Youm, Y.N. (2018). Voluntarily disclosing prosocial behaviors in Korean firms. *Journal of Business Ethics*, 153(4), 1017-1030. <https://doi.org/10.1007/s10551-018-3915-1>
- Enríquez-de-Salamanca, Á. (2018). Stakeholders' manipulation of environmental impact assessment. *Environmental Impact Assessment Review*, 68, 10-18. <https://doi.org/10.1016/j.eiar.2017.10.003>
- Haninun, N. A., Lindrianasari, & N. A., Denziana, A. (2018). "The effect of environmental performance and disclosure on financial performance. *International Journal of Trade and Global Markets*, 11(1/2), 138. <https://doi.org/10.1504/ijtgm.2018.092471>
- Hogner, R. H. (1982). Corporate social reporting: eight decades of development at US Steel. *Research in Corporate Performance and Policy*, 4(1), 243-250.
- Huang, C. L., & Kung, F. H. (2010). Drivers of environmental disclosure and stakeholder expectation: Evidence from Taiwan. *Journal of Business Ethics*, 96, 435-451. <https://doi.org/10.1007/s10551-010-0476-3>
- Janošová, L. (2018). Age Diversity Among Board Members in the Czech Companies. ICMLG 2018, 6th International Conference on Management Leadership and Governance. Academic Conferences and publishing limited.
- Jihadi, M., Vilantika, E., Hashemi, S. M., Arifin, Z., Bachtiar, Y., & Sholichah, F. (2021). The effect of liquidity, leverage, and profitability on firm value: Empirical evidence from Indonesia. *Journal of Asian Finance, Economics and Business*, 8(3), 423-431. <https://doi.org/10.1080/23311975.2021.1920116>
- Kang, S., & Hur, W. M. (2012). "Investigating the antecedents of green brand equity: a sustainable development perspective. *Corporate Social Responsibility and Environmental Management*, 19(5), 306-316. <https://doi.org/10.1002/csr.281>
- KPMG (2006). Estudo da KPMG sobre a publicação de relatórios de sustentabilidade em Portugal, KPMG Advisory - Consultores de Gestão, Portugal. <https://pt.scribd.com/document/215555776/Relatorios-Sustentabilidade-Portugal-KPMG2006>
- Maon, F., Lindgreen, A., & Swaen, V. (2010). "Organizational stages and cultural phases: A critical review and a consolidative model of corporate social responsibility development. *International Journal of Management Reviews*, 12(1), 20-38. <https://doi.org/10.1111/j.1468-2370.2009.00278.x>
- Masum, M.H., latiff, A.R.A., & Osman, M.N.H. (2020). Ownership structure and corporate voluntary disclosures in transition economy. *Journal of Asian Finance, Economics and Business*, 7(10), 601-611. <https://doi.org/10.13106/jafeb.2020.vol7.no10.601>
- Mata, C., Fialho, A., & Eugénio, T. (2014). A análise da investigação em contabilidade sobre relato ambiental: 2006 - 2011. *Universo Contábil*, 10(4), 182-199. <https://doi.org/10.4270/ruc.2014436>

- Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of Management Review*, 22(4), 853-886. <https://doi.org/10.2307/259247>
- Monteiro, A. P. (2021). Social Accounting: Analysis of the Disclosure on Labor Practices and Human Rights and Its Determinants. Doctoral Programme in Economics and Business. International Doctoral School of USC. Universidade de Santiago de Compostela.
- Monteiro, A. P., García-Sánchez, I. M., & Aibar-Guzmán, B. (2022). Labour practice, decent work and human rights performance and reporting: The impact of women managers. *Journal of Business Ethics*, 180(2), 523-542. <https://doi.org/10.1007/s10551-021-04913-1>
- Monteiro, A. P., Pereira, C., & Barbosa, F. M. (2023). Environmental disclosure on mandatory and voluntary reporting of Portuguese listed firms: the role of environmental certification, lucratively and corporate governance. *Meditari Accountancy Research*, 31(3), 524-553. <https://doi.org/10.1108/MEDAR-09-2020-1001>
- Monteiro, A. P., Pereira, C., & Barbosa, F. M. (2021). Determinants of Environmental Responsibility Disclosure on Mandatory and Voluntary Reporting of Portuguese Listed Firms. *Journal of Environmental Accounting and Management*, 9(3), 219-233. <https://doi.org/10.5890/JEAM.2021.09.003>
- Monteiro, S. M., & Guzmán, B. (2010). The influence of the Portuguese environmental accounting standard on the environmental disclosures in the annual reports of large companies operating in Portugal: A first view (2002-2004). *Management of Environmental Quality: An International Journal*, 21(4), 414-435. <https://doi.org/10.1108/14777831011049070>
- Nassreddine, G. (2022). Structural analysis of factors influencing environmental disclosure. *Cogent Economics & Finance*, 10(1), 2024723. <https://doi.org/10.1080/23322039.2021.2024723>
- Neto, R. J., & Pereira, C. A. (2018). Relação entre o nível de relatórios de sustentabilidade de empresas pertencentes ao índice IBRX50 baseadas na metodologia GRI e o nível de Governança Corporativa. *RAGC*, 6(24), 79-94.
- Ofoegbu, G. N., Odoemelam, N., & Okafor, R. G. (2018). Corporate board characteristics and environmental disclosure quantity: Evidence from South Africa (integrated reporting) and Nigeria (traditional reporting). *Cogent Business & Management*, 5(1), 1-27. <https://doi.org/10.1080/23311975.2018.1551510>
- Oliveira, J.da S., Azevedo, G.M.do C., & Silva, M.J.P.C. (2019). Institutional and economic determinants of corporate social responsibility disclosure by banks: institutional perspectives. *Meditari Accountancy Research*, 27(2), 196-227. <https://doi.org/10.1108/MEDAR-01-2018-0259>
- Pucheta-Martínez, M. C., Bel-Oms, I., & Rodrigues, L. L. (2020). Does stakeholder engagement encourage environmental reporting? The mediating role of firm performance. *Business Strategy And The Environment*, 29(8), 3025-3037. <https://doi.org/10.1002/bse.2555>
- Rawlins, B. L. (2006). Prioritizing stakeholders for public relations. Institute for public relations 1-14. [https://www.researchgate.net/profile/Brad-Rawlins-3/publication/237280162\\_Prioritizing\\_Stakeholders\\_for\\_Public\\_Relations/links/004635385ef7a53ba000000/Prioritizing-Stakeholders-for-Public-Relations.pdf](https://www.researchgate.net/profile/Brad-Rawlins-3/publication/237280162_Prioritizing_Stakeholders_for_Public_Relations/links/004635385ef7a53ba000000/Prioritizing-Stakeholders-for-Public-Relations.pdf)
- Ribeiro, V. P., & Guzmán, C. (2010). Determinants of environmental accounting practices in local entities: evidence from Portugal. *Social Responsibility Journal*, 6(3), 404-419 <https://doi.org/10.1108/17471111011064771>
- Rosati, F., & Faria, L. G. D. (2019). Business contribution to the Sustainable Development Agenda: Organizational factors related to early adoption of SDG reporting. *Corporate Social Responsibility and Environmental Management*, 26(3), 588-597. <https://doi.org/10.1002/csr.1705>
- Saremi, H., & Nezhad, B. M. (2014). Role of environmental accounting in enterprises. *Ecology Environment and Conservation*, 20(3), 1257-1268.
- Schaltegger, S., & Burritt, R. (2000). Contemporary environmental accounting: issues concepts and practice. Sheffield, UK: Greenleaf Publishing Limited.
- Serrano-Cinca, C., Rueda-Tomás, M., & Portillo-Tarragona, P. (2009). Factors influencing e-disclosure in local public administrations. *Environment and planning C: Government and Policy*, 27(2), 355-378. <https://doi.org/10.1068/c07116r>

- Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, 20(3), 571-610. <https://doi.org/10.2307/258788>
- Schwartz, M. (2016). Ethical decision-making theory: An integrated approach. *Journal of Business Ethics*, 139(4), 755-776 <https://doi.org/10.1007/s10551-015-2886-8>
- Thomas, T. E., & Lamm, E. (2012). Legitimacy and organizational sustainability. *Journal of Business Ethics*, 110, 191-203. <https://doi.org/10.1007/s10551-012-1421-4>
- Tilling, M. V. (2004). Some thoughts on legitimacy theory in social and environmental accounting. *Social and Environmental Accountability Journal*, 24(2), 3-7. <https://doi.org/10.1080/0969160X.2004.9651716>
- Waheed, A., & Yang, J. (2019). Effect of corporate social responsibility disclosure on firms' sales performance: a perspective of stakeholder engagement and theory. *Corporate Social Responsibility and Environmental Management*, 26(3), 559-566. <https://doi.org/10.1002/csr.1701>
- Wilkinson, A., & Mangalagiu, D. (2012). Learning with futures to realize progress towards sustainability: The WBCSD Vision 2050 Initiative. *Futures*, 44(4), 372-384. <https://doi.org/10.1016/j.futures.2011.12.001>
- Yakhou, M., & Dorweiler, V. P. (2004). Environmental accounting: an essential component of business strategy. *Business Strategy and the Environment* 13(2), 65-77. <https://doi.org/10.1002/bse.395>
- Zrnić, A., Starčević, D. P., & Mijoč, I. (2020). Evaluating environmental accounting and reporting: the case of Croatian listed manufacturing companies. *Pravni vjesnik*, 36(1), 47-63. <https://doi.org/10.25234/pv/8089>

**Funding:** This research was funded by Portuguese national funds through FCT – Fundação para a Ciência e Tecnologia, under the project UIDB/05422/2020

**Data Availability Statement:** Please ask the correspondent author

**Author Contributions:** Conceptualization: *Albertina Paula Monteiro, Francisco Barbosa, Amélia Silva*; methodology: *Albertina Paula Monteiro, Francisco Barbosa*; data analysis: *Albertina Paula Monteiro, Francisco Barbosa*, writing—original draft preparation: *Albertina Paula Monteiro, Francisco Barbosa*, writing; *Albertina Paula Monteiro, Amélia Silva, Catarina Cepêda*; review and editing: *Albertina Paula Monteiro, Amélia Silva, Catarina Cepêda*; visualization: *Albertina Paula Monteiro, Amélia Silva, Catarina Cepêda*. All authors have read and agreed to the published version of the manuscript.

**Albertina Paula MONTEIRO** is Accounting Lecture at Porto Accounting and Business School, Polytechnic of Porto, she has a Phd in Business, from University of Minho, Portugal, and a Phd in Accounting, from University of Santiago Compostela, Spain. Her research interests are accounting, social responsibility reporting, sustainability reporting, accounting information systems and earnings management.

**ORCID ID:** <https://orcid.org/0000-0002-2146-9807>

**Francisco BARBOSA** is a Chartered Accountant, he has a master degree in accounting and finance from Porto Accounting and Business School, Polytechnic of Porto. His research interests are environmental accounting and non-financial reporting.

**ORCID ID:** <https://orcid.org/0000-0001-8466-4370>

**Amélia SILVA** is a Coordinating Professor at Porto Accounting and Business School, Polytechnic of Porto, she has a Phd in Accounting, from University of Vigo, Spain. Her research interests are accounting for decision making, digital transformation in accounting, accounting for sustainability, and business failure prediction.

**ORCID ID:** <https://orcid.org/0000-0002-8366-9863>

**Catarina CEPÊDA** is Accounting Lecture at Porto Accounting and Business School, she has a Phd student at University of Minho, Portugal. Her research interests are financial reporting, non-financial reporting and decision making.

**ORCID ID:** <https://orcid.org/0000-0002-3911-0894>

---

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by author(s) and VsI Entrepreneurship and Sustainability Center  
This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>





**Publisher**

<http://jssidoi.org/esc/home>



## TRAINING HIGHER EDUCATION STUDENTS FOR EMPLOYABILITY SKILLS: IS IT WORTH IT?\*

Mercedes Rubio-Andrés <sup>1\*</sup>, María del Mar Ramos-González <sup>2</sup>, Manuel M. Molina-López <sup>3</sup>,  
Miguel Ángel Sastre-Castillo <sup>4</sup>

<sup>1,4</sup> Complutense University of Madrid, Faculty of Commerce and Tourism, Av. De Filipinas 3, 28003 Madrid, Spain

<sup>2</sup> Complutense University of Madrid, Faculty of Economics and Business, Pozuelo de Alarcón, 28223 Madrid, Spain

<sup>3</sup> CEU San Pablo University, CEU Universities, Faculty of Economics and Business, Julián Romea 23, 28003 Madrid, Spain

E-mails: <sup>1\*</sup> [mercedesrubio@ucm.es](mailto:mercedesrubio@ucm.es) (Corresponding author); <sup>2</sup> [marram24@ucm.es](mailto:marram24@ucm.es); <sup>3</sup> [manuelmaria.molinalopez@ceu.es](mailto:manuelmaria.molinalopez@ceu.es);  
<sup>4</sup> [msastre@emp.ucm.es](mailto:msastre@emp.ucm.es)

Received 11 February 2023; accepted 19 June 2023; published 30 June 2023

**Abstract.** This paper reflects on the importance of employability skills for higher education students in the present and future working environment to determine the impact these skills may have on student competitiveness and satisfaction. The study focused on university students in the Madrid region during their final academic year who participated in a teaching activity that launched real business challenges. We created a model that analyzed the impact of employability skills on student competitiveness and satisfaction and the mediating role of competitiveness in two different moments (before and during the COVID-19 pandemic). Empirical findings suggest that students' improved employability skills increased their competitiveness and satisfaction, with competitiveness as a mediating factor. Thus, academic authorities must focus on students acquiring employability skills, which are among the most valuable in the labour market and positively impact student competitiveness and satisfaction. This way, future graduates can work successfully in a changing and demanding world and find positions aligned with their training. In contrast to some studies that place the teacher as the research target, ours focused on the student and the impact these skills have on the variables mentioned.

**Keywords:** competence; higher education; ability; attitudes; entrepreneurial intention

**Reference** to this paper should be made as follows: Rubio-Andrés, M., Ramos-González, M.d.M., Molina-López, M.M, Sastre-Castillo, M.A. 2023. Training higher education students for employability skills: Is it worth it? *Entrepreneurship and Sustainability Issues*, 10(4), 390-407. [http://doi.org/10.9770/jesi.2023.10.4\(24\)](http://doi.org/10.9770/jesi.2023.10.4(24))

**JEL classifications:** A23, C15, I23, M12, M51

---

\* This research was funded by UCM-Cofares Research Chair Spain. We are also acknowledged the collaboration of the Chair Universidad CEU San Pablo—Mutua Madrileña (060516-USPMM-02/17) and Research Project: PID2020-114183RB-I00.

## 1. Introduction

The expansion of economies and businesses worldwide has meant that universities face the great challenge of adequately educating future professionals, as a digital and globalized world requires a more competitive and better-prepared workforce. This rapidly developing phenomenon is a multidimensional and multifactor process that affects all educational institutions and, in particular, the competitiveness of universities (Coroş et al., 2021; Agapito et al., 2022). By 2025, half of all jobs will be predicted to be filled by highly skilled workers (Bileviciute et al., 2019).

According to Labas et al. (2016), more competitive higher education institutions (HEIs) will likely retain students. University competitiveness involves more than coping with external factors such as globalization but also with internal factors that affect efficient change management, which influences long-term financial sustainability (Rogers, 2019). To cope with this situation, universities must provide quality training focused on graduate needs for entering the labour market, which goes beyond discipline-specific skills and focus on various skills (Caballero et al., 2011), such as employability (Cotronei-Baird, 2020). For Griffin and Coelho (2019), employability skills remain an ongoing topic of debate, with studies addressing the ability of HEIs to produce graduates who are ready for the workforce.

According to Finch et al. (2013), universities are increasingly aware of the vital role they play in preparing future workers and have already shown a strong interest in increasing the employability of their graduates, which has become a critical factor for labour markets (Fugate et al., 2004; Weerathunga & Mallawarachchi, 2020).

In this line, Wilton (2012) highlights two key reasons to focus on improving employability skills: meeting the need for highly qualified staff in companies and increasing educational and employment opportunities for students. Therefore, students must acquire employment skills in advance. Employers are increasingly more interested in their employees' soft skills than in the theoretical knowledge acquired during their university education (Chamorro-Premuzic & Furnham, 2010), conditioned usually by their need to solve their business problems creatively. To respond to this interest, university students must be trained to have the essential skills and successfully develop their professional activity by providing appropriate proposals (Weerathunga & Mallawarachchi, 2020). In a McKinsey survey, 40% of employers posed that there is a significant skill gap between graduates and entry-level requirements: "There is a problem with education systems that do not prepare future workers with the kind of skills required by today and tomorrow's organizations" (McKinsey & Company 2012). In the same vein, Singh and Ehlers (2020) have suggested that there need to be more graduates with adequate interpersonal skills to fill available positions, which results in a potential mismatch between HEIs and the labour market.

There is another tendency, such as that followed by Li et al. (2006), who assess the results of surveys conducted on labour market prospects, concluding that the proportion of university-educated workers who are subsequently overqualified for the jobs they hold has been increasing in the last years. Therefore, universities must ensure that their graduates are qualified and skilled in professional decision-making while knowing how to demonstrate their abilities in a highly competitive labour market (Finch et al., 2013). It is paradoxical that many higher education graduates are overqualified for the position they hold but need more employability skills, making it sometimes difficult to find employment (Clokic & Fourie, 2016).

Regarding the specific employability skills that employees might require, we could highlight the approach of Jackson (2016), who states that communication, teamwork, and self-management are necessary. Companies widely accept these abilities, which is the reason why the efforts of the education community to foster graduate employability should, therefore, be extended to their development (Almerich et al., 2019).

Researchers' interest in how HEIs address the improvement of students' employability (Masduki et al., 2022) has been increasing in the last ten years, motivated by the increased speed of technological changes, globalization, and new business models (De Vos et al., 2021). But despite a positive evolution of the literature, there is still a need for further literature review and empirical studies that address new trends and variables related to employability skills, as well as more applied to countries such as Spain, where the number of studies is significantly lower than other countries such as the United Kingdom or the United States (Dinh et al., 2022). We must consider that employability has also become a topic of vital urgency in the literature due to the lack of graduate training that would allow them to acquire the necessary qualities to meet the requirements of an increasingly demanding labour market (Vande-Wiele, 2017).

So far, most previous methodologies have developed outcome-based learning to enhance employability skills (Noori and Azmi, 2021); other newer methods enable the acquisition of such skills. In our case, we propose a different learning based on solving business challenges. Considering these premises, our research addresses both gaps, on the one hand, by conducting an applied study in Spain through less employed learning and, on the other hand, starting from a review of the literature related to employability skills.

We study whether participation in an undergraduate challenge from two universities in the Region of Madrid (Spain) improves students' employability-related skills and the influence that possessing these skills might have on their competitiveness and satisfaction. Specifically, we define our research questions: (1) Do students' employability skills improve by solving real challenges? (2) Do employability skills lead to more competent and satisfied students? (3) Does student competitiveness have a mediating effect on employability skills and satisfaction?

The remainder of the paper is organized as follows: The theoretical framework is developed, explaining and defining the importance of employability competencies and posing the hypotheses of the established model. The methodology is then described, and the data obtained through structural equations are analyzed, followed by an analysis of the obtained results and the most relevant conclusions. Finally, the limitations of the study and future research lines are established.

## **2. Theoretical Framework and hypotheses**

Employability is one of the challenges set out in the Declaration of Leuven of 2009, as it is understood to empower the individual to make the most of the opportunities offered by the changing labour market with the new requirements of Industry 4.0. Employability is often defined as obtaining and retaining formal employment or finding a new job if necessary (Fugate et al., 2004).

The research trends regarding the concept of employability have changed through the years, being the hot topics of the last years of their studied period, the employer requirements and HEI preparation. In this line, Vande-Wiele (2017) posits that identifying the needs of the labour market is crucial, and this topic is urgent.

Argos and Ezquerro (2014) question whether academic curricula in HEIs are designed to accommodate, cater for, and enhance necessary competencies for students. Schech et al. (2017) confirm that universities are making improvements to incorporate employability into their teaching programmes so that graduates can compete in a globalized environment, while Jiracheewong et al. (2019) go further and state that curricula do not specifically address employability skills, making it difficult for university students to develop practical skills. However, even if such skills were to be incorporated into academic curricula, those needed by new graduates are changing faster than educational programmes can adapt, so there is a need to implement activities within subjects that enable students to acquire these skills. As demonstrated in their empirical study by Menshikov et al. (2021), the activities implemented in the academic environment determine students' employability. Therefore, if skills are not incorporated into

university studies, students will not fully understand the importance of practical employability due to a lack of consideration of future career prospects.

According to Cavanagh (2015), university lecturers must actively intervene by developing effective learning activities for students to develop employability skills. Indeed, more than passive student learning as a mere recipient of lectures is required to cope with today's work environment. Ripollés (2011) and Bager (2011) stress the need to use methodologies in which the learner takes an active and participatory role. Therefore, working on employability skills through challenges is increasingly essential to provide students with the necessary tools. This is precisely the aim of the entrepreneurial challenges we have designed as an innovative activity to develop the skills described above. In this line, Jackson and Wilton (2016) recommend that students reflect on their learning to understand better the relationship between the working world and their undergraduate studies; this allows them to integrate theory with practice better because they have more opportunities to practise the knowledge and skills they have acquired as they try to solve real problems (Weisz & Smith, 2005).

As students' progress through the academic year, they become more aware of employment challenges, particularly in their final year of study, driven by the search for employment opportunities (Qenani et al., 2014). For this reason, our research aims to provide evidence of the need for more studies.

In this vein, Llinares et al. (2013) point to establishing close links between academia and business to promote employability among undergraduates. In addition, the demand for new graduate employees and employers' expectations that graduates possess general and specific skills highlight the importance of methodological initiatives that link educational institutions with businesses to achieve better job-ready graduates (Orr et al., 2023).

Thus, university courses aiming to improve personal strategies, such as time management skills or learning and self-motivation techniques that could be later translated into higher employability and that can be transferred from a particular field of study to life, have long been popular (Fry et al., 2003).

There is a lack of consensus on how employability can be solely defined for undergraduate students, as universities can choose to develop these types of projects in many ways, such as targeting specific groups of scholars, whether struggling or high potential or for targeted training, directly designed to promote one or more soft skills (Emanuel et al., 2021). Jackson and Wilton (2016) refer to graduate employability as the tools to get and maintain suitable quality employment and eradicate the social reproduction of inequality, which many drivers are constantly shaping. In this line, Fugate et al. (2004) argue that employability consists of means and competency attributes that contribute to a person's success in working life and that employers expect workers to possess, which may raise their expectations about their subordinates. Employability skills are the core element of human capital (Yorke, 2006). It includes having the skills and the ability to communicate and demonstrate them directly to employers (Hillage & Pollard, 1998). Therefore, Hora (2018) emphasizes the need for society to recognize universities as places of legitimization of employability skills.

At the same time, the literature has been concerned with finding those factors or skills characteristic of employability. Jackson (2013) identifies self-management, teamwork, communication, problem-solving, and critical thinking, while Donald's (2019) literature review identifies the need to expand on the above classification and include the seven most cited skills from the Dearing Report (2017): oral communication, problem-solving, teamwork, literacy skills, time management, information technology skills, and numeracy skills. Other authors, such as Finch et al. (2013), distinguish between distinct types of skills by trying to group them. The first group would be communication skills, including written (Andrews & Higson, 2008; Gardner et al., 2005) and verbal and listening skills (Grey, 2010; Gardner et al., 2005). A second group, problem-solving skills (Lievens & Sackett, 2012), in turn, incorporates a range of competencies, such as leadership (Conrad & Newberry, 2012), creativity (Kilgour & Koslow, 2009), and flexibility (Barr et al., 2009; Jabr, 2011) and critical thinking (Reid & Anderson,

2012). Empirical evidence suggests that soft skills are an essential predictor of employment (Lievens & Sackett, 2012; Finch et al., 2013).

### **2.1 Impact of employability skills on student satisfaction**

The pursuit of employability has consequences for the satisfaction of HEI students. Kotler and Clarke (1987) defined satisfaction as a state felt by someone who has experienced a performance or outcome that meets their expectations. Satisfaction could be identified as a function of the relative level of expectations and perceived performance, seen as intentional performance that results in contentment (Malik et al., 2010). Many studies have attempted to analyze why some students are more satisfied than others, and various attempts have been made to identify its determinants (Aldridge & Rowley, 1998). Knowing and understanding all the elements that can impact scholar satisfaction creates a valuable resource for research (De Cuyper et al., 2012). It is known that satisfied students with their learning environment and experience can lead to better learning outcomes, which may generate more qualified professionals (Duque & Weeks, 2010; Yusoff et al., 2015).

Following Denson et al. (2010), a significant predictor of student satisfaction is the ability to enroll in courses and activities at an HEI as the student who decides to join this type of activities that, a priori, brings them a closer approach to the company (Hew et al., 2020). For this reason, the possibility of participating in a challenge would affect their satisfaction because the student enrolls in it. HEIs should consider the wide range of elements that increase student satisfaction levels, such as employability, and propose activities that improve student employability. The acquisition of employability skills is here seen as a determinant of student satisfaction and is the independent variable of the proposed model of our study. We understand that students with more employability skills are more satisfied, leading to the following hypothesis.

*Hypothesis 1. The acquisition of employability skills is positively related to student satisfaction.*

### **2.2 Impact of employability skills on university student competitiveness**

While all employability skills are essential, some are particularly vital from employers' perspective. According to Wilton's (2012) findings, a graduate with scarcer skills (e.g., advanced IT skills) will achieve a higher excellent salary in particular employment searches and potentially superior employment outcomes. In the same vein, Finch et al. (2013) have argued that new degree holders who demonstrate employability-related skills (e.g., effective communication and interpersonal skills) might be more competitive in the labour market than those who do not. This is because skills related to critical thinking, entrepreneurship, decision-making, and working under pressure are among the most essential competencies employers look for when hiring new degree holders (Hogan et al., 2013). Creativity, motivation, and learning styles derived from students' goals, values, and attitudes can improve student competitiveness (Howard et al., 2015). Within the university field, the level of understanding and training of specific abilities is a key factor for students in developing skills that make them more competitive (Barba-Sánchez et al., 2021). Under these premises, students with employability skills will be more competitive. We, therefore, pose the following hypothesis:

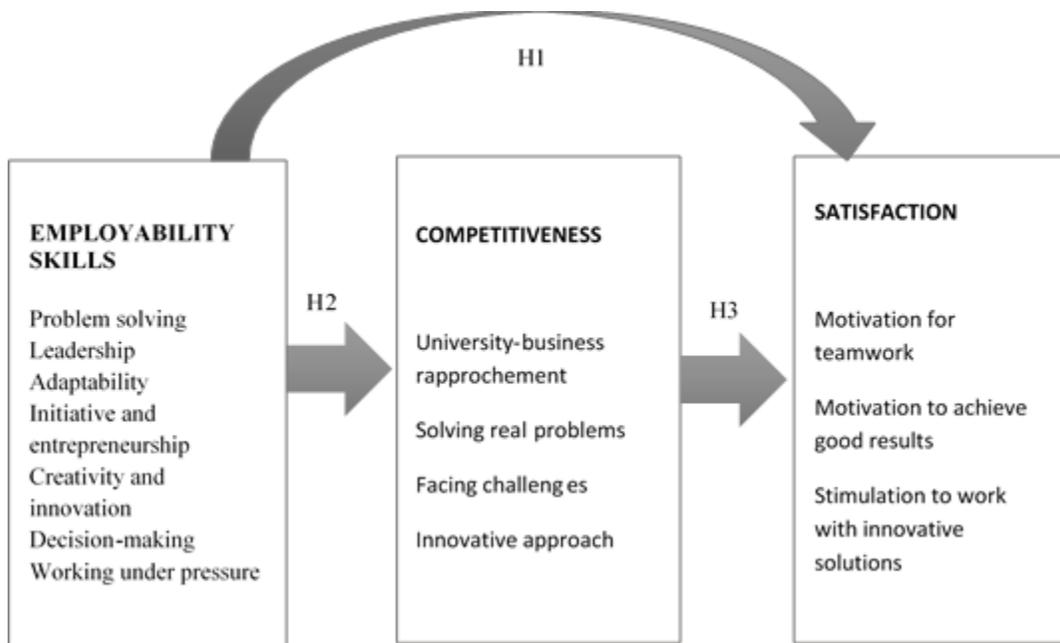
*Hypothesis 2. Employability skills positively affect student competitiveness.*

**2.3 Mediating Role of Competitiveness**

Competitiveness is a personality trait that affects how someone behaves in various personal and professional situations (Smither & Houston, 1992), and it is considered essential for achieving high levels of satisfaction. One of the most relevant elements for students is innovative didactic activities aligned with business reality, which prepares students to be more competitive. In their study, Barba-Sánchez et al. (2021) show that university activities related to entrepreneurship directly influence students' entrepreneurial intention and attitude towards entrepreneurship, contributing to students' perceived control to manage a company and self-confidence. In this sense, Pérez-Rivero & Ubierna (2021), in an applied study on university students' motivation for entrepreneurship, identified the factors that affect the push to promote entrepreneurship, soft skills a key one. The educational system conditions its students' competitiveness and satisfaction (e.g., Misiak-Kwit & Zhang, 2022) show how Chinese students evaluate their educational process higher than European ones). In our study, the motivation referred to by the authors is related to their competitiveness so that it will generate actions in the individual and, therefore, satisfaction. In a sample of university students, Stander et al. (2015) demonstrated how proactive behaviour determines their satisfaction with their studies. Consequently, we consider that more competitive students will achieve higher satisfaction because they are aware of the improvement achieved, so we define the following hypothesis:

*Hypothesis 3. Student competitiveness is related to satisfaction.*

In Figure 1, we graphically represent the relationships between the study variables:



**Figure 1.** Proposed Model  
 Source: Own elaboration

### 3. Methodology

#### 3.1 Population and sample

In contrast to some studies that place the teacher as the target of the research (Arifin, 2015), our study focuses on the students (Raihan & Azad, 2021). The sample we used is final-year students for a bachelor’s degree in business administration at two universities in the region of Madrid who participated in a teaching activity called Challenges, which consists of launching real business challenges at two different moments, before and during the COVID-19 pandemic. In the 2019–20 academic year, a total of 175 students participated, 112 of whom completed the questionnaire correctly. In 2020–21, the pandemic year, our sample was 102 students, all of whom completed the questionnaire correctly. The activity occurred during the first semester of each academic year (September–January). On a scale of 1 to 5, participants rated the level that best describes their ability after facing the proposed challenge. They rated 31 indicators (e.g., oral communication, learning aptitude, creativity), 18 related to employability skills, 7 to competitiveness, and 6 to student satisfaction.

#### 3.2 Measurement instrument

The questionnaire was designed for this study by selecting indicators, variables, and links based on the literature. The questions relate to employability skills, student competitiveness after participating in the challenge, and satisfaction.

#### 3.3 Data Processing

We used structural equation modelling (SEM) and statistical methods to estimate the chains of causal relationships between the unobservable latent variables (Williams et al., 2009).

We have also performed a power analysis using G\*Power 3 (Faul et al., 2007) for the regression with our model's most significant independent variables (i.e., 3). To achieve 80% power with a large effect size (0.4), a sample of 80 cases is required. In our case, both samples of model 1 and model 2 exceed the number recommended by the analysis.

The present study used reflective variables to respond to research objectives (Hair et al., 2014). The indicators and observable variables reflect the constructs, linked to the selected indicators, and are not directly observed (Wetzels et al., 2009) (Table 1).

**Table 1.** Description of the Variables, Indicators and Authors

EMPLOYABILITY SKILLS	Indicators		Authors
	EK_1	Teamwork <sup>(*)</sup> (**)	Wilton, 2012; Donald et al., 2019; Barr et al., 2009; Jabr, 2011; Jiracheewewong et al., 2019; Conrad & Newberry, 2012; Chhinzer & Russo, 2018; Jabr, 2011; Barr et al., 2009; Jackson & Kilgour & Koslow, 2009; Reid & Anderson, 2012; Fallows & Steven, 2000; Finch et al., 2013
EK_2	Autonomous Learning <sup>(*)</sup> (**)		
EK_3	Problem-solving		
EK_4	Management of ICT management <sup>(**)</sup>		
EK_5	Leadership		
EK_6	Ability to adapt to new situations		
EK_7	Initiative and entrepreneurial spirit		
EK_8	Creativity and Innovation		
EK_9	Decision-making		
EK_10	Working under pressure <sup>(**)</sup>		
EK_11	Assuming responsibility		
EK_12	Negotiation <sup>(*)</sup> (**)		
EK_13	Self-confidence		

	EK_14	Detecting new ideas and opportunities	
	EK_15	Acquiring new knowledge	
	EK_16	Motivation to improve <sup>(*)</sup>	
	EK_17	Apply knowledge in practice <sup>(*)</sup>	
	EK_18	Critical thinking	
<b>COMPETITIVENESS</b>	COM_1	Real problem-solving <sup>(**)</sup>	Smither & Houston, 1992; Chamorro-Premuzic et al., 2010.
	COM_2	University-business rapprochement	
	COM_3	Proactive Student Input	
	COM_4	Facing a Challenge	
	COM_5	Novel approach	
	COM_6	Choosing my partners favours my competitiveness <sup>(*) (**)</sup>	
	COM_7	Training <sup>(*)</sup>	
<b>SATISFACTION</b>	SAT_1	Increased motivation to achieve good results	Krägeloh et al., 2019; Chhinzer & Russo, 2018.
	SAT_2	Increased motivation for teamwork	
	SAT_3	More motivation as a result of being able to compete with other teams	
	SAT_4	More stimulation for work with novel solutions	
	SAT_5	Greater satisfaction with creative work	
	SAT_6	I would again participate <sup>(*)</sup>	
<sup>(*)</sup> not significant in model 1: Pre-COVID-19 <sup>(**)</sup> not significant in model 2: During COVID-19			

Source: Own elaboration

## 4. Results

### 4.1 Evaluation of the measurement model

The individual reliability of each indicator or manifest variable was tested by examining the weights obtained by PLS ( $\lambda$ ). An initial iteration of the algorithm was carried out using SmartPLS. Indicators with standardized weights below 0.4 were removed (Churchill, 1979, cited in Henseler et al., 2009), and both models were reformulated. There are some differences in the significance of the indicators; specifically, in model 1, the indicators COM\_7, SAT\_6, EK\_16 and EK\_17 were not significant but were significant in model 2. On the other hand, COM\_1, EK\_4 and EK\_10 were substantial in Model 1 but not in Model 2. We decided to keep these minor differences in the indicators in both models because it is a necessary construct. In both models, Cronbach's Alpha was also considered satisfactory, as the obtained values are over 0.70 (Hair et al., 2014). The first model is between 0.818 and 0.927, and the second is between 0.756 and 0.909. For Fornell and Larcker (1981), composite reliability is a preferable criterion, as it reaches an appropriate value, high in both models (0.832 or more). For Henseler et al. (2009), only values below 0.60 indicate a lack of reliability.

The criterion establishes AVE values of at least 0.5 for latent variables (Fornell & Larcker, 1981; cited in Henseler et al., 2009). As can be seen in Table 2, this is significant in both models, except for Employability in Model 2, which is slightly below that value (0.478).

Table 2. Construct Discriminant and Convergent Validity

INDICATORS	'Pre-COVID-19' model				During-COVID-19 Model			
	Loads ( $\lambda$ )	CA	CR	AVE	Loads ( $\lambda$ )	CA	CR	AVE
<b>COMPETITIVENESS</b>		<b>0.818</b>	<b>0.872</b>	<b>0.578</b>		<b>0.756</b>	<b>0.832</b>	<b>0.502</b>
COM_1	<b>0.731</b>				—			
COM_2	<b>0.742</b>				0.554			
COM_3	<b>0.851</b>				<b>0.755</b>			
COM_4	<b>0.771</b>				<b>0.752</b>			
COM_5	<b>0.700</b>				0.646			
COM_7	—				<b>0.808</b>			
<b>SATISFACTION</b>		<b>0.828</b>	<b>0.879</b>	<b>0.592</b>		<b>0.852</b>	<b>0.891</b>	<b>0.577</b>
SAT_1	<b>0.807</b>				<b>0.792</b>			
SAT_2	<b>0.755</b>				<b>0.754</b>			
SAT_3	<b>0.721</b>				<b>0.714</b>			
SAT_4	<b>0.811</b>				<b>0.744</b>			
SAT_5	<b>0.748</b>				0.678			
SAT_6	—				<b>0.861</b>			
<b>EMPLOYABILITY SKILLS</b>		<b>0.927</b>	<b>0.936</b>	<b>0.533</b>		<b>0.909</b>	<b>0.922</b>	0.478
EK_3	<b>0.717</b>				0.629			
EK_4	<b>0.700</b>				—			
EK_5	0.684				0.682			
EK_6	<b>0.773</b>				0.692			
EK_7	<b>0.754</b>				0.686			
EK_8	<b>0.706</b>				0.617			
EK_9	<b>0.760</b>				<b>0.742</b>			
EK_10	0.591				—			
EK_11	<b>0.752</b>				0.677			
EK_13	<b>0.724</b>				0.689			
EK_14	<b>0.789</b>				<b>0.713</b>			
EK_15	<b>0.780</b>				0.662			
EK_16	—				<b>0.730</b>			
EK_17	—				<b>0.768</b>			
EK_18	<b>0.734</b>				0.685			
CA = Cronbach Alpha; CR = Composite Reliability; AVE = Average Variance Extracted Source: Own based on SmartPLS								

Source: Own based on SmartPLS

#### 4.2 Discriminant validity

The results obtained when testing the discriminant validity of the constructs applying the Fornell-Larcker criterion (Fornell & Larcker, 1981) are shown in Table 3. We observe that the discriminant validity of each construct is different from the rest of the constructs to which it is not related.

**Table 3.** Fornell–Larcker Criterion

	Pre-COVID-19 Model			'During-COVID-19' model		
	Competitiveness	Satisfaction	Employability Skills	Competitiveness	Satisfaction	Employability Skills
<b>COMPETITIVENESS</b>	0.761			0.709		
<b>SATISFACTION</b>	0.690	0.769		0.674	0.760	
<b>EMPLOYABILITY SKILLS</b>	0.671	0.672	0.730	0.653	0.564	0.691

Source: Own based on SmartPLS

Henseler et al. (2016) showed that the lack of validity is detected through the heterotrait-monotrait ratio indicator (HTMT). In our study, the HTMT was lower than one, which is consistent with the study by Gold et al. (2001), which would even consider a value of 0.90. The proposed constructs are fully compliant, as seen in Table 4.

**Table 4.** Heterotrait-Monotrait Ratio (HTMT)

	'Pre-COVID-19' model			During-COVID-19 Model		
	Competitiveness	Satisfaction	Employability Skills	Competitiveness	Satisfaction	Employability Skills
<b>COMPETITIVENESS</b>						
<b>SATISFACTION</b>	<b>0.813</b>			<b>0.772</b>		
<b>EMPLOYABILITY SKILLS</b>	<b>0.736</b>	<b>0.740</b>		<b>0.747</b>	<b>0.621</b>	

Source: Own based on SmartPLS

We found no significant residual values in the residual correlation matrix that would indicate substantial prediction error for indicators or manifest variables.

### 4.3 Evaluation of structural model

The structural model assessment includes various evaluations (Hair et al., 2014; Henseler et al., 2009). We studied multicollinearity in the structural model through tolerance evaluation (below 0.20) and the variance inflation factor, with values below 5. The following table shows the results obtained, where it can be observed that all of them are below (Table 5).

**Table 5.** VIF values

	'Pre-COVID-19' model		During-COVID-19 Model	
	Competitiveness	Satisfaction	Competitiveness	Satisfaction
<b>COMPETITIVENESS</b>		<b>1.818</b>		<b>1.742</b>
<b>SATISFACTION</b>				
<b>EMPLOYABILITY SKILLS</b>	<b>1.000</b>	<b>1.818</b>	<b>1.000</b>	<b>1.742</b>

Source: Own based on SmartPLS

Table 6 shows the results of the beta ( $\beta$ ) coefficient results and the degree of significance and importance of the value distribution using the student's t-test. To test the hypotheses, a bootstrapping procedure with 5,000 subsamples was used (Chin et al., 2003). Regarding the first model, the results provide empirical support for the hypotheses used to structure the research. The H1, H2, and H3 results confirm the positive and significant effects of the variables

( $p < 0.000$ ). Employability skills lead to greater student satisfaction and improved competitiveness. In the second model, the empirical results also confirm all the hypotheses. In the case of hypotheses H2 and H3, the significance level is  $p=0.000$ . For the case of H1, the effects of employment skills on satisfaction are also positive and significant ( $p < 0.05$ ), significantly mediated by variable competitiveness (indirect effect of 0.348).

In statistical terms, the direct effect of employability skills on satisfaction is 0.380, and the mediator of competitiveness is 0.292, so the total effect is 0.672. In the second model, this relationship is even stronger because the mediating effect of competitiveness is 0.348, and the direct effect is 0.216, so the total effect is 0.564.

**Table 6.** Hypothesis Comparison

Hypotheses		'Pre-COVID-19' model			During-COVID-19 Model			Supported
		$\beta$ Coefficients	t-values	p-values	$\beta$ Coefficients	t-values	p-values	
<b>H1</b>	EMPLOYABILITY SKILLS> SATISFACTION	0.380	<b>3.770</b>	<b>0.000</b>	0.216	<b>2.229</b>	0.026	<b>Yes</b>
<b>H2</b>	EMPLOYABILITY SKILLS> COMPETITIVENESS	0.671	<b>13.547</b>	<b>0.000</b>	0.653	<b>10.824</b>	0.000	<b>Yes</b>
<b>H3</b>	COMPETITIVENESS> SATISFACTION	0.434	<b>4.388</b>	<b>0.000</b>	0.534	<b>6.373</b>	0.000	<b>Yes</b>

Source: Own based on SmartPLS

**4.4 Predictive relevance of the model**

According to the obtained  $R^2$  results, the predictive power of reputation is moderate in both models. Specifically, for competitiveness, 45% and 42.6% of the variability in each model is explained by the latent variable employability skills. For satisfaction, 55.5% and 48.2% of the variability is explained by the latent variable Employability skills and competitiveness, respectively.

The size of  $f^2$  measures the effects of an exogenous construct on an endogenous one by the change in  $R^2$  of the endogenous construct when excluding the exogenous one. We obtained remarkable results in our model for  $f^2$ . The effect of employability skills on competitiveness is high in both models ( $f^2 = 0.818$  and  $f^2=0.742$ , respectively) and medium in satisfaction ( $f^2 = 0.233$  in the first model). The effect of competitiveness on satisfaction is considered medium in the second model ( $f^2=0.315$ )

According to the results obtained, the model has predictive relevance due to the positive value for each endogenous variable according to the Q2 criterion of Stone (1974) and Geisser (1975).

**Table 7.** Construct cross-validated redundancy

VARIABLES	'Pre-COVID-19' model		'During-COVID-19' model	
	Q <sup>2</sup>	R <sup>2</sup>	Q <sup>2</sup>	R <sup>2</sup>
COMPETITIVENESS	0.243	0.450	0.199	0.426
SATISFACTION	0.314	0.555	0.264	0.482

Source: Own based on SmartPLS

## 5. Discussion and Conclusions

The role of higher education is becoming even more critical given the increasing demand for highly qualified and socially responsible people in the labour market. Moreover, today's higher education faces significant transformations caused by integrating new technologies into academic activity and the active demand for effective training models.

Therefore, HEIs must be more responsible for the future career path of their graduates and should strive to respond to employer demands, as graduate employability has increasingly become the critical measure of university value (Argos & Ezquerro, 2014). Some authors question the role of HEIs in the challenge of training their students in an increasingly digitalized, discontinuous, and global market (Martínez-Clares & González-Lorente, 2021).

Thus, it is necessary to train students in employability skills that will enable them to successfully meet the challenges of their professional future, whether they work in large companies, small and medium enterprises (SMEs), or as entrepreneurs. However, these competencies only sometimes guarantee professional success (Baruch & Bozionelos, 2011). Encourage innovative teaching activities that promote the acquisition of employment skills should be a priority for universities, primarily when curricula do not always provide an agile response to the incorporation of the skills needed to achieve employment for future graduates (Jackson, 2013; Argos & Ezquerro, 2014; Jiracheewong et al., 2019).

The relationship between employability and education has been studied from the perspective of stakeholders such as university recruiters (Moy, 2006), faculty members (Aistrich et al., 2006) and employers (Finch et al., 2013).

Our study was conducted from the student's perspective, being an interesting approach since research studies exploring student satisfaction with academic and university life are limited (Argos & Ezquerro, 2014; Martínez-Clares & González-Lorente, 2021). Moreover, it was conducted at two essential points in time. The first collected information from the pre-pandemic year in Spain (Sept 2019–Jan 2020), while the second considered students living in quarantine who had to learn digitally (Sept 2020–Jan 2021). Both models confirm the direct effect of employability skills on competitiveness and student satisfaction, which are significant according to the results. We also confirmed the impact of competition on student satisfaction. These findings are essential and novel because of the established relationships. Therefore, we recommend that academic authorities focus on employability skills due to the improvements they provide to university students and their impact on student competitiveness and satisfaction. It is necessary to promote the implementation of fundamental challenges to enhance employability skills, as academic curricula are not sufficiently agile to achieve them (Jiracheewong et al., 2019).

Our findings suggest that the need for students to learn employability skills in HEI is independent of the pandemic, as they influence competitiveness and student satisfaction, regardless of working in a more virtual world. Therefore, we have covered the gap in the literature related to Employability skills and, in a more novel way, incorporated variables on which it impacts in a country where, in comparison with other geographical areas, there is a significantly smaller number of empirical studies. In addition, our empirical results are carried out considering more novel and less studied teaching methodologies in terms of the improvement to be achieved for the acquisition of employability skills by university students.

## 6. Limitations and future research lines

We know that an innovative activity's contribution does not imply the total acquisition of employability skills among university students, but it is a good start. Furthermore, we empirically demonstrated how employability skills increased student competitiveness and satisfaction. Further studies could increase the sample with more students participating in the activity to obtain more robust results. Therefore, we propose expanding both the sample of students and the activities that improve the acquisition of employability skills. Although some studies related to competitiveness and soft skills try to analyze the impact of using an educational action as a sample only one university (Pérez-Rivero & Ubierna 2021), we consider that our study could be carried out in more universities, also considering different types of degree so that results could be compared.

Another proposal would be to conduct studies that assess the acquisition of employability skills of students from the perspective of employers and academic leaders, considering whether there is a relationship with variables such as future career success, the time horizon for obtaining a first job, or better job performance.

## References

- Agapito, J.J.J., Jala, L.L.C., & Cruz-Español, R. (2022). Predictors of entrepreneurial attitude among administrators of selected community colleges and universities in Leyte. *Insights into Regional Development*, 4(4), 36-51. [http://doi.org/10.9770/IRD.2022.4.4\(3\)](http://doi.org/10.9770/IRD.2022.4.4(3))
- Aistrich, M., Saghafi, M.M., & Sciglimpaglia, D. (2006). Ivory Tower or Real World: Do Educators and Practitioners See the Same World? *Marketing Education Review*, 16(3), 73-80. <https://doi.org/10.1080/10528008.2006.11488975>
- Aldridge, S., & Rowley, J. (1998). Measurement of customer satisfaction in Higher Education. *Quality Assurance in Education*, 6(4), 197-204. <https://doi.org/10.1108/09684889810242182>
- Almerich, G., Suárez-Rodríguez, J., Díaz-García, I., & Cebrián-Cifuentes, S. (2020). 21st-Century Competences: The Relation of ICT Competences with Higher-Order Thinking Capacities and Teamwork Competences in University Students. *Journal of Computer Assisted Learning*, 36(4), 468-479. <https://doi.org/10.1111/jcal.12413>
- Andrews, J., & Higson, H. (2008). Graduate Employability, 'Soft Skills' versus 'Hard' Business Knowledge: A European study. *Higher Education in Europe*, 33(4), 411-422. <https://doi.org/10.1080/03797720802522627>
- Argos, J., & Ezquerro, P. (2014). Universities and Skills for Employability. *Procedia-Social and Behavioral Sciences*, 139, 290-296. <https://doi.org/10.1016/j.sbspro.2014.08.002>
- Arifin, H.M. (2015). The influence of competence, motivation, and organizational culture on high school teacher job satisfaction and performance. *International Education Studies*, 8(1), 38-45. <http://dx.doi.org/10.5539/ies.v8n1p38>
- Bager, T. (2011). 16 Entrepreneurship Education and New Venture Creation: A Comprehensive Approach. Hindle, K., and Klyver, K. (Ed.s), *Handbook of Research on New Venture Creation*. Edward Elgar, Cheltenham, UK, p. 299. <https://doi.org/10.4337/9780857933065.00024>
- Barba-Sánchez, V., Mitre-Aranda, M., & Del Brío-González, J. (2022). The Entrepreneurial Intention of University Students: An Environmental Perspective. *European Research on Management and Business Economics*, 28(2), 100184. <https://doi.org/10.1016/j.iemeen.2021.100184>
- Barr, S.H., Baker, T., Markham, S.K. & Kingon, A.I. (2009). Bridging the Valley of Death: Lessons Learned from 14 Years of Commercialization of Technology Education. *Academy of Management Learning and Education*, 8(3), 370-388. <https://doi.org/10.5465/amle.8.3.zqr370>
- Baruch, Y., & Bozionelos, N. (2011). Career Issues. Zedeck, S. (Ed.), *Handbook of Industrial and Organizational Psychology*, American Psychological Association, Washington, DC, Vol. 2, pp. 67-113.
- Bileviciute, E., Draksas, R., Nevera, A., & Vainiute, M. (2019). Competitiveness in Higher Education: The Case of University Management. *Journal of Competitiveness*, 11(4), 5-21. <https://doi.org/10.7441/joc.2019.04.01>

- Caballero, C. L., Walker, A., & Fuller-Tyszkiewicz, M. (2011). The work readiness scale (WRS): Developing a measure to assess work readiness in college graduates. *Journal of Teaching and Learning for Graduate Employability*, 2(2), 41-54. <https://doi.org/10.21153/jtlge2011vol2no1art552>
- Cavanagh, J., Burston, M., Southcombe, A., & Bartram, T. (2015). Contributing to a Graduate-Centred Understanding of Work Readiness: An Exploratory Study of Australian Undergraduate Students' perceptions of their employability. *The International Journal of Management Education*, 13(3), 278-288. <https://doi.org/10.1016/j.ijme.2015.07.002>
- Chamorro-Premuzic, T., & Furnham, A. (2010). *The Psychology of Personnel Selection*. Cambridge University Press, Cambridge, UK.
- Chhinzar, N., & Russo, A.M. (2018). An Exploration of Employer Perceptions of Graduate Student Employability. *Education + Training*, 60(1), 104-120. <https://doi.org/10.1108/ET-06-2016-0111>
- Chin, W.W., Marcolin, B.L., & Newsted, P.R. (2003). A Partial Least Squares Latent Variable Modelling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. *Information Systems Research*, 4(2), 189-217. <https://doi.org/10.1287/isre.14.2.189.16018>
- Clokie, T. L., & Fourie, E. (2016). Graduate Employability and Communication Competence: Are Undergraduates Taught Relevant Skills? *Business and Professional Communication Quarterly*, 79(4), 442-463. <https://doi.org/10.1177/2329490616657635>
- Conrad, D., & Newberry, R. (2012). Identification and Instruction of Important Business Communication Skills for Graduate Business Education. *Journal of Education for Business*, 87(2), 112-120. <https://doi.org/10.1080/08832323.2011.576280>
- Coroş, M.M., Racolţu-Paina, N.D., Pop, A.M., Bolog, C., & Nistoreanu, B.G. (2021). The Perception of Romanian Students and Graduates of Tourism and Hospitality Programs Regarding the Labor Market and Their Future Employment. *Transformations in Business & Economics*, Vol. 20, No 1 (52), pp.125-139.
- Cotronei-Baird, V. S. (2020). Academic hindrances in the integration of employability skills development in teaching and assessment practice. *Higher Education*, 79(2), 203-223. <https://doi.org/10.1007/s10734-019-00405-4>
- De Cuyper, N., Raeder, S., Van der Heijden, B.I., & Wittekind, A. (2012). The Association between Workers' Employability and Burnout in a Reorganisation Context: Longitudinal Evidence Building upon the Conservation of Resources Theory. *Journal of Occupational Health Psychology*, 17(2), 162. <https://psycnet.apa.org/doi/10.1037/a0027348>
- De Vos, A., Jacobs, S., & Verbruggen, M. (2021). Career transitions and employability. *Journal of Vocational Behavior*, 126, 103475. <https://doi.org/10.1016/j.jvb.2020.103475>
- Dearing Report. (2017). *The Dearing Report: Higher Education in the Learning Society*. Report of the National Committee of Enquiry into Higher Education, HMSO, London.
- Denson, N., Loveday, T., & Dalton, H. (2010). Student Evaluation of Courses: What Predicts Satisfaction? *Higher Education Research and Development*, 29(4), 339-356. <https://doi.org/10.1080/07294360903394466>
- Dinh, N.T., Dinh Hai, L., & Pham, H.H. (2023). A Bibliometric Review of Research on Employability: Dataset from Scopus between 1972 and 2019. *Higher Education, Skills and Work-Based Learning*, 13(1), 1-21. <https://doi.org/10.1108/HESWBL-02-2022-0031>
- Donald, W.E., Baruch, Y., & Ashleigh, M. (2019). The Undergraduate Self-Perception of Employability: Human Capital, Careers Advice, and Career Ownership. *Studies in Higher Education*, 44(4), 599-614. <https://doi.org/10.1080/03075079.2017.1387107>
- Duque, L.C., & Weeks, J.R. (2010). Towards a Model and Methodology for Assessing Student Learning Outcomes and Satisfaction. *Quality Assurance in Education*, 18(2), 84-105. <https://doi.org/10.1108/09684881011035321>
- Emanuel, F., Ricchiardi, P., Sanseverino, D., & Ghislieri, C. (2021). Make Soft Skills Stronger? An Online Enhancement Platform for Higher Education. *International Journal of Educational Research Open*, 2, 100096. <https://doi.org/10.1016/j.ijedro.2021.100096>
- Fallows, S., & Steven, C. (2000). Building Employability Skills into the Higher Education Curriculum: A University-Wide Initiative. *Education and Training*, 42(2), 75-82. <https://doi.org/10.1108/00400910010331620>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: "A flexible statistical power analysis program for the social, behavioural, and biomedical sciences". *Behaviour Research Methods*, 3(2), 175-191. <https://doi.org/10.3758/BF03193146>
- Finch, D.J., Hamilton, L.K., Baldwin, R., & Zehner, M. (2013). An Exploratory Study of Factors Affecting Undergraduate Employability. *Education + Training*, 55(7), 681-704. <https://doi.org/10.1108/ET-07-2012-0077>
- Fornell, C., & Larcker, D.F. (1981). Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *Journal of Marketing Research*, 18(3), 382-388. <https://doi.org/10.1177/002224378101800313>

- Fry, H., Ketteridge, S. & Marshall, S. (2003). *A User's Guide. A Handbook for Teaching and Learning in Higher Education: 3*. New York: Routledge.
- Fugate, M., Kinicki, A.J., & Ashforth, B.E. (2004). Employability: A Psycho-Social Construct, its Dimensions and Applications. *Journal of Vocational Behavior*, 65(1), 14-38. <https://doi.org/10.1016/j.jvb.2003.10.005>
- Gardner, C.T., Milne, M.J., Stringer, C.P., & Whiting, R.H. (2005). Oral and Written Communication Apprehension in Accounting Students: Curriculum Impacts and Impacts on Academic Performance. *Accounting Education*, 14(3), 313-336. <https://doi.org/10.1080/06939280500077269>
- Geisser, S. (1975). A New Approach to the Fundamental Problem of Applied Statistics. *Sankhyā: The Indian Journal of Statistics, Series B (1960-2002)*, 37(4), 385-397. <http://www.jstor.org/stable/25051975>
- Gold, A.H., Malhotra, A., & Segars, A.H. (2001). Knowledge Management: an Organizational Capabilities Perspective. *Journal of Management Information Systems*, 18(1), 185-214. <https://doi.org/10.1080/07421222.2001.11045669>
- Gray, F.E. (2010). Specific Oral Communication Skills Desired in New Accountancy Graduates. *Business Communication Quarterly*, 73 (1), 40-67. <https://doi.org/10.1177/1080569909356350>
- Griffin, M., & Coelhoso, P. (2019). Business students' perspectives on employability skills post internship experience: lessons from the UAE. *Higher Education, Skills and Work-Based Learning*, 9(1), 60-75. <https://doi.org/10.1108/HESWBL-12-2017-0102>
- Hair Jr, J.F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V.G. (2014). Partial Least Squares Structural Equation Modeling (PLS-SEM): An Emerging Tool in Business Research. *European Business Review*, 26(2), 106-121. <https://doi.org/10.1108/EBR-10-2013-0128>
- Henseler, J., Ringle, C M., & Sinkovics, R.R. (2009). The Use of Partial Least Squares Path Modeling in International Marketing. *Advances in International Marketing*, 20, 277-319. [https://doi.org/10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014)
- Hew, K.F., Hu, X., Qiao, C., & Tang, Y. (2020). What Predicts Student Satisfaction with MOOCs: A Gradient Boosting Trees Supervised Machine Learning and Sentiment Analysis Approach. *Computers & Education*, 145, 103724. <https://doi.org/10.1016/j.compedu.2019.103724>
- Hillage, J., & Pollard, E. (1998). *Employability: Developing a Framework for Policy Analysis*. Department for Education and Employment, London.
- Hogan, R., Chamorro-Premuzic, T., & Kaiser, R.B. (2013). Employability and Career Success: Bridging the Gap between Theory and Reality. *Industrial and Organisational Psychology*, 6(1), 3-16. <https://doi.org/10.1111/iops.12001>
- Hora, M.T., Benbow, R.J., & Smolarek, B.B. (2018). Re-thinking Soft Skills and Student Employability: A New Paradigm for Undergraduate Education. *Change: The Magazine of Higher Learning*, 50(6), 30-37. <https://doi.org/10.1080/00091383.2018.1540819>
- Howard, L.W., Tang, T.L.P., & Austin, M.J. (2015). Teaching Critical Thinking Skills: Ability, Motivation, Intervention, and the Pygmalion Effect. *Journal of Business Ethics*, 128(1), 133-147. <https://doi.org/10.1007/s10551-014-2084-0>
- Jabr, N.H. (2011). Social Networking as a Tool for Extending Academic Learning and Communication. *International Journal of Business and Social Science*, 2 (12), 93-102. [https://www.academia.edu/download/31829465/3\\_Social\\_networking.pdf](https://www.academia.edu/download/31829465/3_Social_networking.pdf)
- Jackson, D. (2013). The Contribution of Work-Integrated Learning to Undergraduate Employability Skill Outcomes. *Asia-Pacific Journal of Cooperative Education*, 14(2), 99-115. [https://ro.ecu.edu.au/ecuworks2013?utm\\_source=ro.ecu.edu.au%2Fecuworks2013%2F19&utm\\_medium=PDF&utm\\_campaign=PDFCoverPages](https://ro.ecu.edu.au/ecuworks2013?utm_source=ro.ecu.edu.au%2Fecuworks2013%2F19&utm_medium=PDF&utm_campaign=PDFCoverPages)
- Jackson, D. (2016). Re-Conceptualising Graduate Employability: The Importance of Pre-Professional Identity. *Higher Education Research and Development*, 35(5), 925-939. <https://doi.org/10.1080/07294360.2016.1139551>
- Jackson, D., & Wilton, N. (2016). Developing Career Management Competencies Among Undergraduates and the Role of Work-Integrated Learning. *Teaching in Higher Education*, 21(3), 266-286. <https://doi.org/10.1080/13562517.2015.1136281>
- Jiracheewong, E., Yongxia, M.A., & Han, X.U E. (2019). The Determinants for Best Employability Skills and Job Opportunities for Undergraduate Students Majoring in Chinese in Thailand. *Education and Urban Society*, 51(7), 989-1004. <https://doi.org/10.1177/0013124517747684>
- Kilgour, M. & Koslow, S. (2009). Why and How Do Creative Thinking Techniques Work? Trading off Originality and Appropriateness to Make More Creative Advertising. *Journal of the Academy of Marketing Science*, 37(3), 298-309. <https://doi.org/10.1007/s11747-009-0133-5>
- Kotler, P. & Clarke, R.N. (1987). *Marketing for Health Care Organizations*. Prentice-Hall, Englewood Cliffs, NJ.

- Krägeloh, C.U., Medvedev, O.N., Hill, E.M., Webster, C.S., Booth, R.J., & Henning, M.A. (2019). Improving Measurement of Trait Competitiveness: A Rasch Analysis of the Revised Competitiveness Index with Samples from New Zealand and US University Students. *Psychological Reports*, 122(2), 689-708. <https://doi.org/10.1177/0033294118762548>
- Labas, I., Darabos, E., & Nagy, T.O. (2016). Competitiveness-Higher Education. *Studia Universitatis "Vasile Goldis" Arad-Economics Series*, 26(1), 11-25. <https://doi.org/10.1515/sues-2016-0002>
- Li, C., Gervais, G., & Duval, A. (2006). *The Dynamics of Overqualification: Canada's Underemployed University*. Statistics Canada, Ottawa.
- Lievens, F., & Sackett, P.R. (2012). The Validity of Interpersonal Skills Assessment Via Situational Judgment Tests for Predicting Academic Success and Job Performance. *Journal of Applied Psychology*, 97(2), 460. <https://psycnet.apa.org/doi/10.1037/a0025741>
- Llinares, L. I., Zacares, J. J., & Cordoba, A. I. (2013). Generic skills training in higher education: promotion of employability as labour integration strategy. In *EDULEARN13 Proceedings* (pp. 5070-5077). IATED.
- Malik, M.E., Danish, R.Q., & Usman, A. (2010). The Impact of Service Quality on Students' Satisfaction in Higher Education Institutes of Punjab. *Journal of Management Research*, 2(2), 1-11. <https://www.academia.edu/download/85652906/1470.pdf>
- Martínez-Clares, M.P., & González- Lorente, C. (2021). Satisfacción del Universitario en su camino hacia la inserción socio-laboral: un estudio de caso. *Electronic Journal of Educational Research, Assessment & Evaluation*, 27(2), 1-18. <http://doi.org/10.30827/relieve.v27i2.20998760>
- Masduki, N. A., Mahfar, M., & Senin, A. A. (2022). A Bibliometric Analysis of the Graduate Employability Research Trends. *International Journal of Evaluation and Research in Education*, 11(1), 172-181. <http://doi.org/10.11591/ijere.v11i1.22145>
- McKinsey & Company (2012). *The State of Human Capital 2012: False Summit – Why the Human Capital Function Still Has Far to Go*. Research Report No. R-1501-12-RR, McKinsey and Company.
- Menshikov, V., Kokina, I., & Ruza, O. (2021). The entrepreneurial potential of Latvian students: the role of the university environment. *Entrepreneurship and Sustainability Issues*, 9(1), 502. [http://doi.org/10.9770/jesi.2021.9.1\(31\)](http://doi.org/10.9770/jesi.2021.9.1(31))
- Misiak-Kwit, S., & Zhang, Y. (2022). The entrepreneurial attitude of students-comparative study between China and Poland. *Entrepreneurship and Sustainability Issues*, 9(3), 118. [http://doi.org/10.9770/jesi.2022.9.3\(8\)](http://doi.org/10.9770/jesi.2022.9.3(8))
- Noori, M.I. and Azmi, F.T. (2021). Students perceived employability: a systematic literature search and bibliometric analysis. *Eurasian Journal of Business and Economics*, 14(28), 37-56. <https://doi.org/10.17015/ejbe.2021.028.03>
- Orr, P., Forsyth, L., Caballero, C., Rosenberg, C., & Walker, A. (2023). A systematic review of Australian higher education students and graduates' work readiness. *Higher Education Research & Development*, 1-18. <https://doi.org/10.1080/07294360.2023.2192465>
- Pérez-Rivero, C.A., & Ubierna, F. (2021). The Development of the Entrepreneurial Motivation from the University. *International Entrepreneurship and Management Journal*, 17(3), 1313-1334. <https://doi.org/10.1007/s11365-020-00723-5>
- Qenani, E., MacDougall, N., & Sexton, C. (2014). An Empirical Study of Self-Perceived Employability: Improving the Prospects for Student Employment Success in an Uncertain Environment. *Active Learning in Higher Education*, 15(3), 199-213. <https://doi.org/10.1177/1469787414544875>
- Raihan, M. Z., & Azad, M. A. K. (2023). A bibliometric review on outcome-based learning for graduate employability: mapping the research front. *Journal of Education*, 203(1), 73-91. <https://doi.org/10.1177/002205742110164>
- Reid, J.R., & Anderson, P.R. (2012). Critical Thinking in the Business Classroom. *Journal of Education for Business*, 87 (1), 52-59. <https://doi.org/10.1080/08832323.2011.557103>
- Ripollés, M. (2011). Aprender a emprender en las universidades. *Arbor*, 187 (Extra\_3), 83-88. <https://doi.org/10.3989/arbor.2011.Extra-3n3131>
- Rogers, N.M. (2019). Why Change? A Practitioner's Perspective on Why and How Universities Tackle Organisational Change (or don't). *Perspectives: Policy and Practice in Higher Education*, 23(4), 152-157. <https://doi.org/10.1080/13603108.2019.1581850>
- Schech, S., Kelton, M., Carati, C., & Kingsmill, V. (2017). Simulating the Global Workplace for Graduate Employability. *Higher Education Research and Development*, 36(7), 1476-1489. <https://doi.org/10.1080/07294360.2017.1325856>
- Singh, S. & Ehlers, S. (2020). Employability as a Global Norm: Comparing Transnational Employability Policies of OECD, ILO, World Bank Group, and UNESCO. *International and Comparative Studies in Adult and Continuing Education*, Firenze University Press, 131-147. <https://doi.org/10.36253/978-88-5518-155-6.09>
- Smither, R.D., & Houston, J.M. (1992). The Nature of Competitiveness: The Development and Validation of the Competitiveness Index. *Educational and Psychological Measurement*, 52(2), 407-418. <https://doi.org/10.1177/0013164492052002016>

- Stander, F.W., Diedericks, E., Mostert, K., & De Beer, L.T. (2015). Proactive Behaviour towards Strength Use and Deficit Improvement, Hope and Efficacy as Predictors of Life Satisfaction Amongst First-Year University Students. *SA Journal of Industrial Psychology*, 41(1), 1-10. <https://hdl.handle.net/10520/EJC173016>
- Stone, M. (1974). Cross-Validatory Choice and Assessment of Statistical Predictions. *Journal of the Royal Statistical Society: Series B (Methodological)*, 36(2), 111-133. <https://doi.org/10.1111/j.2517-6161.1974.tb00994.x>
- Vande-Wiele, P. (2017). *Higher Education for Employability: The Development of a Diagnostic Maturity Model*. Evry University-Paris Saclay
- Weerathunga, M. & Mallawarachchi, Y. (2020). Identification of Factors Affecting the Employability of Information Technology Graduates. *Global Journal of Management and Business Research*, 20(18), 15-25. Online ISSN: 2249-4588
- Weisz, M., & Smith, S. (2005). Critical Changes for Successful Cooperative Education. In *Higher Education in a Changing World. Proceedings of the 28th HERDSA Annual Conference*, 605-616.
- Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration. *MIS Quarterly*, 3(1), 177-195. <https://doi.org/10.2307/20650284>
- Williams, L.J., Vandenberg, R.J., & Edwards, J.R. (2009). 12 Structural Equation Modeling in Management Research: A Guide for Improved Analysis. *Academy of Management Annals*, 3(1), 543-604. <https://doi.org/10.1080/19416520903065683>
- Wilton, N. (2012). The Impact of Work Placements on Skills Development and Career Outcomes for Business and Management Graduates. *Studies in Higher Education*, 37(5), 603-620. <https://doi.org/10.1080/03075079.2010.532548>
- Yorke, M. (2006). *Employability in Higher Education: What it is what it is not* (Vol. 1). York: Higher Education Academy.
- Yusoff, M., McLeay, F., & Woodruffe-Burton, H. (2015). Dimensions driving business student satisfaction in higher education. *Quality Assurance in Education*, 23(1), 86-104. <https://doi.org/10.1108/QAE-08-2013-0035>

**Funding:** This research was funded by UCM-Cofares Research Chair Spain. We are also acknowledged the collaboration of the Chair Universidad CEU San Pablo—Mutua Madrileña (060516-USPMM-02/17) and Research Project: PID2020-114183RB-I00.

**Data Availability Statement:** More information and data can be obtained on reasonable request.

**Author Contributions:** Conceptualization: MR-A, MdMR-G, MMM-L; methodology: MR-A, MdMR-G, MMM-L, MAS-C; data analysis: MR-A, MdMR-G, writing—original draft preparation: MR-A, MdMR-G, MMM-L, MAS-C; writing; review and editing: MR-A, MdMR-G, MMM-L, MAS-C; visualization: MR-A, MdMR-G, MM-L, MAS-C. All authors have read and agreed to the published version of the manuscript.

**Mercedes RUBIO-ANDRÉS** is an assistant professor in Complutense of Madrid University, where she is a degree coordinator. She has published articles in indexed journals, such as Corporate Social Responsibility and Environmental Management, Review of Managerial Science, International entrepreneurship and management journal. Her research interests is sustainable practices and management in companies. She has participated in national and international conferences of recognized prestige.  
**ORCID ID:** <https://orcid.org/0000-0002-9112-7669>

**María del Mar RAMOS-GONZÁLEZ** is an assistant professor in the Faculty of Economics and Business Sciences at the Complutense University of Madrid. She continues a line of research focused on Responsible and Sustainable Behavior of Companies. Along with other authors, she has published articles in indexed journals and several book chapters. She has participated in national and international conferences of recognized prestige.  
**ORCID ID:** <https://orcid.org/0000-0002-1999-299X>

**Manuel M. MOLINA-LÓPEZ** is an assistant professor of Business Organization at the Faculty of Business and Economics Science at CEU San Pablo University, where he is currently the Vice Dean. He has been a visiting researcher at the American University and at Columbia University. His research interests is corporate governance and entrepreneurship education, areas in which he has published several studies.  
**ORCID ID:** <https://orcid.org/0000-0002-9207-5901>

**Miguel Ángel SASTRE-CASTILLO** is a professor of Business Organisation at the Complutense University of Madrid. He has held the following management positions: Vice-rector for Economic Policy, Dean of the Faculty of Commerce and Tourism, and Vice-rector for Quality. His main lines of research are human resources and entrepreneurship, in which he has published more than 40 academic articles.  
**ORCID ID:** <https://orcid.org/0000-0003-0163-5692>

To make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

---

Copyright © 2023 by the author(s) and VsI Entrepreneurship and Sustainability Center  
This work is licensed under the Creative Commons Attribution International License (CC BY).  
<http://creativecommons.org/licenses/by/4.0/>





**Publisher**

<http://jssidoi.org/esc/home>



---

## FASHION RETAIL STRATEGIES IN-STORE DESIGN AND PLANNING: THE CASE OF SOUTH AFRICA\*

Michael Cant <sup>1\*</sup>, Cornelius Bothma <sup>2</sup>

<sup>1,2</sup> *Department of Marketing and Retail Management, University of South Africa*

*E-mails: <sup>1\*</sup> [cantmc@unisa.ac.za](mailto:cantmc@unisa.ac.za) (Corresponding author); <sup>2</sup> [bothmem@unisa.ac.za](mailto:bothmem@unisa.ac.za)*

*Received 25 November 2022; accepted 21 June 2023; published 30 June 2023*

**Abstract.** The study followed a consumer-centred approach in investigating the subject of visual merchandising in the South African fashion retail industry holistically. Inspired by the vision of 'Fashionomics' as a potential driver of economic growth, the primary research objective was to synthesise key visual merchandising elements to drive retail strategies in-store design and planning in the broader South African fashion retail market. This research study adopted a mixed-methods approach, analysing the data through directed content and factor analysis. This research study aims to reinvigorate South African fashion retail by targeting key visual merchandising elements, which South African fashion retailers can use as strategic tools. The key elements were determined from the consumer's perspective; hence, fashion retailers' strategies may become more effective. Fashion retailers can differentiate themselves through the in-store environment created through unique visual merchandising strategy based on the identified critical elements and using them to gain a competitive advantage. The specified visual merchandising elements represent functions, activities, and business practices consumers value and demand. They reveal what consumers could see as a benefit to their relationship with the retailer. It was found that fashion retailers should implement good housekeeping – cleanliness and neatness, train customer-centric staff, and pay attention to fitting rooms, amongst a range of other visual merchandising elements in their retail strategies. As these three elements appear significant according to consumers, retailers will likely benefit the most by focusing on them.

**Keywords:** visual merchandising; South African retail industry; fashion; retail strategy; store design; store planning; key elements; consumers; merchandising; store atmosphere.

**Reference** to this paper should be made as follows: Cant, M., Bothma, C. 2023. Fashion retail strategies in-store design and planning: the case of South Africa. *Entrepreneurship and Sustainability Issues*, 10(4), 408-427. [http://doi.org/10.9770/jesi.2023.10.4\(25\)](http://doi.org/10.9770/jesi.2023.10.4(25))

**JEL Classification:** M11, M31, M37

---

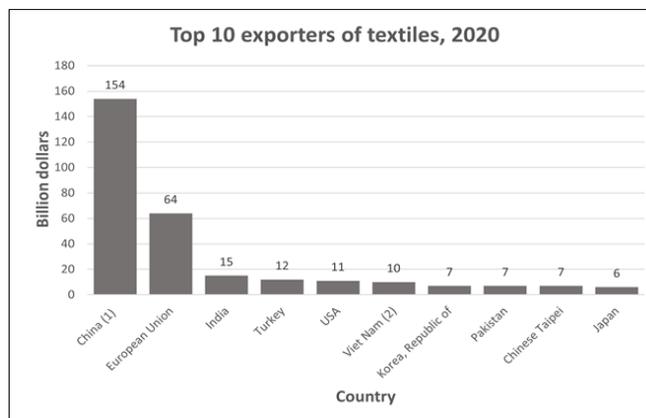
\* *This research was funded by the University of South Africa.*

**1. Introduction**

Fashionomics (or ‘economics of fashion’) is a Pan-African programme initiated by the African Development Bank (AfDB) to support the development of the textile and fashion industry with a focus on MSMEs (AfDB, 2016; Dekker & Hollander, 2017; Dakora, 2019; Clark, 2020). The initiative provides African entrepreneurs operating in the fashion and textile sector with a platform to create and grow their businesses with a particular focus on women and the youth (Business Trumpet, 2020).

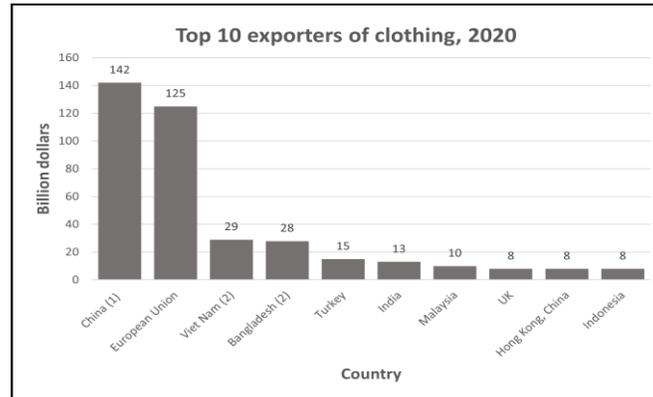
The AfDB Fashionomics initiative – see <http://www.fashionomicsafrica.org> – was spurred by the realisation that the fashion industry was the second largest employer after agriculture in most developing countries, yet in Africa, the industry remained largely an untapped sector. This insight impelled the AfDB to establish a platform that ensured the development and support of the sector, given its potential to become a significant contributor to economic growth and job creation in African nations. The global fashion industry is worth about USD 1.3 trillion; in Sub-Sahara Africa, it is estimated to be worth USD 31 billion (Yamama, 2021). Considering that the global GDP was estimated to be worth USD 87.3 trillion in 2019, Africa's GDP of USD 2.5 trillion for the same period represents 2.9% of the worldwide GDP (International Monetary Fund 2020). Africa's fashion sector, however, represents only 2.4% of the worldwide total (i.e. USD 31bn/USD 1300bn). These figures indicate that Africa's fashion sector, as a share of the worldwide fashion economy, lags behind Africa's global GDP.

Research by the Organisation for Economic Cooperation and Development (2021:33) suggests that the textile and fashion apparel sector can play an important role in emerging markets by creating jobs and spurring further industrialisation, especially the light industry, ideally suited to these emerging markets. Suppose one looks at the top textile-producing countries (Figure 1) and the top 10 clothing exporting (Figure 2). In that case, it is clear (a) the several leading producers are from emerging markets, and (b) no serious African competitors are on this list. As the fashion sector has the potential for easy entry for individuals and small businesses, as well as the potential for broader employment and as a driver for reindustrialisation, the AfDB's efforts to kickstart the ailing fashion sector in Africa make sense. Developing the textile and fashion apparel sector could create over 400 000 new jobs and export growth from USD 3 billion to USD 5 billion by 2025 (AfDB, 2016).



\*Note: (1) Includes significant shipments through processing zones; (2) Secretariat estimates

**Figure 1.** Top 10 Largest Textile Producing Countries 2020  
 Source: Adapted from World Trade Organization (2022, p. 77)



\*Note: (1) Includes significant shipments through processing zones; (2) Secretariat estimates

**Figure 2.** Top 10 exporters of clothing in 2020

Source: Adapted from World Trade Organization (2022, p. 78)

The abovementioned economic backdrop to the African fashion sector justifies the study that focuses on synthesising key visual merchandising elements to drive retail strategies in-store design and planning. This study is focused on the South African fashion apparel sector (referred to as 'fashion' in the remainder of this article). Still, the lessons learnt may be helpful for the rest of Africa.

## 2. Visual Merchandising

In defining and comprehending visual merchandising, it is necessary to understand the origin and development of the concept. The concept of visual merchandising developed from two terms – 'visual' and 'merchandising'. The term 'visual' refers to an action relating to or using one's sight or 'seeing' (Cambridge, 2022), while 'merchandising' is the retailer's attempt to present the correct quantity of the right merchandise in the proper place at the correct time, while meeting the company's financial objectives (Hefer, 2017). Various definitions have combined these two terms over the years, some of which have become prominent definitions of visual merchandising (Levy & Weitz, 2016; Basu, Paul & Singh, 2022, Pellegrini, 2020). All the efforts have the same aim: to arrange a store and its merchandise to draw the attention of a possible consumer, provide the consumers with a pleasing shopping environment, and increase sales. From product merchandising and store layout to background music, housekeeping, the type of lighting used, pictures, posters and light boxes, signage and graphics, window displays and props, the walls and the use of furniture and fixtures, all these elements and their visual arrangement form part of visual merchandising (Shanfar 2016).

### *Key elements in visual merchandising*

Regardless of the significant amount of attention given to the critical success factor approach by academics and specialists (Borman & Janssen, 2013) the current literature needs to place critical elements in the context of visual merchandising. The present study thus aims to develop essential elements for visual merchandising from the consumers' perspectives.

Rockard defined vital elements in the 1970s as those essential things that must go well to ensure that an organisation performs well and attains future success (Freund, 1988). It combines vital fundamentals to accomplish one or more sought-after business goals. The critical element concept has evolved to include competitive factors as well. Key elements must adhere to specific criteria (Freund, 1988). They are:

- critical to achieving overall corporate goals and objectives;
- measurable and controllable by the organisation;

- relatively few – not everything can be vital;
- expressed as things that must be done;
- applicable to all companies in the industry with similar objectives and strategies (for example, all fashion retail stores); and
- hierarchical in nature – some critical success factors will pertain to the overall company, while others will be more narrowly focused on one functional area.

The critical visual merchandising elements identified by this study can ultimately determine or influence the success of a visual merchandising division of a fashion retailer. Key visual merchandising elements are the 'must achieve' factors. The accent on achievement underlines that critical success factors are action-oriented (Long, 2022). They are not business objectives or aims but a mixture of activities and procedures designed to support the success of the desired outcomes specified by a retailer's objectives and goals. In turn, the identified vital visual merchandising elements will be action-able and, to some extent, controllable by the retailers (Cooper, 2021).

As is evident from the above sections, the developing South African fashion retail industry has much to gain from identifying key visual merchandising elements. The section below expands on this study's contribution by presenting these key visual merchandising elements.

### **3. Significance of the study**

The purpose of a retail store is to display and sell merchandise to consumers. Therefore, the retail spaces must be designed to encourage an enjoyable and hassle-free shopping experience. Planning and creating a retail store space that is both pleasurable for consumers and functional for the retailer and that also fits the image or brand of the retailer is a challenge that many companies face.

Searches on diverse academic databases such as EBSCOHost, Google Scholar, Emerald and ScienceDirect produced various articles, books, and information on visual merchandising. However, the databases needed to generate literature concerning the focus of this study, namely key visual merchandising elements for fashion retail stores in a South African context. The existing literature (predominantly European and American) merely discusses and examines various visual merchandising elements, and, how these elements influence consumer behaviour and perceptions.

This study attempts to fill a void in the literature by synthesising key visual merchandising elements that can be used as a strategic tool to drive retail strategies for in-store design and planning in South African fashion retail stores. These elements have been synthesised by consumers, combining essential visual merchandising elements that could be used in-store to affect the consumer's shopping experience favourably and, ultimately, generate extra sales.

A review of the contemporary literature reveals that it needs to emphasise the priority of the elements in the context of visual merchandising. The elements of visual merchandising have never been tested in terms of their level of importance in the minds of consumers. By including the consumers' inputs regarding the significance level of the various visual merchandising elements, consumers become a dimension within fashion retailers' visual merchandising skills. Fashion retailers could use the identified key features to detect what is essential and what would keep consumers satisfied regarding store design to optimise their retail space using the correct visual merchandising elements.

Fashion retailers could include the critical visual merchandising elements in their current retail strategies to develop new store designs or to improve their contemporary store designs with an improved visual

merchandising proficiency, to enhance their brand image and to improve their customer satisfaction levels, and subsequently use these efforts as a competitive advantage. All this will work towards improving their sales, as consumers are more likely to return for repeat purchases if the shopping environment is favourable. Currently, retailers differentiate themselves according to several factors, including, but not limited to, product quality, brand image, product price and style (Cant, 2021). However, fashion retailers can also differentiate themselves from their competition through the in-store environment created by visual merchandising by optimising their visual merchandising strategy based on the critical elements identified and using this strategy as a competitive advantage.

#### 4. The South African retail sector

The South African retail industry is the largest in the sub-Saharan region and is ranked as one of the largest retail markets in the world (PWC, 2016). The retail industry's significant economic contribution offers more employment opportunities than many other sectors, specifically today's youth. The sales in 2020 for the retail sector Table 1 below illustrates the composition of retail trade sales by type of retailer for the second quarter of 2022.

The clothing retail industry makes up the second largest % of retail sales is 15.7. Retail trade sales increased by 5.2% in the three months ended June 2022 compared with the three months ended June 2021. According to Statistics South Africa (2022), the main contributors to this increase were retailers in food and beverages, general dealers, pharmaceuticals and health products, textiles, clothing, footwear, leather goods, and household furniture and appliances.

**Table 1.** Composition of retail trade sales at current prices for April-June 2022

Type of retailer	Apr-Jun 2021 (R million)	Weight	Apr-Jun 2022 (R million)	% change between Apr- Jun 2021 and Apr-Jun 2022	Contribution (% points) to the total % change
General dealers	131 413	46,4	140 517	6,9	3,2
Food, beverages and tobacco in specialised stores	22 139	7,8	23 917	8,0	0,6
Pharmaceuticals and medical goods, cosmetics and toiletries	22 893	8,1	24 228	5,8	0,5
Textiles, clothing, footwear and leather goods	44 367	15,7	46 591	5,0	0,8
Household furniture, appliances and equipment	12 492	4,4	12 973	3,9	0,2
Hardware, paint and glass	23 683	8,4	22 931	-3,2	-0,3
All other retailers	26 144	9,2	26 832	2,6	0,2
<b>Total</b>	<b>283 131</b>	<b>100</b>	<b>297 992</b>	<b>5,2</b>	<b>5,2</b>

Source: Adapted from Statistics South Africa (2022)

Statistics show that fashion retailers have a significant impact on the retail industry and that it is responsible for a substantial share of the growth of the South African retail sector (Statistics South Africa, 2022). Therefore, the fashion retail industry must continue to find innovative ways to develop and stay current.

As the study focuses on fashion retailers, it is necessary to understand what fashion retailing is clearly. Since a retailer is defined as a business that sells goods to a consumer for their personal use, it can be inferred that a fashion retailer is a business that sells clothing and clothing-related items directly to the consumer for their personal use. These products could include clothing, shoes, hair, make-up, and accessories (Diamond, Diamond & Litt, 2015).

Due to the large number of fashion retailers in South Africa and the fact that retailers are fighting for a share of the consumer's wallet, the competition in the fashion retail industry is intense. Brick-and-mortar retailers are also facing competition from online fashion retailing, which has grown positively over the past few years (PWC, 2016). Even though online retailing has shown great potential, factors such as being able to feel and touch the clothes and trying the clothes in-store draw customers back to the physical stores. Because of this, all retailers strive to entice consumers to enter their stores by having the most exciting and visually appealing retail environments, which cultivate an atmosphere where consumers can shop effortlessly for clothing and clothing-related items in different colours, fabrics, styles, and values.

To achieve visually appealing retail environments, fashion retailers use visual merchandising (which is one of retailing's crucial components). However, retailers often need help regarding this aspect of their retail strategies (Levy & Weitz, 2016). For this reason, this study offers retailers key visual merchandising elements to incorporate into their retail plans. The value of crucial visual merchandising elements lies in taking into account consumers' views, which enables retailers to anticipate what the consumers would like to see in their stores.

## **5. Primary Objective**

The primary research objective of the study was to synthesise key visual merchandising elements from a customer perspective to drive retail strategies for in-store design and planning in the broader South African fashion retail market.

## **6. Research Method**

This research study adopted a pragmatic paradigm and followed a mixed-methods approach. Therefore, the research design was divided into two parts. The first part followed an exploratory qualitative research design, drawing on in-depth interviews with the three leading retailers in South Africa. These individuals were very experienced, and their expert opinion was deemed valuable in identifying any visual merchandising elements/items missing from the list. They were not required to remove any elements from the original list, as it was felt that the longer the list, the more detailed it would be for the second and third research methods. After that, two focus groups were held with 8 and 6 participants (consumers), respectively. The participants were asked to examine and discuss the visual merchandising elements synthesised from the literature. Throughout the discussion, consumers could add additional visual merchandising elements/items they felt should have been mentioned on the list. Again, participants were prohibited from removing any elements/articles from the original list.

Once research methods 1 and 2 had been conducted, the list of visual merchandising items totalled 176 (this included the visual merchandising items synthesised from the literature and insight from retailers and consumers).

A thorough literature review was conducted to identify and examine all known visual merchandising elements as a starting point in developing the final research instrument (used in research method 4). These elements were compiled into a list that included the visual merchandising elements and individual visual merchandising items that make up the element for research methods 1 and 2.

Because the length of an online questionnaire is positively correlated with drop-out rates and negatively correlated with the number of responses (Rocco, 2019), the next step in the research process was to reduce the number of elements to be tested. To this end, a word-sorting exercise and a pilot study were used. The word-sorting activity was conducted to compare, contrast and sort items according to the visual merchandising

elements they were linked to and, most importantly, eliminate duplicate and ambiguous items. A subject matter expert was used for this exercise. This step thus ensured that the things adequately represented the underlying theoretical content within each element. After a word-sorting exercise, the elements to be tested were reduced to 142 from the initial 176 items.

The word-sort exercise was followed by a pilot survey using an online questionnaire. Forty-five respondents completed this survey. The initial 142 visual merchandising items were formulated into Likert-scale questions and administered to the respondents' pilot sample. These respondents were required to rate the importance of each visual merchandising item on a five-point Likert scale ranging from 1=Unimportant to 5=Very important. Based on the respondents' ratings, an item mean was calculated for each item. Following this process, the 80 items with the highest mean score were selected for preliminary inclusion in the questionnaire. In addition to using the highest mean scores of the items as an inclusion criterion, a further inclusion criterion was related to the mean score of that item being higher than the average of '3'.

The final step in the item reduction process involved a further review by the same subject matter expert used before to ensure that sufficient domain content for each element was retained. The item reduction process yielded a final list of 81 visual merchandising items. The abovementioned process resulted in a definitive list of questions deemed short enough and sufficient to elicit the required information while minimising respondent burden.

Finally, an online survey was used to send a questionnaire to 1 057 respondents. This sample was selected randomly from more than 40 000. As the precise measurement of key visual merchandising elements in terms of importance was considered necessary, quantitative research was deemed the best method.

### **Data analysis and results**

The visual merchandising managers of three of the largest retailers in the country, with a combined turnover of approximately R150 billion in 2021, were invited for in-depth interviews. All three senior executives were female between the ages of 40 and 55. Regarding the participants in the three focus groups, 25 participants took part, 44 per cent male and 56 per cent female, all between the ages of 18 and 55. Detailed demographics of respondents are provided in Appendix A.

The data from the qualitative part of the empirical research was analysed employing directed content analysis. In contrast, the data from both the pilot and complete surveys were analysed using SPSS. In analysing the survey data, the data was first cleaned and coding, with the second stage focusing on the analyses and interpretation of the results. Both descriptive statistics were compiled, standard factor analysis using the principal axis factoring method and reliability analyses were conducted on the data. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were utilised to determine the factorability of the data. Both the KMO measure (.960) and Bartlett's test of sphericity  $\chi^2(3240) = 47786.71, p < .01$  suggested sufficient intercorrelation and common variance within the data to conduct a factor analysis. The initial factor analysis of the data suggested the extraction of 16 factors (visual merchandising elements) using the Kaiser criterion (eigenvalues greater than 1). This factor solution, however, yielded several factors with only 2 or 3 significant primary loadings. This solution would thus not produce stable characteristics. Further analyses were conducted to find a better factor solution to fit the data. The scree plot was utilised to further assist in identifying the number of factors (visual merchandising elements) to extract. Finally, the a priori criterion was also used to determine the number of factors (visual merchandising elements) to remove, pointing to 11 factors as shown in Table 2 shows that all the factors have good internal consistency and reliability with all the Cronbach's alpha coefficients  $> 0.6$  (Shrestha, 2021).

**Table 2.** Factors identified from the research and corresponding Cronbach's alpha

Factors*	Items	Cronbach's alpha
Factor 1: Housekeeping – cleanliness and neatness	32; 34; 39; 40; 41; 42; 43; 44	.919
Factor 2: Window displays and focal points	37; 60; 61; 62; 63; 64; 66; 67; 68; 69; 71	.912
Factor 3: Store design – comfort and convenience	8; 11; 12; 15; 16; 17	.757
Factor 4: Fitting rooms	72; 73; 74; 75; 76; 77	.858
Factor 5: Store design – ease of access and organisation	1; 2; 3; 4; 5; 6; 7; 14	.819
Factor 6: Signage and graphics	19; 20; 21; 22; 23; 24; 25; 26	.844
Factor 7: Mannequins	55; 56; 57; 58; 59	.883
Factor 8: Merchandise organisation	45; 47; 48; 49	.720
Factor 9: Atmospherics	29; 30; 31; 38	.721
Factor 10: Fixtures	50; 51; 52; 53	.798
Factor 11: Staff	78; 79; 80; 81	.797

\*The factor naming was done together with the review expert to select a name descriptive of the item in question

Table 3 compares the subjective rankings of the various critical visual merchandising elements according to perceived importance and the average percentage of total respondents' scores for each component.

**Table 3.** Comparison of rankings according to perceived importance versus extracted factor scores

Rank	Ranking by respondents	Rank by average % (elements as in 81 items)	Rank by average % (elements according to extracted factors)
1	Staff	Staff	Housekeeping – cleanliness and neatness
2	Store design	Fitting rooms	Staff
3	Housekeeping	Housekeeping	Fitting rooms
4	Atmospherics	Window displays	Store design – ease of access and organisation
5	Fitting rooms	Signage and graphics *	Merchandise organisation
6	Signage	Mannequins	Signage and graphics
7	Window displays	Focal points	Mannequins
8	Graphics	Atmospherics	Window displays and focal points
9	Fixtures	Store design	Fixtures
10	Focal points	Fixtures	Atmospherics
11	Mannequins		Store design – comfort and convenience

\* Signage and graphics were combined in research method 3

The results revealed that certain visual merchandising elements were perceived as more important than others. We discuss the findings below.

## 7. Discussion of findings

The in-depth interviews and the consumer focus groups identified four new visual merchandising elements (elements that should have been covered in the literature reviewed). They are as follows:

The pay points are the areas where consumers pay for goods. Consumers suggested that they would like multiple pay points per department located at different places, not just in specific ones.

Fitting rooms are inside a retail store where consumers can try on clothing in private before deciding whether to purchase it. The analysis indicated that the items that made up the second new element revolved around the furniture in the fitting room, the design, style and size, its location, and the type of flooring used. Consumers specified that the fitting rooms should be large enough to be able to move around comfortably and that they

should be fitted with large mirrors. They further discussed the different floor types used within fitting rooms, furniture, and information conveyed through signage and graphics.

Staff is a human factor and includes the people that the retailer employs. The items that made up this specific element revolved around the staff member's skill, their training in visual merchandising to replenish and maintain where necessary, and staff hygiene. The research revealed that the staff should correspond to the store's image. The personal hygiene of staff and their friendliness are also paramount.

A mirror is a smooth surface that forms images by reflection. The content analysis indicated that the items included in this new element revolved around the placement of mirrors in different departments and the size of mirrors used in the store.

The 11 elements identified by the factor analysis are illustrated in Figure 3 below and are ranked in order of importance, together with their top two rated items, as indicated by consumers.

In order of importance, housekeeping – cleanliness and neatness is the essential element out of all the visual merchandising elements, followed by staff, fitting rooms, store design – ease of access and organisation, merchandise organisation, signage and graphics, mannequins, window displays and focal points, fixtures, atmospherics, and store design – comfort and convenience.

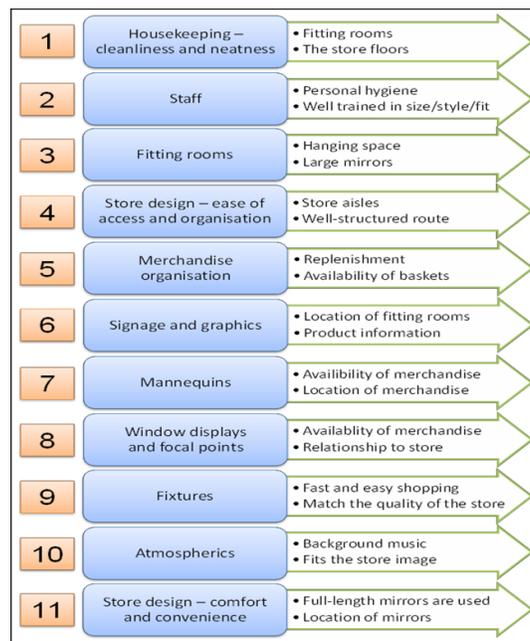


Figure 3. Visual merchandising elements ranked per order of importance

Source: Authors' compilation

It was evident from the results that certain visual merchandising elements were perceived as more important than others by consumers. Therefore, based on these results, the elements were divided into three distinct groups, namely:

1. Key visual merchandising elements - housekeeping, staff, and fitting rooms
2. Significant visual merchandising elements - store design, merchandise organisation, and signage and graphics);
3. Less-important visual merchandising elements (fixtures, atmospherics, and store design – comfort and convenience). Each group is discussed in detail below.

### **7.1 Group 1: The critical visual merchandising elements**

Three elements in this group are seen as crucial to the success of retailers and ranked above the 80<sup>th</sup> percentile in the result. They are discussed below:

- *Element 1: Housekeeping – cleanliness and neatness*

This element was ranked the most critical visual merchandising element by consumers. Although the literature discusses housekeeping as a subdivision of atmospherics, based on these findings, it is strongly recommended that housekeeping not only be seen as an element on its own but also receive the most attention.

According to Smith (2019), housekeeping is an umbrella term in retailing to indicate that the floors have been cleaned, the carpets are vacuumed, and the displays and merchandise are kept neat and organised. However, the empirical study showed that housekeeping includes more than just the above. It is therefore recommended that the element Housekeeping – cleanliness and neatness – further refer to the cleanliness and working order of the retail store, as well as the cleanliness of the baskets/trolleys, the fitting rooms, fixtures, and store floors.

Although the literature suggests that housekeeping often goes undetected by the consumer, consumers are more likely to notice it when it is not satisfactory. Housekeeping and cleanliness start outside the store with a clean and well-maintained store exterior that is attractive and free from clutter. The overall impression that a fashion retailer creates can easily be ruined if the cleanliness and neatness of a store do not complement this image. It is recommended that fashion retailers implement housekeeping policies and procedures as part of their retail strategies. Therefore, an essential part of a retailer's everyday visual merchandising management should be housekeeping.

As the highest ranked item and therefore the most critical item under housekeeping – cleanliness and neatness, fitting rooms should be kept clean and tidy throughout the day, focusing on the cleanliness and neatness of the floors. Attention should also be given to the merchandise left behind in the fitting room by previous customers, ensuring that all merchandise is removed and a clean and neat fitting room is made available for the next customer. Store floors should always be kept clean and tidy as the second highest ranked item and therefore second to the essential item. Therefore, no matter the type of surface (wood, vinyl, cement, tiled, etc.), all floor areas should be cleaned daily with fresh water and cleaning materials, ensuring that a 'wet mop smell' is not present once finished. Further recommendations concerning this element of housekeeping are the following:

- Staff should receive proper training in housekeeping standards, as discussed in the following points.
- All carpeted areas should be vacuumed daily.
- Not only should baskets/trolleys be placed throughout the store for easy access by consumers, but they must be spotless, especially as consumers are going to put clothing items in them.
- Stores should ensure proper ventilation throughout the store, providing enough clean air to the store. This can be obtained by either natural or mechanical means. This will ensure that stale, overheated and polluted air is removed from the store and fresh air is circulated through, assisting with a natural clean smell.

- All store areas, including the counters and points of sale, should be dusted daily and kept clean. This includes the store windows.
- Rubbish bins should be emptied and cleaned – after hours – not in the presence of consumers.
- The displays should be kept clean and tidy throughout the day, ensuring that customers are met by a 'fresh' store and not just early mornings. For example, stores should be 'opened' three times a day – in the morning, in the early afternoon and again in the late afternoon – ensuring that even customers entering over lunchtime or late afternoons also get a 'just opened' store.
- Fixtures should be checked to ensure they are in good working order, and maintenance should be done as soon as possible.

- *Element 2: Staff*

This element was ranked the second most crucial visual merchandising element by consumers. 'Staff' are generally not mentioned in the literature as an optical merchandising element. However, staff were seen as necessary by the retailer representatives in the study and the consumers. The team element is, therefore, a brand-new visual merchandising element fashioned from empirical research.

Most customers pointed out that the staff are the business and that they are one of the first things noticed in a store. Therefore, it is understandable why a team should form part of a store's visual merchandising strategy. Staff dress and demeanour should fit the store's image, and their hygiene should be of a high standard. The study findings suggest that the staff should be well trained on two fronts: firstly, in assisting the consumer in making size, style and fit suggestions, and secondly, in being able to replenish and maintain the merchandising and displays where necessary.

The sales staff is visible to consumers. They can add value to the visual merchandising proficiency of a store. Even though most stores have dedicated optical merchandising staff to look after the visual merchandising of a store, it is highly recommended that retailers train sales staff in the art of visual merchandising so that they have the confidence to make visual merchandising decisions, for example, to replenish and maintain visual displays. Therefore, sales staff should be included in the store's visual merchandising strategy. The sales staff in the physical implementation of the visual merchandising strategy and that are aware of the store's visual merchandising strategy could feel that they are adding value to the store. This could assist sales if sales staff can fulfil merchandising tasks on a slow day, especially when visual merchandising staff are outside the store. This could help fashion retailers with the following:

- Ensuring the store is visually attractive throughout the day by replenishing displays, dressing mannequins, and guaranteeing the merchandise on display is available in-store.
- Ensuring visual consistency across the store.
- Communicating product attributes, qualities and selling points, building awareness and expertise.

Staff are the actual sellers; if they need to be more engaging and help understand the product, any visual merchandising strategy in place will be instrumental. Consequently, by upskilling staff and making sure that they can maintain the visual merchandising strategy that was put in place, they will be skilled enough to see that a particular item on display or in the window has sold out and to find a suitable substitute (that relates to the current visual theme in the store) in its place. It is recommended that fashion retailers include staff in their retail strategies for store design and planning.

- *Element 3: Fitting rooms*

Visual merchandising is another element that must be mentioned in the contemporary literature. Retailers and consumers unanimously agree that fitting rooms should be an element of visual merchandising. Therefore, the study suggests this item is a brand-new optical merchandising element created from empirical research.

Interestingly, even though fitting rooms are an element of their own and rated third highest, the cleanliness of the fitting rooms was highlighted in the detail of housekeeping – cleanliness and neatness and was ranked the most important in this element. This further emphasises the importance of fitting rooms as part of a fashion retailer's retail strategy for store design and planning. Shoppers regularly try on the fashion they want to purchase to make buying decisions. It was apparent in the focus group discussion that a pleasing fitting room environment could increase the likelihood that consumers will use the fitting room, increasing the probability of purchasing. Suppose consumers make their purchase decisions in the fitting room. In that case, this is more profitable for the retailer and more efficient and enjoyable for the customers, which could build customer loyalty. It is, therefore, in the retailer's best interest to invest in the quality of the total fitting room experience. It is recommended that fashion retailers embrace and take advantage of this selling opportunity and make their appropriate room environments as pleasing as possible to consumers by focusing on the items within this element.

The items within the element of fitting rooms solely relate to the layout, setup and size of the in-store fitting rooms, the furniture used in the fitting room, and the location of the fitting rooms within the store. Regarding the visual merchandising element of fitting rooms, the most critical item is the amount of hanging space available in the fitting room. It is therefore highly recommended that the fitting rooms be equipped with plenty of hanging space for consumers to hang their selected items while trying other ones on. Thus, the fitting room should be furnished and having hooks, pegs, and knobs for hangers. Shelf space is also handy if the items selected come on a different hanger. Furthermore, it is recommended that large mirrors be placed in the fitting room for fuller-figure consumers to view themselves – this item was rated as the second most important item. This item also emerged as the second most important in the male group.

Consumers mentioned that even though clothes look good and well made in the store, the fitting room could change the perception of the items being 'skanky' and 'cheap' due to a dirty fitting room. Consumers could walk into a new and trendy retail store, expecting a whole and impressive experience, but are taken into a different world when they enter the fitting room. To create a highly sought-after fitting room experience, the following is recommended:

- Allow enough floor space when designing a store to make the fitting rooms large enough for consumers to try on their chosen merchandise without feeling cramped; in other words, ensure that the area is large enough for consumers to move around the fitting room comfortably.
- Have the fitting rooms equipped with bright lighting.
- Furnish each fitting room with good furniture, such as a chair and ample hanging space.
- Have a fitting room in each store department, for example, a separate fitting room for males and females.

## **7.2 Group 2: Significant visual merchandising elements**

The five elements in this group are seen as elements also worthy of attention, ranking between the 75<sup>th</sup> and 79<sup>th</sup> percentiles. Once again, there was a slight disparity between these elements, implying that they are all equally significant, albeit not as crucial as the first group of three elements. These elements are discussed below.

- *Element 4: Store design – ease of access and organisation*

This element is widely discussed in the literature. The item relates specifically to the ease of access within the store and the organisation of items within the store. This element also includes the aisles, how they manage the route through the store, and their neatness. A great store design offers the consumer a pleasant and productive shopping experience. The literature points to retail store design as incorporating a well-organised strategy to arrange a store in such a way as to enhance space and increase sales; therefore, it goes further than merely creating an attractive store with appealing displays. De Wet and Prinsloo (2021) posit that consumers not only

purchase the products the retailer sells; they also buy the whole retail experience created by the store design.

Even though this is not one of the key elements identified in the study, the items within this element are still significant regarding store design and layout. It is, however, recommended that fashion retailers focus mainly on the following, as these items were ranked the highest within the element:

- Fashion retailers should ensure the store's aisles are neatly organised and clutter-free. This will provide a clear pathway to the store, guiding the customer through the different departments. The proper path will further assist consumers in finding their way through the store, directing them to the merchandise they are searching for. Signage and graphics can indicate the location of fitting rooms in different departments.
- Furthermore, the aisles should be wide enough for consumers to move around comfortably, especially when pushing a trolley or a stroller/ pram.

- *Element 5: Merchandise organisation*

The item includes how the merchandise is displayed on the floor, for example, hanging or flat packed, the replenishment of sold merchandise, how shoes are displayed, and the availability of baskets throughout the store to carry inventory. Figure 1 illustrates the items ranked in terms of importance for the element of merchandise organisation.

Fashion retail stores should present their merchandise visually appealing to get the most benefit out of their selling space. The following are some recommendations that fashion retailers can implement to obtain optimum results in terms of organising their merchandise:

- Merchandise should be replenished throughout the day. As staff members replenish inventory, this item specifically ties in with the visual merchandising element of staff (as discussed earlier).
- Fashion retail stores should make baskets available throughout the store, in various locations, for consumers to carry around merchandise while shopping for more items, especially if they buy many things. It must be noted that this specific item ties in with one of the items in housekeeping – cleanliness and neatness, where it is indicated how important it is that the shopping baskets are clean. This increases the importance of this item.
- Merchandise should be appropriately classified before it is placed on the floor. The inventory must be organised in design, colour, category, etc. Through proper classification, fashion retailers can assist consumers in shopping quickly, finding their way through the store, browsing, and making additional sales.
- Planning space concerning merchandise placement should be done right away. Properly preparing the area to display merchandise will prevent unnecessary losses and shrinkage.

Keeping shelves and rails full by replenishing them once the product is sold out could enable a retailer to increase their sales and reduce stock carrying costs. Ensuring all required styles and sizes are available on the sales floor is important.

- *Element 6: Signage and graphics*

Another item stems from the literature. Only some people are literate, but photos and pictures are collectively more easily understood. According to Murray, Teller and Elms (2019), graphics and illustrations are a powerful way to convey a message to consumers, especially when combined with signage. Even though a picture is worth a thousand words, it is sometimes better when a message is read and seen. Signage is one of the best and least costly communication methods for consumers, particularly retail organisations, as signs account for many unplanned visits (Ebster & Garaus, 2011). Signs are often a consumer's first contact with a store.

It is recommended that signage and graphics be used as a communication tool to indicate the fitting rooms' location. It was noted that most consumers surveyed struggled to locate fitting rooms. It is further recommended

that in-store signage be used as an information tool to indicate sale items and communicate product information such as prices. These items within signage and graphics relate strongly to the visual merchandising element of store design – ease of access and organisation discussed earlier. Signage and graphics can direct customers through the store, helping them find the items they are searching for.

- *Element 7: Mannequins*

The element of mannequins includes the different types of dummies used in the store and how they are used to display the merchandise. Well-dressed figures make an impressive first impression of fashion. Forms work hard in retail stores as they have many tasks to fulfil. Among others, they are used to highlight the newest fashion in-store by displaying the latest trends in fashion and influencing the customers to purchase the items in question. Shoppers look to mannequins to learn to combine separates and accessories (Lindström, Berg, Nordfält, Roggeveen & Grewal 2016). According to Bell and Ternus (2012), a dummy may be a store's most valuable communication tool.

Regarding the visual merchandising element of mannequins, it is highly recommended that the merchandise displayed on the figure be available to purchase in-store. For example, if a specific item displayed on a mannequin has sold out in the store, the item should be removed from the dummy and replaced with a suitable alternative. The availability of advertised items was the essential remark concerning mannequins. Training is suggested for the team to make informed decisions regarding visual merchandising. It is further recommended that the merchandise be close to the mannequin on which it is featured. It will assist consumers in finding the merchandise they are looking for and direct them through the store.

- *Element 8: Window displays and focal points*

This item includes the themes, colours and timelines used for the different window displays and focal points. Window displays generally help retailers attract consumers' attention and invite them into the store to make unintentional visits (Oh & Petrie, 2012). Window displays that are more inventive are arguably better perceived by consumers in terms of the store's image (Saricam, Okur, Erdem, Akdag & Kilikci, 2018). Abidin and Aziz (2012) maintain that window displays act as stimuli to entice the customer to enter the store. Some fashion retailers spend vast amounts of money on creating works of art in their windows, while others keep their windows simple but effective.

To reap the most benefits out of the element of window displays and focal points, the following are recommended:

- Window displays must be carefully planned to ensure that the merchandise displayed in the window is available to purchase in the store. This item relates not only to the element of mannequins but also that of staff. As explained earlier, if a particular item displayed on a mannequin has sold out in the store, the item should be removed from the dummy and replaced with a suitable alternative.
- A retailer with storefront windows has one of the most recognised (and least costly) forms of promotion. Retailers can visually communicate the merchandise on offer to consumers. However, if the merchandise displayed in the window is unavailable, it could harm the consumers' impression of the retailer more than reasonably.
- Because sight is the most influential human sense, good visual merchandising displays can appeal to the consumer's cognitive and emotional feelings. As soon as the graphic shows have attracted consumers, retailers can further utilise the visual merchandising displays to keep the consumers in the store by directing them towards certain products.
- The window displays (the design, the theme, and the merchandise) must relate to what is seen in the store. Therefore, fashion retailers can increase the probability of making sales by understanding consumer perceptions of visual displays and determining what works and what does not.

Including store design – ease of access and organisation, merchandise organisation, signage and graphics, mannequins and window displays, and focal points in a retailer's retail strategy, in-store design and planning could be advantageous to a fashion retailer. Still, these elements are not as crucial as the recommended vital elements. However, it is recommended that if fashion retailers decide to implement any of the significant characteristics or already have them executed, they focus on the highest-rated items within each component, as discussed in the preceding sections. Concentrating on the highest-ranked things within each element will ensure that the retailers benefit from each aspect.

After the significant visual merchandising elements, the final three elements are classified as the less critical and discussed in the section below.

### **7.3 Group 3: Lesser essential visual merchandising elements**

The last three elements (fixtures, atmospherics, and store design – comfort and convenience) proved less critical – ranking between the 63rd and 69th percentiles. Therefore, these three elements were found to have a lesser impact on consumers regarding visual merchandising. Consequently, it is recommended that fashion retailers spend less time and effort on these elements.

- *Element 9: Fixtures*

The items that constitute this element all relate to the different types of furniture used as fixtures and the placement of fixtures within the store. It is recommended that the fixtures used in the store be chosen with the consumers in mind; in other words, they should assist consumers with fast and easy shopping. Bell and Ternus (2012) posit that tables are one of the important fixtures to use in the retail industry due to their low profile. Tables are the perfect fixtures to greet customers at a department's entrance and introduce the merchandise. Furthermore, tables break up the floor space effectively, and consumers find it easy to browse and shop from tables (Morgan, 2008). They also allow consumers a clear sight of the rest of the merchandise in the store. Fixtures are the 'furniture' of a retail store, and without fixtures, a retailer cannot show inventory and generate sales. The theory highlights that the fixturing must be used to fit the retailer's image, which relates to the second most important item as rated by consumers, namely that the fixtures used in the store should match the quality of the clothing sold.

- *Element 10: Atmospherics*

Widely discussed in the literature, the concept of atmospherics involving conventional visual merchandising, such as fixtures and signage, might only sometimes be enough to get the overall atmosphere of a store right. Atmospherics refer to the design of the in-store environment through communicating with the consumers by employing senses such as lighting, colour, music and scent (Pegler, 2010). Retail atmospherics includes anything in the store that impacts how consumers perceive their environment (Grewal, Roggeveen, Puccinelli & Spence, 2014).

To create the right atmosphere in retail stores, retailers can use a variety of aural, visual and olfactory elements (Helmefalk & Hultén, 2017). Bell and Ternus (2012) explain that atmospherics that appeals to the five senses of humans can be 'layered' into the store to improve the shopping environment and build the store's brand image. Of all the various atmospheric elements proffered by participants, the items that remained for consumer testing revolved only around music and colour within the store interior. It is therefore recommended that fashion retailers focus on music and the use of colour throughout the store.

It is recommended that the music played in-store only be in the background and be just audible. A further recommendation is that the piece fit the image and brand of the store. This was also highlighted in the theory that

the music played should suit the store image, the style of the consumers, as well as the merchandise (Toldos, González & Motyka, 2019).

- *Element 11: Store design – comfort and convenience*

The content for the items within the last element relates to the identified visual merchandising element of store design, which was ranked as the least important out of all the elements. If the component is examined in greater depth, the item content pertains explicitly to the comfort and convenience of the store layout, and details ensure convenience and comfort. It also includes the use of mirrors, their size and location.

It is also posited that a proper floor layout is essential as a poor floor plan can lead to retail crowding, leading to too many consumers in the store simultaneously with too little space to move (Coskun, Gupta & Burnaz, 2020). A great deal of energy and effort goes into planning a retail store floor plan – the location of every product is cautiously planned and strategically placed to ensure effortless shopping and increase sales (Poloian, 2013).

In terms of store design – comfort and convenience, it is recommended that full-length mirrors be used throughout the store and that mirrors be visible in all store departments.

It is evident from Figure 3 that fixtures, atmospherics and store design – comfort and convenience seem to be of lesser importance, and, while not unimportant, retailers are advised to pay more attention to these visual merchandising elements seen as more important in the minds of customers. Retailing is about resource efficient resource utilisation, and therefore, it is recommended that retailers spend more critically on what is seen as necessary by customers. However, suppose a retailer uses these lesser important visual merchandising elements in their stores. In that case, attention should be given to the items that were ranked the highest within each aspect, as these items are the most critical items within the element in the minds of consumers.

## **8. Conclusion and key takeaway**

The study highlights the importance of visual merchandising as a strategic tool in fashion retailing. Following the guidelines suggested above should contribute to retail success and the objectives underpinning Fashionomics – namely, economic growth in the fashion sector. Without proper attention to the elements identified, a retailer will not likely be as successful as it might otherwise be. Given the statistics and lack of traction of fashion retail in South Africa and Africa presented at the start of this article, it is recommended that South African fashion retailers pay careful attention to the visual merchandising elements identified.

The study provided a hierarchy of three levels (groups) of visualisation elements covering 11 elements ranging from the key, significant, to lesser critical elements. The elements in order of priority are (1) housekeeping, (2) staff, (3) fitting rooms, (4) ease of access and organisation, (5) merchandise organisation, (6) signage and graphics, (7) mannequins, (8) window displays and focal points, (9) fixtures, (10) atmospherics, and, finally, store design (comfort and convenience). Interestingly, the staff role was seen as part of the 'visual' offering of the store. However, it makes sense that a friendly, smiling, and helpful salesperson will majorly impact the customer, and all these positive signals are visual. Also, the importance of good housekeeping and clean and presentable fitting rooms will undoubtedly have gained even more traction with the lasting hygiene lessons learnt from the COVID-19 pandemic.

Although the study draws on senior managers' input in the country's three largest apparel firms as the initial source of essential visualisation items rather than on a broader range of firms, the information from the focus groups and the large-scale survey helped counterbalance this shortcoming. Further research could be put into testing the findings from this study amongst a broader range of apparel retailers in the country to confirm the conclusions of a supplier rather than buyer perspective. The scientific novelty of this study is founded on the

relative importance of certain visual merchandising elements over others. This relative importance of visual merchandising elements can be used by new entrants to the apparel market, allowing them to focus on those elements perceived as relatively more important, allowing new firms to gain more rapid traction in the marketplace.

## References

- Abidin, N. A. Z. Z. & Aziz, A. A. 2012. Window display compositions: Its influences on youths in Malaysia. *Social and Behavioral Sciences*, 38(1), 355-361. <https://doi.org/10.1016/j.sbspro.2012.03.357>
- AfDB. 2022. Fashionomics. African Development Bank website. [Online] Available from: <https://www.afdb.org/en/news-keywords/fashionomics> [Accessed: 1 July 2022].
- Bell, J. & Ternus, K. 2012. *Silent selling*. 4th ed. New York: Fairchild.
- Basu, R., Paul, J., & Singh, K. 2022. Visual merchandising and store atmospherics: An integrated review and future research directions. *Journal of Business Research*, 151(2022), p. 399. <https://doi.org/10.1016/j.jbusres.2022.07.019>
- Bizvibe Blog. 2022. Global Textile Industry Factsheet 2020: Top 10 Largest Textile Producing Countries and Top 10 Textile Exporters in the World. [online] Available from: <https://blog.bizvibe.com/blog/top-10-largest-textile-producing-countries> [Accessed 4 October 2022].
- Borman, M. & Janssen, M. 2013. Reconciling two approaches to critical success factors: The case of shared services in the public sector. *International Journal of Information Management*, 33(2), 390-400. <https://doi.org/10.1016/j.ijinfomgt.2012.05.012>
- Cambridge. 2022. Visual. Cambridge Dictionary. [Online] Available from: <https://dictionary.cambridge.org/dictionary/english/visual> [Accessed: 1 July 2022].
- Cant, M.C. and Van Heerden, M. 2021. *Marketing Management: A South African Perspective*. 4th ed. Cape Town: Juta.
- Cooper, F. 2018. The importance of visual merchandising in the retail business. *Small Business Bonfire*. [Online] Available from: <https://smallbusinessbonfire.com/visual-merchandising> [Accessed 17 August 2022].
- Cornelius, B., Natter, M. & Faure, C. 2010. How storefront displays influence retail store image. *Journal of Retailing and Consumer Services*, (17)2, 143-151. <https://doi.org/10.1016/j.jretconser.2009.11.004>
- Coskun, M., Gupta, S. & Burnaz, S. 2020. Store disorderliness effect: shoppers' competitive behaviours in a fast-fashion retail store. *International Journal of Retail & Distribution Management*, V48(7), 763-779. <https://doi.org/10.1108/IJRDM-06-2019-0193>
- De Wet, M. and Prinsloo, I. 2021. The Influence of Economic Theories on the Value of Retail Design: A Designer's Perspective. Quartier, K., Petermans, A., Melewar, T.C. and Dennis, C. (Ed.) *The Value of Design in Retail and Branding*, Emerald Publishing Limited, Bingley, pp. 67-84. <https://doi.org/10.1108/978-1-80071-579-020211006>
- Diamond, E., Diamond, J. & Litt, S. 2015. *Fashion retailing: a multi-channel approach*. 3rd ed. New York: Fairchild Books. <https://doi.org/10.5040/9781501309076>
- Ebster, C. & Garaus, M. 2011. *Store design and visual merchandising: Creating store space that encourages buying*. New York: Business Expert Press. <https://doi.org/10.4128/9781606490952>
- Freund, Y. P. 1988. Critical success factors. *Planning Review*, 16(4), 20-23. <https://doi.org/10.1108/eb054225>

Grewal, D., Roggeveen, A. L., Puccinelli, N. M. & Spence, C. 2014. Retail atmospherics and in-store nonverbal cues: An introduction. *Psychology and Marketing*, 31(7), 469-471. <https://doi.org/10.1002/mar.20708>

Hefer, Y. 2017. Identifying key visual merchandising elements to drive fashion retail strategies in-store design and planning. Doctoral thesis submitted to the University of South Africa.

Helmefalk, M. & Hultén, B. 2017. Multi-sensory congruent cues in designing retail store atmosphere: Effects on shoppers' emotions and purchase behaviour. *Journal of Retailing and Consumer Services*, 38, 1-11. <https://doi.org/10.1016/j.jretconser.2017.04.007>

Levy, E. & Weitz, S. 2016. Retailing management. 8th ed. New York: McGraw Hill.

Lindström, A. Berg, H., Nordfält, J., Roggeveen, A.L., & Grewal, D. 2016. Does the presence of a mannequin head change shopping behaviour? *Journal of Business Research*, 69(2), 517-524. <https://doi.org/10.1016/j.jbusres.2015.04.011>

Long, T. 2022. Getting there: Key success factors for retailers. Agility Technology Group. [Online] Available from: <https://www.argility.com/thought-leadership/key-success-factors-for-retailers> [Accessed 17 August 2022].

Morgan, T. 2008. Visual merchandising: Window and in-store displays for retail. London: Laurence King.

Murray, J., Teller, C. & Elms, J. 2019. Examining store atmosphere appraisals using parallel approaches from the aesthetics literature. *Journal of Marketing Management*, 35(9-10), 916-939. <https://doi.org/10.1080/0267257X.2019.1618365>

Oh, H. & Petrie, J. 2012. How do storefront window displays influence the entering decisions of clothing stores? *Journal of Retailing and Consumer Services*, 1(19), 27-35. <https://doi.org/10.1016/j.jretconser.2011.08.003>

Pegler, M. 2010. Visual merchandising and display. 5th ed. New York: Fairchild Books.

Pellegrini, M. 2020. Luxury store design and merchandising visual with a Chinese-English terminological glossary. Master's thesis submitted at Università Ca'Foscari Venezia.

Poloian, L. R. 2013. Retailing principles. 2nd ed. New York: Fairchild Books.

PWC. 2016. Prospects in the retail and consumer goods sector in ten sub-Saharan countries [Online]. Available from: <https://www.pwc.co.za/en/assets/pdf/retail-in-africa.pdf> [Accessed: 5 August 2021].

Rocco, S. 2019. The direct and indirect relationships between design orientation and market orientation. Doctoral thesis submitted to the University of Maribor.

Saricam, C., Okur, N., Erdem, D., Akdag, S., & Kilickci, B.E. 2018. Analysing the Visual Merchandising Elements for the Apparel Retailers. IOP Conference Series: Materials Science and Engineering, Volume 460, 18th World Textile Conference (AUTEX 2018) 20-22 June 2018, Istanbul, Turkey. <https://doi.org/10.1088/1757-899X/460/1/012010>

Shanfar, A. 2016. Effective Promotional Strategies Influencing Customers for the Products of BigBazaar, Kasaragod. MBA Report submitted Visvesvaraya Technological University, Belgaum.

Shrestha, N. 2021. Factor analysis as a tool for survey analysis. *American Journal of Applied Mathematics and Statistics*, V9(1), 4-11. <https://doi.org/10.12691/ajams-9-1-2>

Smith, D. 2019. British Retail Consortium (BRC) Global Standard for Food Safety Issue 8 - Requirements for Housekeeping and Hygiene. International Association for Food Protection. [Online] Available from: <https://iafp.confex.com/iafp/euro19/onlineprogram.cgi/Paper/20306> [Accessed 1 August 2022].

Statistics South Africa. 2022 Retail trade sales. Statistical release P6242.1 Statistics South Africa. [Online]. Available from:

<https://www.statssa.gov.za/publications/P62421/P62421June2022.pdf> [Accessed: 17 August 2022].

Toldos, M.P., González, E.M. & Motyka, S. (2019). Exploring international atmospherics: The impact on shopping behaviours based on the language of the lyrics of music played in global apparel retailers' stores. *International Journal of Retail & Distribution Management*, 47(4), 368-383. <https://doi.org/10.1108/IJRDM-12-2017-0297>

World Trade Organization. (2021). WTO | Trade Statistics - World Trade Statistical Review 2021 (WTSR 2021). <https://doi.org/10.30875/604b3e6d-en>

**Appendix A**

**Demographics of main survey respondents**

The table below provides an overview of the demographics of the survey sample of 1 057 respondents

<b>Race</b>	<b>n</b>	<b>Percentage</b>
African	177	16.7
White	681	64.4
Coloured	93	8.8
Indian	73	6.9
Asian	8	0.8
Other	25	2.4
<b>Gender</b>	<b>n</b>	<b>Percentage</b>
Male	535	50.6
Female	522	49.9
<b>Age</b>	<b>n</b>	<b>Percentage</b>
18 – 25	21	2
26 – 35	174	16.5
36 – 45	288	27.2
46 – 60	476	45
Older than 60	98	9.3
<b>Employment status</b>	<b>n</b>	<b>Percentage</b>
Employed	1 042	98.6
Unemployed	15	1.4
<b>Monthly income</b>	<b>n</b>	<b>Percentage</b>
Up to R10 000	36	3.4
R10 001 – R30 000	245	23.2
R30 001 – R60 000	340	32.2
R60 001 – R90 000	238	22.5
More than R90 000	198	18.7
<b>Location</b>	<b>n</b>	<b>Percentage</b>
Gauteng	725	68.6

Western Cape	161	15.2
KwaZulu-Natal	71	6.7
Mpumalanga	28	2.6
Eastern Cape	26	2.5
North West	20	1.9
Free State	17	1.6
Limpopo	6	0.6
Northern Cape	3	0.3

**Funding:** This research was funded by the University of South Africa

**Data Availability Statement:** More data can be obtained from the authors on a reasonable request

**Author Contributions:** The authors contributed equally. The authors have read and agreed to the published version of the manuscript.

**Michael CANT**

ORCID ID: <https://orcid.org/0000-0002-6925-8822>

**Cornelius BOTHMA**

ORCID ID: <https://orcid.org/0000-0003-2256-5056>

To make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES:  
@Entrepr69728810

---

Copyright © 2023 by the author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>

