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Dear readers,

Today I would like to bring to your attention the newest edition of the Journal of Security and Sustainability Issues. The journal has been regularly published for five years. Each quarter readers are greeted with the latest papers on the variety of topics which are embraced by sustainable and secure development research areas. The focus of the journal allows us to claim that the publisher, The General Jonas Žemaitis Military Academy of Lithuania, gradually undertakes additional important role as an analysist of international threats.

In today’s turbulent environment security becomes one of the major pillars of sustainable development. In order to create premises for secure sustainable development, a wide array of threats has to be taken into consideration. For that the sources of those threats have to be timely indicated, brought to broader audience and discussed. The ultimate aim is to develop scenarios and alternative policies leading to suppressing of threats in their early period of life cycle in order to foster secure and sustainable development in all countries. Looking forward to your comments and contribution to this ongoing discussion and discovering innovative and unordinary ways for prevention of tensions and conflicts in our path towards sustainable future!

With best regards,

Colonel Raimundas Matulis
Commandant of The General Jonas Žemaitis Military Academy of Lithuania
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Towards Enhanced Security: Education and Development of Military Commanders Within the Lithuanian and Austrian Armed Forces

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Abstract. This paper is focused on the current state of opinions and positions on issues of education and development of commanders within the Lithuanian and Austrian Armed Forces. The contribution presents the results of a questionnaire survey entitled „Analysis of current situation, opinions and attitudes to the issue of education and development of military commanders (managers) of chosen subjects in subordination of the National Defence System of Lithuania“ and „Analysis of current situation (opinions, attitudes) of the issue of education and developmet of managers (military leaders) of chosen subjects in subordination of the Austrian Armed Forces“. The selected areas provide a current overview of the opinions and attitudes of the views of awareness and opportunities for consultation, development of managerial skills and leadership managing at the beginning effect on the function, development needs, barriers, educational and development activities attendance and integration of new elements to training. Attention is paid to the methodology of Crew Resource Management from a civilian and military point of view, its history, focus, application, etc. This paper focuses on the use of CRM at United States Navy and Marine Corps, United States Air Force, United States Army, United States Coast Guard and other world’s military services.

Keywords: education, development, commanders, Lithuanian Armed Forces, Austrian Armed Forces, Crew Resource Management

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1. Introduction

Nowadays, knowledge and skills requirements placed on humans are constantly changing and in order to function as a labor force, therefore, been employed, shall his knowledge and skills continuously deepen and broaden. Education and formation of work abilities is becoming a lifelong process. In order to allow the armed forces to fully carry out its tasks, they must be flexible and ready to change. However, the flexibility of the armed forces is formed by flexible people, who are not only ready for change, but accept and support it. Education of employees (or forming of working abilities and personalities of employees) belongs to the relatively widely understood human resources activity, which is fundamentally linked with other personnel activities.

2. Education and development of managers

Education and development of managers assist the employer with regard to the need not only in the present, but also in the future. An employer deals with the education and development of managers with regard to cur-
rent needs and future needs (Čirjevskis 2015; Lace et al. 2015; Oganisjana et al. 2015; Dlugoborskytė et al. 2015; Matetskaya 2015; Dalati 2015; Giessen 2015; Raudelūnienė et al. 2015; Tarabbkova 2014; Caurkubule, Rubanovskis 2014). This activity is followed by management and career planning. It is an ongoing process to ensure the preparation of managers, management of reserves and stabilizing the optimum number of and structure of executives. Dvořáková (2007) describes the system of management and career planning at two levels. The first level represents the employer party that identifies needs, plans, selects and evaluates staff who will respond to future requirements. The second level represents the party staff – the future manager who carries out various steps to realize career goals. Education and development of managers is not just about handing over general, theoretical knowledge. An emphasis is also placed on leadership and applied knowledge. This includes the need to specifically develop appropriate teaching materials.

The manager’s job then develops and intends possible variants of dealing with situation, organizes, continuously trains, attends trainings, evaluates information, communicates. Working eligibility of managers can be interpreted as a measure of consistency between the requirements and prerequisites. According to Moricová (2012) it consists of physical, psychological, professional and moral component. Ability and eligibility of manager should be as professional (the ability to manage, organize, coordinate, flexibly and dynamically decide) and social (to lead people, motivate, stimulate, maintain the moral qualities of personality, be able to face mental stress) and conceptual (planning, implementing solutions situations, see the context and consequences of the decision).

There is the claim that managers learn best while working. However, it is not possible for an employer to leave the managers to their fate and their future education and development were merely a random process. Armstrong (2008) recommends three basic approaches to the development of managers, i.e. non-formal education, “learning by doing”, formal education, feedback, advice and support. Managers face the informal approach in everyday work. The manager must be able to deal with the new situation learnt and apply it in the future. Managers may, in discussions with colleagues and superiors, reveal weaknesses that need to be further developed. Formal development approaches of managers include development while working through coaching, consulting, monitoring and response from their superiors, development through work experience, i.e. job rotation, work in project teams, „learning by doing“, formal education through courses, structured development of oneself according to individual learning programs. Managers get feedback through a mentor, an expert in the field of education of managers, who provide advice aimed at improving activities carried out.

3. Analysis of the current state of the commanders’ opinions and attitudes on education and development in the Lithuanian and Austrian Armed Forces

The empirical surveys1 taken in Austrian and Lithuanian Armed Forces determined the current status, attitudes and opinions of military commanders (managers) of the National Defence System of Lithuania and Austrian Armed Forces to their area of education and development and there after to undertake a comparison between these two armed forces.

By means of the questionnaire surveys taken in the Lithuanian and Austrian Armed Forces there were determined a current overviews of satisfaction, opinions and attitudes from the perspectives of:
- the information awareness and the consultation possibilities,
- the development of management skills and leading of manager at the beginning of his working position,
- the need for the development, barriers, range of educational/training and development activities attendance,
- integrating new elements of training.

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1 The empirical surveys „Analysis of current situation, opinions and attitudes to the issue of education and development of military commanders (managers) of chosen subjects in subordination of the National Defence System of Lithuania“ and „Analysis of current situation (opinions, attitudes) of the issue of education and development of managers (military leaders) of chosen subjects in subordination of the Austrian Armed Forces“ are part of the specific research at University of Defence, Faculty of Military Leadership in Brno in the Czech Republic [KPRMAR, 2013-2016] – „Education and Development of Crisis Managers in the Ministry of Defence of the Czech Republic“.
In Lithuania, the questionnaire survey was conducted from March to June 2015 with the help of the General Jonas Žemaitis Military Academy of Lithuania. Object of the study were the Lithuanian Armed Forces. The questionnaire contained 71 questions and respondents were 63 officers (60 men, 3 women) of Lithuanian Armed Forces. In detail 21 % of respondents were senior officers and 79 % of them were junior officers. The other one took a place in the Austrian Armed Forces in August and September 2014 with the help of Theresian Military Academy in Wiener Neustadt. The questionnaire contained 90 questions and respondents were 60 officers (58 men, 2 women) of Austrian Armed Forces. Seventy-three percent of respondents were senior officers and 27 % of them were junior officers.

3.1. The information awareness and the consultation possibilities

The survey revealed, that in the Lithuanian Armed Forces 71 % of the respondents have information about educational opportunities and development within the National Defence System of Lithuania. The rest of the respondents (29 %) said that they do not have such information. Is almost one third of uninformed respondents a lot or a little? At Austrian Armed Forces, the situation is better, 92 % of respondents confirmed that they have information about education and development within the resort. The rest of the respondents (8 %) said that they do not have such information. It is apparent that the Austrian military commanders are being better informed when compare to Lithuanian, i.e. 21 %. However, it is assumed that the army officers should be 100 % informed.

The second question was put slightly differently in the Lithuanian and Austrian Armed Forces, but the meaning remains the same. With the current range of education and development activities of military professionals – managers organized within the National Defence System of Lithuania is only 3 % of respondents very satisfied, 33 % of respondents are rather satisfied, 54 % neither satisfied nor dissatisfied and 7 % rather dissatisfied, and 3 % were dissatisfied (Figure 1). Paradoxical as it seems that only 18 % of the respondents submitted specific suggestions for amendments, and 28 % of the respondents submitted specific suggestions on the content of education and development activities.

On the question whether the offer of current educational and development activities provided by the Austrian Armed Forces is sufficient for managers (military commanders), 33 % of respondents answered yes, 54 % more likely yes and 8 % more likely no and remaining 5 % of respondents considered an offer of training and development activities as insufficient (Figure 2). Only 37 % of Austrian respondents have ever submitted a proposal to amend the educational and development activities for commanders (managers) in the Austrian Armed Forces.

![With the current range of educational and development activities of commanders (managers) of Lithuanian Armed Forces organized within the National Defence System of Lithuania, I am:](image)

**Fig.1.** Satisfaction with the current range of educational and developmental activities – Lithuanian Armed Forces

*Source: Own research*
On the question whether the respondents (Lithuanian Armed Forces) consult with their nearest superior officer the individual areas of their further education and development, 54 % answered yes, 46 % no. At Austrian Armed Forces 85 % answered yes, 15 % no.

In the Lithuanian version of questionnaire survey 57 % respondents above that said they consult with their nearest superior officer individual areas of further education and development of their subordinates, 43 % do not consult at all.

Eighty-two percent of Lithuanian respondents answered that they pass information related to further education and development to their subordinates. In Austria, only one respondent does not pass information, thus 98% answered positively.

3.2. The development of management skills and leading of manager at the beginning at his working position

To the question whether the senior employee can become a good manager only by performance at their work, 79 % of respondents of Lithuanian Armed Forces answered yes. The larger part, i.e. 60 % of respondents, also adds that for development of managers are the courses developing managerial skills important. The remaining 21 % of respondents answered no. In Austria, only 59 % of respondents believe that it is possible, the remaining 41 % say that it is not possible. That is 38 % more negative responses than in the Lithuanian version.

To the question whether respondents had someone at the beginning at leading position who allowed them to learn from his knowledge and experience, at Lithuanian Armed Forces 68 % answered yes, 32 % did not (Figure 3). Respondents who in the previous question answered no, they were also asked whether they needed to have access to someone like that. This question was answered with 67 % yes, I missed advice and 33 % did not need any. In contrast, respondents of Austrian Armed Forces had someone like that just half of them, i.e. 50 % (Figure 4). Of this, 42 % took it as helpful, for the remaining 8 % it was not useful. Furthermore, 50 % of Austrian respondents who chose a negative response, stated that they lacked the advice at the beginning. They had a need to be next to someone that would enable them to learn from his knowledge and experience.
Fig. 3. The need to have someone at the beginnings at leading position who allowed a respondent to learn from his knowledge and experience – Lithuanian Armed Forces

Source: Own research

Fig. 4. The need to have someone at the beginnings at leading position who allowed a respondent to learn from his knowledge and experience – Austrian Armed Forces

Source: Own research

3.3. The need for the development, barriers and educational and development activities attendance

To the question in which respondents were asked to identify areas in which they need to be further developed identified the following list (when calculating the percentage of responses „definitely yes“ and „more likely yes“ together):

Lithuanian Armed Forces:
1. Language skills,
2. Self-knowledge,
3. Communication skills,
4. Expertise,
5. Leadership skills,
6. Personal vision, goal orientation,
7. Personal requirements.

More significantly exceeding the needs of the development are (when calculating the percentage of responses „definitely yes“ and „more likely yes“ together) in excess over the other are the language skills. Other areas are about the same level, at least was a need for the development of personal qualities.
Austrian Armed Forces:
1. Language skills
2. Expertise
3. Communication skills
4. Personal vision, goal orientation
5. Leadership skills
6. Self-knowledge
7. Personal requirements

Individual respondents of Lithuanian Armed Forces added moreover a need to develop their flexibility, interoperability, instructor skills and they would welcome more training activities. Individual respondents of Austrian Armed Forces added moreover a need to develop the ability to solve problems which are given by differences between people (character, temperament, personality), in negotiation skills of an orator, social competencies in personnel management in relation to information and communication technologies (They submitted that the software is now available at Theresian Military Academy Wr. Neustadt).

An equally important area of questioning is the area of barriers that hinder military commanders in further education and development. As shown in Figure 5 and Figure 6, respondents perceive barriers to further education and development, when calculating the percentage of responses „definitely yes“ and „more likely yes“ together in following order mainly in:

Lithuanian Armed Forces
1. Time, the workload
2. Finance
3. Family
4. Languages
5. Methods of courses
6. Laziness
7. Age
8. Tiredness
9. Commuting
10. Health

| Barriers to further education and development of commanders of Lithuanian Armed Forces |
|---------------------------------|---|---|---|---|---|---|---|---|
| Time, the workload | 57 % |
| Age | 52 % |
| Finance | 44 % |
| Family | 41 % |
| Languages | 40 % |
| Methods of courses | 35 % |
| Laziness | 33 % |
| Tiredness | 18 % |
| Commuting | 17 % |
| Health | 12 % |

Source: Own research
Austrian Armed Forces:
1. Time, the workload
2. Family
3. Commuting
4. Methods of courses
5. Laziness
6. Tiredness
7. Health
8. Languages
9. Age

Fig. 6. Barriers to further education and development of commanders of Austrian Armed Forces

Source: Own research

In the questionnaire authors also asked if the respondents already attended any training and development activities designed to improve the management skills, where they had gained them. Beyond activities completed within Lithuanian educational institutions as Generolo Jonos Žemaičio Lietuvos Karo Akademiija in combination with Aleksandras Stulginskis University, Mykolas Romeris University and Vilnius University respondents stated another foreign educational institutions. Foreign institutions where they completed educational activities or courses itself are:

- Kremenchuk flight college of National Aviation University (KFC NAU)²;
- Nato School Oberammergau – PSYOPS³ (Psychological operations) Course;
- Royal Danish Military Academy (Junior Officers Advance Course and Staff Officer’s Course);
- Baltic Platoon Commanders’ Course in Denmark;
- Training Command – Military Academy in Vyškov, Czech Republic (Instructor Course);
- NBC Defence Institute⁴ at University of Defence (Czech Republic);
- Language school in Canada;
- Instructor Course (United Kingdom);
- Baltic Defence College (Estonia) – Joint Command and General Staff Course;
- US Infantry Officers basic course;
- US Instructors course;

² A university in Ukraine specialising in the teaching of aerospace-related courses.
³ The aim of this course is to provide students with knowledge of PSYOPS contributions to NATO operations, and to enable an understanding of PSYOPS in operational-level planning procedures.
⁴ Department of Chemical, biological, radiological and nuclear defense (CBRN defense or CBRND).
– Junior Commander Course (UK Royal Marines);
– BG (Battle Group) Commander Course (UK);
– Civil-Military Cooperation Centre of Excellence (Netherlands);
– and other unspecified courses taken in USA, Denmark and Sweden.

Beyond activities completed within Austrian educational military institutions as Theresian Military Academy in Wiener Neustadt and National Defence Academy in Vienna respondents stated another and foreign educational institutions. Among foreign institutions where they completed educational activities or courses itself belong:
– Schule für Feldjäger und Stabsdienst der Bundeswehr (School of Military Police and Headquarters Service in Hannover, Germany);
– Die Technische Schule der Luftwaffe (The Technical School of the Air Force, Kaufbeuren, Germany);
– Nato School Oberammergau;
– Practical training – Armored Infantry Battalion PzGrenB332 in Wesendorf (Germany);
– Operational Capabilities Concept Evaluation and Feedback (OCC E&F), Oberammergau (Germany);
– United States Military Academy (West Point);
– Flight training at 2 Canadian Forces Flying Training School – Phase IV (Royal Canadian Air Force);
– Radar Control Training (United States Air Forces);
– and other internships and courses in Germany, Switzerland (Thun), Canada and USA.

In Lithuanian version, at the end of the questionnaire respondents could note any comments and suggestions for education/training and develepoment of military commanders (managers) of the National Defence system of Lithuania. Respondents stated the following:
– More good leaders (examples to follow).
– Be more strict and hold higher standards for cadets.
– National Defence System of Lithuania should provide more courses for aviation oficers specialists to improve their skills.
– Create and maintain logical training system.
– Do not change system of officer’s training every 5–6 years.
– More educated civilians or retired specialists.
– Need to properly prepare intructors prior to assigning them as an instructors.
– Military science should be approved as a separate science, that would help not to lose time for bachelor studies unrelated to military service in cadet training.

4. Integrating new elements of training

Above that the Lithuanian respondents were also asked whether they would be interested in an educational activity that would have applied the Crew Resource Management methodology (CRM). CRM is a process and a system of training for the activities in which human error has devastating effects. It was developed in the late seventies by NASA in order to reduce the possibility of human error in aviation. It focuses on interpersonal communication, leadership and decision-making in emergency situations. Training content created by NASA at workshop in 1979, has since been applied in various industries and organizations. CRM concept includes three basic elements, i.e. basic training to reinforcing awareness, practice, feedback and recurrent training. The key to success in the use of CRM is mutual respect and trust generated among crew members and teams, as well as supporting an environment that is conducive to openness and constructive criticism. The result is a higher professional performance due to the synergy which is achieved, thereby the risk of accidents or some random incidents is decreasing. The purpose of CRM is to streamline communication crews and teams who work in hazardous environments and the consequences of their decisions can be fatal.

CRM methodology was first applied to commercial aviation. Currently is used among air rescue teams, world military services, firefighters, police officers and hospital personnel. Statistics in the US document the decline in injuries and deaths of firefighters. After the implementation of the CRM methodology, deaths fell
by 100 and injured about 100,000 cases per year (Lesage, Dyar 2011). Also among employees in the US Coast Guard aviation personnel accidents were reduced by 70% (Reason 1999). Feedback revealed the cause of past accidents. Those were seen by the rescuers in the lack of accountability, communication managers, administrators, insufficient training and further education. Authors Reason (1999) and Kanki et al. (2010) who were examining human error in aviation operations published statistics from the period 1959–1989. According to their studies the primary cause of the accident is caused by airline staff (70%), further by technical error on aircraft (12%), error in aircraft maintenance (3%), bad weather (4%), an error caused by airport (4%), other errors (2%). Marshall (2009) describes the CRM issue amongs paramedics and Okray and Lubnau (2004) examine CRM by fire brigades.

Complex problem solving in a dynamic environment entails open communication, respect, awareness and feedback. The methodology CRM is focused on:
- finding adequate communication;
- recognition of different opinions;
- conflict resolution;
- its monitoring;
- decisions;
- and evaluation of a situation.

By adopting these attributes it can detect the areas in which the team communication fails. The performance of employees is being protected through the methodology of CRM. Achievement of synergy is possible if all team members understand the mission, their strengths and weaknesses and its own role in the team communication.

4.1. Use of CRM from the military perspective

Crew Resource Management training was first introduced in the US military in the late 1980s. The initiative for CRM training in the US military came directly from commercial aviation. However, at the beginning CRM courses were not well received by all military aviators. In the early 1990s the US Army, Navy and Air Force began funding CRM-related research. There were made great advances in terms of developing a research based model for delivering effective military CRM training. Researchers and military aviators developed a CRM program that consisted of basic concepts, academics and skill sets relevant to the demands of military flight operations. In the US military, this model has remained largely unchanged for over a decade. Further, this research served as the basis for CRM training in many services throughout the world (O’Connor et al. 2010).

The US Navy and Marine Corps initiated CRM in the early 1990s. The program was developed on the basis of a significant research program carried out at the Naval Air Warfare Center Training System Division (NAWCTSD). This led to the identification of seven CRM critical skills decision-making, adaptability/flexibility, situational awareness, mission analysis, communication, assertiveness and leadership), and a theoretically grounded method for how to train these skills (O’Connor et al. 2010).

The United States Air Force (USAF) was the military leader in CRM. The first Air force command to initiate a military version of CRM training for aircrew was the Military Airlift Command (MAC) in the mid-1980s. Almost immediately, other major commands began implementing their own mission-specific versions of CRM training for their aircrews (Wang 2013). In 1994, the Air Force formally mandated CRM training and assessment for all Air Force flight crew members (O’Connor et al. 2010). USAF specified six core CRM skill and knowledge areas which are situation awareness, crew coordination/flight integrity, communication, risk management/decision-making, task management, and mission planning/debrief (Wang 2013).

The US Army introduced their CRM training, called Aircrew Coordination Training (ACT) in 1994 for both their fixed wing aircraft and helicopters. This program only included a one-time training event with no continuation or refresher training. The following year’s results showed a significant decrease in overall accident rates. By 1999, the accident rates had increased back to baseline. Therefore, any attempt to use CRM training
should contain a comprehensive plan to reinforce and build on the initial training (Baker 2007). According to O’Connor et al. (2010) the Army was the first US service to achieve a service-wide standardized CRM program. Since the inception of ACT, the US Army has invested substantial resources to update its program, and in 2006 implemented ACT-E (Aircrew Coordination Training-Enhanced).

The Coast Guard CRM training, which as part of the program started in 2003, is very similar to that of the US Navy, addressing the same seven skills. All pilots and air crew are required to participate in initial and annual Coast Guard CRM training. Human error continues to be the most significant cause of U.S. Coast Guard mishaps. Studies show that 60% to 65% of cutter and boat navigation mishaps have had human error as a contributing cause. Ninety percent of the human error-caused mishaps were due to poor judgment (67%), inattention (more than 16%) and ineffective supervision (more than 5%). As a solution Coast Guard among other things delivers CRM training to boat personnel called Team Coordination Training (TCT). TCT is a program that focuses on reducing the probability for human error in cutter, boat and command/control operations and activities by increasing individual and team effectiveness (O’Connor et al. 2010; U.S. Coast Guard 1998).

4.2. CRM in other world’s military services

Most of the world’s military services have a CRM program. Among those services applying CRM training belong e.g.: Royal Air Force (United Kingdom), Royal Australian Air Force, Royal Australian Navy, Italian Navy, Dutch Navy, Spanish Navy, South African Air Force, Taiwan Navy, and the Finnish Air Force. The influence of US military CRM programs, curricula and research can be seen in all the services above. In some cases, however, such as the UK, there is substantial independent research and subsequently a distinct CRM program is emerging. In the Netherlands, the basic academic curriculum for military CRM programs is administered by the Netherlands Defence Academy (NLDA). Most countries have a Ministry of Defense order or instruction that governs their CRM program. The Dutch military CRM program subscribes extensively to civilian CRM program governance promulgated by Dutch civil aviation authorities. For all the services above, CRM program were implemented in the 1990s. Once the US military adopted CRM programs, it appears many non-US militaries followed suit (O’Connor et al. 2010).

Eighty-three percent of Lithuanian respondents answered that they would be interested in an educational activity that would have applied the Crew Resource Management methodology, 17% have no interest.

Would you be interested in educational activities at the Generolo Jono Žemaičio Lietuvos Karo Akademija where would the CRM methodology be applied?

| Yes | 83% |
| No  | 17% |

Fig. 7. The interest in educational activities at the Generolo Jono Žemaičio Lietuvos Karo Akademija (The General Jonas Žemaitis Military Academy of Lithuania) where would the CRM methodology be applied.

Source: Own research
Conclusions

The surveys taken in Lithuanian and Austrian Armed Forces showed that most of the Austrian commanders are aware of the opportunities for education and development within the Austrian Armed Forces. A situation is a little bit worse in Lithuania, where the commanders are by 21 % less informed when compared to Austria.

Also, most of the commanders transmit the information and consult them with superiors and subordinates employees. Interestingly, however, it may appear that a range of training and development activities is by Lithuanian Armed Forces very and rather satisfied only 36 % of commanders, 10 % commanders is very and rather dissatisfied with the current state – of which only 28 % of the respondents submitted specific suggestions on changes or additions to the content of education and development activities.

The offer of current educational and development activities provided by the Austrian Armed Forces is for 87 % of commanders sufficient or rather sufficient and for 13 % is the offer of training and development activities insufficient or rather insufficient. A proposal to amend the educational and development activities for commanders in the Austrian Armed Forces has ever submitted only 37 % of Austrian respondents.

Larger part of the commanders believe that the senior employee can become a good manager only by performance at their work, at the same time for development of managers are the courses developing managerial skills important. As a positive, it appears that more than half of Lithuanian commanders and exactly half of Austrian commanders had someone at the beginnings at leading position who allowed them to learn from his knowledge and experience.

For Lithuanian commanders arise as the most first three important areas in which they need to be further developed language skills, self-knowledge and communication skills. At Austrian Armed Forces are the priority areas for development needs at language skills, expertise and communication skills. The greatest barriers to further education and development Lithuanian commanders see in time, the workload, age, finance and family. Austrian commanders perceive the greatest barriers in time, the workload, in family, in commuting and methods of courses.

Up to 83 % of commanders at the Lithuanian Armed Forces would appreciate an implementation of new systems of training focused on the Crew Resource Management methodology and its application to the conditions of the National Defence System of Lithuania. The results of the questionnaire survey can be used to synchronize the needs and requirements with planning and implementation of educational and developmental activities of commanders in the Lithuanian Armed Forces and Austrian Armed Forces.

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ENERGY SECURITY, RESILIENCE AND CRITICAL INFRASTRUCTURE PROTECTION: SPANISH PUERTOLLANO REFINERY CRISIS CASE

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Abstract. Critical Energy Infrastructures can suffer different impacts from accidents and natural disasters which concern the whole energy system and specific functional aspects of Energy Security as well. A negative energy event -i.e. a strategic refinery blockade due to an accident- can provide useful experiences which demonstrate the connection among logistic efficiency, resilience and Energy Security. Spanish refinery Puertollano suffered an accident in year 2003 which stopped oil logistics in a significant part of the country. Military oil refined products logistics in Spain are managed by CLH oil products logistic company -operating in the framework of a Public-Private Partnership and civil-military cooperation model- and then this enterprise facilitated the implementation of a resilience measures aimed to guarantee the operation of oil products logistic chain in the affected area. Management of Puertollano refinery crisis in 2003 showed positive results for ensuring National Energy Security, market and business normal function, system stability and infrastructure re-adjustment. This crisis advanced criteria and lesson learned for Critical Energy Infrastructure Protection and business continuity planning.

Keywords: Critical Energy Infrastructure, Energy Security, oil products logistic system resilience.

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JEL Classifications: O13, Q41

1. Introduction

Critical Energy Infrastructure Protection is a key component of Energy Security system (European Commission 2015). Operation of such a kind of facilities is indispensable and its stop generates a deep impact against essential public services. On the one hand, these facilities are a potential target for deliberated attacks coming from several possible agents: criminal organisations, terrorist groups and armed forces (using conventional tools or ways of Hybrid Warfare (Ruehle & Grubliauskas 2015). On the other hand, these infrastructures can suffer different impacts from accidents and natural disasters which concern the whole energy system and specific functional aspects of Energy Security as well. In order to give an efficient response from institutions involved in Energy Security, it is needed to get entities able to engage all the National Security problems associated and capable to interact with other agencies involved. Lesson learned from practical events provide advanced knowledge to implement planning, counter-measures and accurate tools (Domech Moré 2010; Vílchez 2008). Energy logistics are deeply related to Critical Infrastructure Protection issues and this must be planned in advance to have an efficient operational management and resilience under crisis management situation. Military oil refined products logistics in the Spanish case are linked to CLH hydrocarbon logistic company -Compañía Logística de Hidrocarburos S.A.(CLH 2015) and this is a specific PPP case of civil-military cooperation model as well.
(NATO 2015). Considering NATO Strategic Concept approved in year 2010 -which introduced Energy Security topic as a priority for the Atlantic Alliance, boosting previous efforts (NATO EAPC 2007; NATO 2008)- and subsequent Chicago Summit in 2012 which highlighted the important role of Energy Security in common defence framework, this paper focuses in Critical Energy Infrastructure Protection issue to show how a negative energy event -strategic refinery blockade due to an accident- can provide useful experiences which demonstrate the connection among logistic efficiency, resilience and Energy Security.

2. Description of Puertollano refinery crisis

According to the report released by International Energy Agency - Standing Group on Emergency Questions (IEA 2006), we can know important information about the accident in REPSOL YPF Puertollano refinery and reaction from CLH company. An Emergency Response Programme Review of Spain took place in Madrid -on the 21 and 22 November 2005- conducted by a team comprising representatives of the USA, Sweden and the IEA Secretariat. It was based on Spain’s reply to the Emergency Response Questionnaire IEA/SEQ (94) 26/REV2. Puertollano oil refinery is an inland facility owned by Spanish petroleum company REPSOL -in 2003, REPSOL YPF- (REPSOL 2015), located 225 km to the South of Madrid. It supplies the area of Central Spain (among cities of Madrid, Mérida and Alcázar). This area is the first consumer of oil products in Spain (near 9 million m3 in the year previous to the accident described in this article). More than half of the product consumed in this area (55%) was supplied from Puertollano, through the pipeline connecting Puertollano and Loeches; the remaining 45% of the product consumed reached the area through other pipelines in the oil logistic track between Rota and Zaragoza: North (11%) and South (34%) ROTAZA (Espejo Marín 2008).

On August 14, 2003, the Puertollano refinery was forced to interrupt its activity as a consequence of an explosion which severely affected the two production units. Safety conditions were good: facilities had completed regular checks; control and alarm systems had right function parameters. None of them were activated in the hours before the accident; staff were qualified and well-skilled.Cause of the accident was an explosion and fire in tanks (FCC section), after gas (butane and other LPG) burse reached critical level of heat; gas escaped from light gasoline tank 2178-C where it was unexpectedly transfered from tower C-43. This irregular situation was not rectified on time (IEA 2006). This explosion also affected the pipes in the storage area of finished product, thus stopping the tender to the pipeline. It also had one of the worst possible consequences for the tender of oil products to Central Spain: no supply of 55% of the total oil product consumed in the area during almost half a year (5 months). The accident forced the immediate interruption of the Puertollano-Loeches pipeline activity, since this pipeline starts from the Puertollano refinery. The ROTAZA North and South pipeline working at its maximum capacity barely covered 50% of supply required daily in the area.

3. Reaction and emergency measures to keep oil products supplies

Crisis reaction and management coordination to solve Puertollano refinery accident included complex public-private coordination, involving 4 players mainly: ministry department (Direction General for Energy Policy and Mines), national agency CORES (Cores 2015) and two corporate entities (REPSOL YPF and CLH companies).

The governmental body Direction General for Energy Policy and Mines activated the response system for emergencies -in that time, current Spanish CNPIC - National Centre for Critical Infrastructure Protection (Cnpic 2015) did not exist- and the Administration summoned the Sectorial Committee of Energy Resources (CSREM), as well as national agency for oil reserves CORES -state-owned corporation of strategic reserves of oil-based products, which is responsible for managing strategic reserves and controlling the compulsory minimum security stocks in Spain-, petroleum company REPSOL YPF and oil logistic company CLH, and it called for an evaluation of the crisis situation plus the necessary measures to be adopted. The Administration established the priorities to guarantee supply in the area affected and to avoid market distortions; the actions criteria: equal treatment for all operators; a procedure for information and for a follow up of evolution until the end of the crisis (firstly on a weekly basis during months 1st and 2nd, furtherly on a monthly basis).
National agency CORES authorized company REPSOL YPF to transfer 115,000 m³ of strategic reserves from the Puertollano refinery to other refineries located in the Spanish coast (in towns of La Coruña, Cartagena and Tarragona). CORES also allowed a transfer of other geographical areas, of up to 300,000 m³ of the strategic reserves stored by enterprise CLH in Central Spain. CLH asked for this transfer in order to keep normal supplies to final consumers of oil products. Both authorizations were based on the firm compromise to restore the original paper stocks situation before the end of that year. Later on, the Ministry of Industry gave an exceptional authorisation to REPSOL YPF for pumping 450,000 m³ of diesel and heating oil through the crude oil Cartagena-Puertollano pipeline. CLH would then pump this product from Puertollano to Madrid.

CLH took the following measures in order to ensure the continuity of oil products supply to the affected area:
- In a initial stage, it transferred temporarily 150,000 m³ of gasoline and gas oil from Central Spain to the coast. These products were distributed amongst all the market operators involved, in proportion to the average consumption in the area during the last year, and with the commitment to re-establish the initial paper stock position before year end. An additional transfer of 150,000 m³, requested by CLH for reserve stocks, was not necessary thanks to the Administration authorisation to use REPSOL YPF crude oil pipeline.
- It allowed operators with security reserves located in Central Spain to consume these reserves within the area, allowing replacement of amounts consumed in other peripheral depots.
- Operators adapted the production schedules of their refineries located in the coast in order to supply larger amounts of products and maximize pipeline transport.

Furthermore, CLH implemented the following complementary measures:
- Adjustment of tanker rail-wagons to transport oil products from the coast (Cartagena and Grao de Valencia) to Central Spain, and conditioning facilities in Torrejón (where there is a major Spanish air force base) and Villaverde for reception of rail-wagons and tanker trucks.
- Modification of pumping conditions in the pipeline network in order to facilitate the transport of oil products to Central Spain.
- Providing extraordinary logistic services apart of normal contractual conditions.

It is important to have in mind that Spain has no crude oil significant resources and the country has a high external dependence of hydrocarbons (Segoviano Monterrubio 2011), therefore all downstream activities developed in the Spanish refineries are related to petroleum imports.

4. Lessons learned.

According to the final report about Puertollano refinery incident and considering the results of the actions taken in that time, there are some principal aspects which provide important lessons:
- The transfer of credit entries of 115,000 m³ (from REPSOL YPF) and 150,000 m³ (from CLH) of compulsory reserves owned by CORES from Central Spain to the coast, were crucial during the first days of the crisis, since it provided operators with the necessary product to maintain their normal levels in sales.
- The authorization to change the accreditation of a second amount of product owned by CORES, contributed the calmness to guarantee supply security during the whole period of crisis, and it allowed setting up the planned actions without additional stress.
- The compulsory reserves level was maintained in CLH and in Spanish refineries during the whole crisis.
- The immediate actions of the Public Administration ensured supply to end consumers, without neither price distortion nor market instability. These actions provided the necessary flexibility which CLH and operators needed in order to come up with the required solutions in the short term.
- The strict control system of the rights of each operator to consign products to the affected area of Central Spain by the Administration assured equal treatment for all the operators. The existence of an integrated logistics system of storage and pipeline transport allowed product shifting and truck load movement to depots outside Central Spain.
5. CLH logistics system, aimed to energy resilience

During the Puertollano refinery crisis affecting oil products Spanish energy sector, key element for the resilience of the system and ensuring supplies under stable operations were CLH oil logistic company and its business model. Therefore, it is necessary to know more about this.

CLH is a private entity, independent, with corporate governance stable under its own bylaw. Company has long business experience of more than 80 years. Its main activities are oil refined products logistics, including storage, pipeline transport and tanker truck loading; management of airport storage facilities and into-plane refuelling services; strategic storage and emergency stocks management for the Spanish central agency CORES, other foreign agencies and the operators; injection of quality and fiscal additives; biofuels blending. CLH also provides bunkering services.

Main assets include 4,027 km. of pipelines (connecting import harbour facilities, refineries, inland depots and other logistic companies), 7.9 mm3 of storage capacity in 39 facilities, 28 airport storage facilities, 5 hydrant systems in principal airports. Its labour force (2014) has 1,461 skilled workers. CLH network has a national Spanish coverage, providing service in more than 500,000 km2 and more than 46 million inhabitants; also has international links to Mediterranean and North European markets.

Key aspects of CLH’s logistic services are open access for any customer in Spain, competitive prices and flexible conditions, immediate product availability in any of CLH facilities upon receipt in CLH system, modern business model and efficient operations and information systems (i.e. state-of-the-art practices, fully automated, online nominations, inventories and billing), guaranteed product quality with dynamic product rotation. High degree of automation allows to significantly increase its productivity. CLH is the main operator of Spanish oil refined products logistic system.

Oil refined products logistic system is performed in open access for any customer, facilitating competitive prices (fee is less than 1% of retail product value) and flexible conditions, immediate product availability in any facility, fully automated operations, periodic quality control and product rotation. This logistic system has a high degree of automated processes and advanced level of integration (of storage and transport facilities, management and control systems), integrity and consistency of the information.

6. The CLH oil logistic model, National Security framework and the Armed Forces.

CLH business concept is closely related to Spanish emergency and strategic stocks of refined products, corporate governance and management. CLH is permanently linked to Spanish General Staff headquarters, and it includes operational Military Energy Security common framework. At the same time, CLH cooperates with national agency CORES supporting obligation of 92 days emergency refined products storage (Currently it is obligated by EU Directive 2009/119/CE, September 14, 2009). Although when the accident in Puertollano refinery arose Spanish national energy security rules and institutional framework were different from current conditions, it seems that CLH activities 12 years ago during Puertollano crisis provided experiences which have been very useful for performing modern strategies. Nowadays, the modern Spanish National Security Strategy 2013 considers Energy Security and Critical Infrastructure Protection issues and Spanish National Energy Security Strategy 2015 recently approved (July) provides more concrete guidelines in this way (nowadays, CLH security division implemented Critical Infrastructure Protection measures obligated by CNPIC establishing Operator Security Plan [PSO], Specific Security Plans [PPEs] and some business continuity protocols).

CLH services to military organisations are provided since the 1960’s and company is cooperating with military authorities -customers are Ministry of Defence (MINISDEF) and Defence Energy Support Center (DESC). Spanish business model related to the ownership and operation of the Spanish military bulk fuel system is a Government concession. Assets are refined products pipeline Rota-Torrejón-Zaragoza (ROTAZA) and strategic storage tanks (La Muela and Loeches). CHoD (Chief of Defence) on behalf of MoD retains the ownership of
the assets integrated in the system, and CLH company operates, maintains, updates, upgrades, and permanently improves the system. This military refined products logistic subsystem is fully interoperability with the rest of the Spanish non-military bulk fuel system.

The Spanish Government concession business model implemented in Spain to operate refined products logistic military assets has several advantages aimed to operational and cost-limited efficiency. Military authorities have the property over the assets and there is a military preferential use, under both peacetime, crisis situation or war conditions. Military assets under normal operation -which is integrated with civil infrastructures- ensures assets maintenance and readiness in crisis situation, therefore it mitigates the risk of technologic or material obsolescence. Civil network can be used for military purposes either under peacetime, crisis situation or war conditions. Emergency stocks always ensure product availability under crisis situation, furthermore for NATO European partners which locate their emergency stocks in Spain as well (i.e. Ireland) (CLH 2015). Military authorities obtain an economic benefit, especially from long term governmental concessions: fee regarding the right of use of the assets for civil purposes; preferential service price based on operation direct costs, and also competitive prices whenever network is efficiently operated. Military standards (i.e. O&M, product quality, specific certifications) are included in the Government concession agreement terms and conditions. This framework was satisfactorily kept during Puertollano crisis.

Regarding military organisation and logistics. CLH provides services to Ministry of Defence and Defence Energy Support Center, which a highly coordinated framework. Regulatory committees are established: Peer Mixed Committee (CLH – MINISEDf) and Mixed Technical Commission (DESC – MINISDEF), as regulated in the Defence Agreement between the Kingdom of Spain and the United States of America (April 2002). Services include product transport and storage, quality control and additivation (anti freezing, anti-.corrosion and anti-static additives), proposal and management of improvement projects. That economic relationship is based on a fee paid by CLH for using the pipeline (ROTAZA) under a governmental concession scheme. Preferential price is based only on direct costs derived from the operation of the pipeline (i.e. labour, energy, maintenance), depreciation, general costs and industrial margin. This model provides several advantages for military energy conditions taking into consideration that under his PPP framework (Espona 2014), military fuel supply is the priority and always guaranteed over civil services. Operation in crisis situation scheme means that pipeline network and storage facilities are put at military authorities disposal with preferential use, under activation of military operations (i.e. Operations Desert Storm, Irak Freedom -which was conducted along year 2003, just the same year in which Puertollano accident happened-, Enduring Freedom and Allied Force Joint Guardian) or crisis management situation (i.e. Puertollano oil refinery activity interruption in 2003). Logistic services -storage and transport- ensure the supply of the Rota (Spanish Armada and U.S.Navy operate units in this naval station) and Morón military bases (South of Spain area). The military assets are used also for civil services integrated in the CLH network, maximizing its operational utilization, minimizing risk of obsolescence and ensuring the financial resources for its maintenance.

Conclusions


Thanks to the coordinated actions by the Public Administration, national agency CORES, CLH company and operators, one of the most critical scenarios that could happen in production failure in a refinery in Spain was successfully overcome, despite its long duration (5 months).

Considering oil logistic model operated by CLH, this crisis advanced criteria and lesson learned for Critical Energy Infrastructure Protection and business continuity planning. These concepts can be found in the Spanish national Energy Security strategic framework established between year 2013 and year 2015, which is the most modern state-level strategic planning public instrument.
Regarding Military Energy Security, this oil logistic model shows several advantages for military energy conditions considering that, under his PPP framework, military fuel supply is the priority and always guaranteed over civil services. Operation in crisis situation scheme means that pipeline network and storage facilities are put at military authorities disposal with preferential use, under activation of military operations or crisis management scenario. Military assets in normal operation -which are integrated with civil infrastructures- ensure assets maintenance and readiness in crisis situation (military refined products logistic subsystem is fully interoperability with the rest of the Spanish non-military bulk fuel system).

Looking at future trends in the security & defence global framework, it seems that such kind of incidents affecting Energy Security should be deeply analysed taking into account the arising strategies and tactics of Hybrid Warfare.

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Social security issues: II pillar pension funds' performance in Lithuania

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Abstract. Since demographic problems have appeared, the pension system’s transformation has become an extremely relevant issue in terms of dealing with country’s social security problems. Development of medicine and a better quality of life have caused population aging which is particularly noticed in the developed countries. The problem of an aging population has encouraged scientists and practitioners to actively discuss the issue of social security. Particularly, the importance of a changing pension system has become a concern in regards of ensuring the public welfare. Therefore, the article analyses the sustainability of Lithuania II pillar pension funds using multi-criteria methods. The carried out research has enabled the evaluation and comparison of II pillar pension funds and their performance. The use of multi-criteria methods combining a few funds’ actions defining indicators into a whole have helped to evaluate the pension funds. In addition, it has helped to identify the funds’ operational sustainability and to choose the best fund, emphasizing the most important aspects for each member and shaping the weights of multi-criteria methods’ evaluation. It is important to emphasize that the aspect of reward indicator is significant in the asset accumulation in pension funds because the goal of these funds is to accumulate the biggest amount of asset for the future pension in a long period and not just to protect the money from its depreciation. Finally, it is worth mentioning that this type of a research provides a new perspective on the pension funds’ evaluation in the context of other criteria.

Keywords: pension fund, multi-criteria decision making, multi-criteria analysis.

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JEL Classification: G230, C390.

1. Introduction

Social security issues are affected by many factors, among which as sustainable development of economy (Oganisjana et al. 2015; Pather 2015; Travkina, Tvronavičienė 2015; Tvronavičienė 2014; Dobele et al. 2015; Olaniyi, Reidolf 2015), and demographic situation play very important role (Starineca; Voronchuk 2015). Influenced by demographic changes that started a few decades ago, countries around the world began performing an old-age pension system reforms. Some of the countries have made relatively small but significant and consistent changes; meanwhile others extremely rearranged the whole old-age pension system where Lithuania was not an exception. The structural changes of pension system made by The World Bank are still being actively discussed among the scientists who are trying to find some means of an evaluation. Contrary to the rest of the countries, Lithuania is not obliged to participate in the operations of II pillar pension
funds; however, once having entered the funds, a voluntary leaving would not be approved. This factor influences and presupposes a demand for the further analysis and evaluation. Systemization of the literature has shown that the indicators evaluating performance of pension funds are interpreted each individually (Jasienė, Kočiūnaitė 2007; Bartkus 2007; Gudaitis 2010; Lieksnis 2010; Bohl et al. 2011; Jurevičienė, Samoškaitė 2012; Huang, Mahieu 2012; etc.) without combining them into a whole which could help the members to make the right decision. Therefore, the use of multi-criteria assessment methods is becoming more and more significant (Pendaraki, Zopounidis 2003; Pendaraki et al. 2005; Alptekin 2009; Ching-Hui et al. 2010; Babalos et al. 2011; Stankevičienė, Bapkauskaitė 2014). In Lithuania, these methods have been applied for the investment funds’ assessment, solving problems of the construction sector and other complicated phenomena that are defined by using indicators which each emphasize different aspects of assessment. However, this kind of analysis has not been carried out for Lithuanian II pillar pension funds.

The aim of the article is to suggest a technique which would enable a complex evaluation of fund’s operation and would help to perform quantitative evaluation of Lithuanian II pillar pension funds’ performance.

Therefore, the research is not only significant because it allowed evaluating and comparing II pillar pension funds. In addition, a combination of multi-criteria methods has been employed in a scientific context which is quite unusual because it is still only being analysed on the level of theoretical approach. Results of the research enabled current members of the pension system to make decisions while choosing a pension fund for assess accumulation; furthermore, pension management companies obtained a possibility to determine their funds’ situation in the context of other funds.

2. The Issue of Pension Funds’ Assessment

The issue of population aging began to pose a problem in industrial countries at the end of the XX century. It was caused by demographic changes such as increased life expectancy and declining birth rates. R. Lazutka (2008) observes that because of the latter reasons, various countries in the world started implementing parametric and structural reforms of old-age pension systems. The author claims that most of the European Union countries have already performed parametric reforms: they extended the retirement age, made changes in pension indexation mechanism etc. E. L. Croitoru (2012) stresses that some of the European Union countries, such as Hungary, Latvia, Lithuania and others, made cardinal changes in their old-age pension system structures, taking into consideration a multi-system conception promoted by The World Bank and yet widely discussed in scientific contexts (Averting the Old Age Crisis 1994). Some scientists criticized such reform proposals claiming that they were not based and mythical; on the other hand, quite a few post-communist countries in Latin America have chosen to carry out such reforms based on The World Bank proposals (Orszag, Stiglitz 1999; Kotlikoff 1999). Lithuania was not an exception, however, changes made by the government have caused a lot of discussions that are still present nowadays (Gylys 2002; Lazutka 2008; Bitinas 2011; Gudaitis 2009a, 2009b; Medaiskis, Gudaitis 2013; Bitinas, Maccioni 2014; etc.). Lithuania performed an old-age pension system reform which resulted in three pension system pillars in 2004: I pillar was based on the current payments’ principal, i.e. PAYG (pay-as-you-go); II pillar was partially mandatory cumulative pension funds; III pillar meant voluntary cumulative pension funds (Gudaitis 2009b). Since the global financial crisis has started, the reward in cumulative pension funds has significantly decreased. In addition, the government reduced Sodra’s pensions and applied additional pension-size reductions to the working pensioners (Bitinas 2011). As a result of all the changes, Lithuania has performed another old-age pension system reform in 2013. Contrary to the system of 2004, a maximum accumulation was introduced in 2014, i.e. in addition to the payment transferred to a particular pension fund account by Sodra, a member is able to add his own assess, in this manner receiving an encouragement made by the government (The Republic of Lithuania… 2012). Although the maximum accumulation became obligatory for all the new signatories in pension funds, in 2013 specified period, the members of these funds had an opportunity to choose whether to start a maximum accumulation, return to Sodra’s system, or to stay at the old cumulative mean (Bitinas, Maccioni 2014). Ultimately, at the end of 2013, 96.8 % of all the insured remained in II pillar pension funds without a possibility to terminate the contract voluntary (Statistical… 2013). This promotes an evaluation of the results of pension funds and encourages the creation of ability for the members to choose the best cumulative fund.
Lithuanian scientific literature is limited to the sparse assessment analysis of II pillar pension funds (Jasienė, Kočiūnaitė 2007; Bartkus 2007; Gudaitis 2009a, 2010; Jurevičienė, Šamšinskaitė 2012; etc.). The articles evaluate data provided by the supervisory authority, Lithuanian Bank: data consist of the unit value changes, standard deviation that reflects the risk, or charges. In addition, Sharpe Ratio, Alpha, and Beta indicators are analysed.

Authors who have analysed investment funds also applied Treynor-Mazuy regression model and new multi-criteria methods SAW (Simple Additive Weighting) (Gavrilova 2011; Stankevičienė, Gavrilova 2012; Stankevičienė, Bernatavičienė 2012; Jurevičienė, Bernatavičienė 2012). Scientific articles of a theoretical nature are also worth mentioning since they provide a significant amount of applied methods that help to evaluate investment and pension funds (Dzikevičius 2004; Jokšienė, Žvirblis 2011; Žvirblis, Rimkevičiūtė 2010, 2012; Kuodzevičiūtė 2012). Even though the articles discuss quite a few indicators that are already in use, the authors mentioned above discover new possibilities. For instance, A. Žvirblis and V. Rimkevičiūtė describe the assessment of macro factors’ influence on investment funds, using various multi-criteria methods. In addition, they suggest applying the regression model in order to predict the prospects of investment fund’s capital’s volume (2012). R. Kuodzevičiūtė mentions absolute (unconditional), conditional beta and conditional beta-alpha assessment models that are widely used among foreign authors in order to evaluate investment and pension funds (Sawicki, Ong 2000; Ferson, Khang 2002; Cuthberston 2008; etc.).

The methods of the research, used to evaluate pension (investment) funds are provided in Table 1. Even though not all the indicators (e.g. the size of fund’s assets, the number of units) used to assess the investment funds are suitable and might be used to compare the pension funds, there are still valuable unemployed methods that would help the members of pension funds to make the right decisions.

<table>
<thead>
<tr>
<th>Methods Applied in Lithuania to Evaluate Investment and II-Pillar Pension Funds</th>
<th>Evaluation of II Pillar Pension Funds’ Carried Out by</th>
<th>Investment Fund’s Evaluation Carried Out by</th>
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</thead>
<tbody>
<tr>
<td>Treynor – Mazuy Model</td>
<td>(Gamma ratio) Stankevičienė, Gavrilova 2012; (Alpha, beta and gamma ratios) Gavrilova 2011.</td>
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<tr>
<td>The Number of Fund’s Investment Units</td>
<td>- Stankevičienė, Gavrilova 2012; Stankevičienė, Bernatavičienė 2012; Jurevičienė, Bapkauskaitė 2014.</td>
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Source: composed by the authors
To conclude the researches provided by Lithuanian scientists, there are a few observations worth discussing. D. Jurevičienė and Š. Samoškaitė suggest evaluating pension funds using Sharpe ratio in the period of three and a half years, however, they also claim that the funds have been already active for seven years (2012). It is important to notice that pension funds aim at a long-term reward, thus the researches should be also aimed at long periods. Nevertheless, according to R. Lazutka, a short-term evaluation should not be neglected either: waiting for a long period of time the results might appear disappointing and such a system would not help to ensure higher pensions (2008). However, taking into consideration the ideas provided in the article written by D. Jurevičienė and Š. Samoškaitė, the research could have been performed at the very beginning of the funds’ performance, i.e. in the period of seven years (2012). It is worth mentioning that the chosen period of time coincided with the year of crisis when many funds generated negative return and a risk-free interest rate had a considerable risk premium. In his dissertation T. Gudaitis employs alpha and beta ratios to calculate the period of 2008 which resulted in alpha ratios being negative in 18 funds out of 28, in other words, the performance of 18 funds’ managers was supposedly inefficient. Therefore, the evaluation of a short-term might distort the results, thus it is recommended to analyse pension funds covering a possibly maximum period of time.

Table 2. Analysis of Indicators Evaluating the Results of II Pillar Pension Funds

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Analysis of the Indicator</th>
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<tr>
<td>Change of the Unit Value</td>
<td>The indicator measures changes in pension fund’s member’s assets after they have been transferred into a pension fund account. Lithuanian Bank emphasizes that these indicators focus on deduction of property and not on the payment tax. M. Jasiene and D. Kociuinaite agree that change of the unit value enables a proper evaluation of company’s investment yield; however, it does not show net rates of return received by the member (2007). T. Gudaitis contributes to the ideas mentioned above and proves them in his dissertation in a practical nature (2010). It is worth mentioning that in the pension system reform performed in 2013, management companies applied taxes that were significantly reduced, furthermore, in a few years period, the payment fee will be entirely eliminated (Republic of Lithuania... 2012). Without a payment fee, the unit value change will become an even more significant indicator used to measure pension fund’s return.</td>
</tr>
<tr>
<td>Average Standard Deviation</td>
<td>T. Gudaitis emphasizes that an average standard deviation is “one of the best indicators to measure the risk” (2009a). He shows distribution of the average, i.e. how much the fund unit value is fluctuating in the period of the analysis (Noulas et al. 2005). Nevertheless, according to X. Huang and R. L. Mahieu, standard deviation is not an accurate indicator to evaluate fund’s risk (2012). M. Eling agrees and emphasizes that the standard deviation involves both positive and negative return directions, thus does not fully reflect an authentic definition of the risk (2008). However, Lithuanian II pillar pension fund’s risk shows that Lithuanian Bank does calculate this indicator.</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>The ratio combines the reward and the risk (standard deviation). J. Estrada claims that this indicator is the most popular in terms of evaluating fund’s reward that takes into consideration the risk; however, all the criticism related to the standard deviation is attributed to the Sharpe ratio (2006). Meanwhile, M. Eling states that despite the new alternative indicators, Sharpe coefficient remains one of the most appropriate measurements to evaluate reward and the risk (2008).</td>
</tr>
<tr>
<td>Beta Ratio</td>
<td>According to A. G. Noulas and other scientists, this ratio measures an investment systematic risk (2005). To be more specific, Beta ratio shows the change in fund’s reward when the market return is changing (market return reflects the changes of benchmark index) (Gudaitis 2010).</td>
</tr>
<tr>
<td>Treynor’s Ratio</td>
<td>This ratio evaluates fund’s reward that is related with the risk. According to M. T. Bohl and other scientists, contrary to the Sharpe ratio, this indicator evaluates systematic and not the general portfolio risk, this means, that the indicator deals with beta coefficient instead of standard deviation (2011). A. Dzikevicius emphasizes that the value of the indicator would only be correct in case of a fully diversified investment portfolio, which is, unfortunately, still quite abstract in a practical nature (2004). To conclude, although the indicator is criticized, it is quite widely used in terms of funds’ evaluation.</td>
</tr>
<tr>
<td>Jensen’s Alpha Ratio</td>
<td>J. Stankeviciene and A. Bernataviene define this indicator as an added value created by the actions of funds’ managers; it does not consider market development and the risk taken by the funds (2012). A. Dzikevicius criticizes that this indicator is based on averages and dispersions that do not reflect actual results (2004). Despite the criticism, this indicator is widely used and employed by many scientists in the evaluation of both investment and pension funds.</td>
</tr>
</tbody>
</table>

Source: composed by the authors

Investment and pension funds (see Table 2) are quite often evaluated using already mentioned Sharpe, Jensen’s alpha, Beta, and Treynor’s indicators in foreign scientific literature (Redman et al. 2000; Artikis, 2003; Noulas et al. 2005; Aamir Shah, Hijazi 2005; Jagric et al. 2007; Bohl et al. 2011; HemaDivyaa 2012). However, quite a few researches also involve other methods, such as Sortino ratio, Fama index or Sterling ratio (Hribernik, Vek 2011; Kolbadi, Ahmadinia 2011; Prajapati, Patel 2012; Parlak 2014). Regression models are applied and used to
calculate the weights of coefficient, for instance, CAMP (Capital Asset Pricing Model), Treynor-Mazuy, Fama- 
French and other models (Lieksnis 2010; Bohl et al. 2011; Adami et al. 2014). Although there are more various 
mathematical and statistical methods used in foreign scientific literature (Otten, Bams 2004; Cuthberston et 
al. 2008; Aldaa et al. 2013; etc.), most of the authors consider fund’s reward, standard deviation, Sharpe ratio, 
Jensen’s alpha ratio, Beta and Treynor’s ratio as the most influential indicators to evaluate investment funds.

3. The Issue of Multi-criteria Assessment Methods

Quite lot indicators that are used to evaluate II pillar pension funds presuppose a demand to combine them 
and evaluate the funds in a complex nature. According to J. Stankevičienė and A. Bernatavičienė, this resulted 
in now widely used multi-criteria assessment methods (MCA) becoming quite popular over the last decade 
(2012). R. Ginevičius and V. Podvezko agree and claim that its popularity is influenced by the versatility of 
these particular methods since the application of multi-criteria assessment methods enable a quantitative evalu 
atlon of any complicated phenomena expressed by many indicators (2008b).

Multi-criteria assessment methods receive more and more consideration in scientific literature (Opricovic, Tz- 
eng 2002; Pendaraki et al. 2003; Ginevičius, Podvezko 2008a, 2008b; Simonavičienė 2011; Jokšienė, Žvirblis 
2011; Žvirblis, Rimkevičiūtė 2012; Prascevic, Prascevic 2013; Sarkar 2013). Although II pillar pension funds 
have not been evaluated using these methods before, they are being used more and more in other fields of sci- 
ence (see Table 3).

The use of these methods helps to explore more than just social phenomena; it is used to evaluate the construc-
tion sector and its technological processes, the quality of products etc. Thus the methods are widely employed 
and appropriate in order to evaluate complicated complex phenomena. It is important to mention that multi-
criteria methods enable determination of analysed alternative priority queue; furthermore, it is advanced 
cause of the ability to combine both maximizing and minimizing indicators denominated in various dimensions 
into one summative indicator. In other words, the growth of such indicators in some cases result in a better 
phenomenon situation, and in others, the opposite. This type of combination is possible when all the indicators 
are transformed into zero-dimensional; this means that they are being compared among each other (Ginevičius, 
Podvezko 2008b).

<table>
<thead>
<tr>
<th>Author</th>
<th>Multi-criteria Assessment Method</th>
<th>Object of Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bogdanovic, Miletic</td>
<td>PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation)</td>
<td>Personnel assessment and selection</td>
</tr>
<tr>
<td></td>
<td>AHP (Analytic Hierarchy Process)</td>
<td></td>
</tr>
<tr>
<td>Tvaronavičienė et al.</td>
<td>SAW (Simple Additive Weighting)</td>
<td>Comparison of development in the Baltic countries</td>
</tr>
<tr>
<td></td>
<td>AHP</td>
<td></td>
</tr>
<tr>
<td>Podvezko, Podviezko</td>
<td>PROMETHEE I</td>
<td>Assessment of economic situation in the Baltic countries and Poland</td>
</tr>
<tr>
<td>Podvezko et al. (2010)</td>
<td>TOPSIS (Technique for Order Preference by Similarity to Ideal Solution)</td>
<td>Quality of construction contracts</td>
</tr>
<tr>
<td></td>
<td>SAW VS (Sum of Ranks)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AHP</td>
<td></td>
</tr>
<tr>
<td>Ginevičius, Podvezko</td>
<td>TOPSIS SAW COPRAS (Complex Proportional Assessment) COPRAS-M VS</td>
<td>Economic and social development in Lithuanian districts</td>
</tr>
<tr>
<td>Malinauskas, Kalibatas</td>
<td>COPRAS</td>
<td>Selection of rational construction processes</td>
</tr>
<tr>
<td>Tamošiūnienė et al.</td>
<td>SAW GA (Geometric average)</td>
<td>Assessment of investment projects</td>
</tr>
</tbody>
</table>

Table 3. Multi-criteria Assessment Methods and Their Uses
Table 3 shows that there are quite a few various methods applied in the analysis of different phenomena. According to the level of complexity, the methods are divided into two groups: simpler or less complicated (SAW, GA, and VS) and those that have a more complicated internal logic (VIKOR, COPRAS, TOPSIS, and PRO-METHEE) (Ginevičius, Podvezko 2008a; Podvezko 2008; Ginevičius et al. 2013). Every single method has its advantages and disadvantages, thus it is essential to decide which method should be used when dealing with a particular problem: their use and peculiarities are quite widely discussed in scientific literature. To begin with the least complicated method of VS, it is worth mentioning its difference from the rest of the indicators: in order to calculate the summative indicator, it does not use ratio weight. Furthermore, VS does not depend on the mean of data normalization or transformation since it only helps to determine the priority queue of each indicator that is involved (Ginevičius, Podvezko 2008a). Interestingly, V. Podvezko claims that alternatives set by VS method are not considerably different from the results of other methods that are based on complex mathematical calculations. Nevertheless, later R. Ginevičius and V. Podvezko in their article mention that, notwithstanding, this method provides quite accurate results (2008, 2008a). The authors compare various methods and exclude that VS is similar to GA: both of the methods do not depend on the included ratio weight. However, there are some GA’s disadvantages that should be mentioned, for instance, GA as well as SAW method only includes maximizing indicators (Podvezko 2008). V. Podvezko claims that it is fairly easy to change minimizing indicators into the maximizing ones, thus eliminating disadvantage mentioned previously applying both GA and SAW methods (2011). Considering SAW method, it is important to notice that this is one of the oldest and the most widely used methods. Nevertheless, V. Podvezko adds that using SAW method does not always provide accurate results because of the contradiction among used indicators (2011). As an alternative, COPRAS method that includes both minimizing and maximizing indicators is mentioned. After having carried out VIKOR and TOPSIS comparison, S. Opricovic and G. H. Tzeng observe that although both methods are based on similar principle (best proximity point), their normalization process is different. This determines that VIKOR method does not depend on the indicators’ units of measurement, meanwhile TOPSIS, contrary to VIKOR, might be influenced by these units of measurement (2002).

There are quite a few comparisons of various methods performed in the scientific literature in order to ascertain the coincidence of the results. J. Antuchevičienė et al. (2011) used Spearman’s correlation coefficient to compare TOPSIS, COPRAS and VIKOR methods’ results. The authors concluded that the arrangement of alternative summative ratios coincides the most when it is calculated by using TOPSIS and COPRAS methods; meanwhile the coincidence probability of other methods was significantly lower. R. Ginevičius and V. Podvezko compared the results’ coincidence of SAW, VS, GA, TOPSIS and VIKOR methods by using correlation coefficient (2008a). They claim that even though there is a strong connection between methods, VS and SAW methods are the least related because VS method does not include ratio weight (2008a). R. Ginevičius and A. Krivka has performed the research and concluded that the results calculated by using four methods (SAW, VS, COPRAS, TOPSIS) coincided; VIKOR was the only method that showed different results (2009). In addition,

<table>
<thead>
<tr>
<th>Source</th>
<th>composed by the authors</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Author(s) (Year)</th>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zavadskas et al. (2009)</td>
<td>COPRAS</td>
<td>Assessment of housing maintenance contractors</td>
</tr>
<tr>
<td>Pabedinskaitė, Vitkauskas (2009)</td>
<td>SAW</td>
<td>Assessment of a product quality</td>
</tr>
<tr>
<td>Baranauskiene (2012)</td>
<td>SAW</td>
<td>Assessment of a social welfare</td>
</tr>
<tr>
<td>Drejeris (2014)</td>
<td>COPRAS</td>
<td>Assessment of agricultural buildings’ functioning consistency</td>
</tr>
<tr>
<td>Ginevičius, Krivka (2009)</td>
<td>VS, SAW, COPRAS, TOPSIS, VIKOR</td>
<td>Assessment of competitive environment in the oligopolistic market</td>
</tr>
<tr>
<td>Stankevičienė, Bernatavičienė (2012)</td>
<td>SAW</td>
<td>Investment funds’ assessment</td>
</tr>
<tr>
<td>Andruškevičius (2010)</td>
<td>COPRAS</td>
<td>Contractors’ assessment</td>
</tr>
</tbody>
</table>
T. Y. Chen compares SAW and TOPSIS methods and concludes that the alternatives rated by these methods are fairly similar, furthermore, the author emphasizes that SAW method is easier applied and perceived than TOPSIS (2012). Meanwhile R. Kareivaitė explores sustainable development and declares that among SAW, COPRAS and TOPSIS methods, the latter is the best and the most appropriate method since it is more objective than the others (2012).

Scientific literature analyses methods’ sensitivity to the initial data change. S. Opricovic and G. H. Tzeng have performed comparative analysis of VIKOR and TOPSIS methods and claim that VIKOR tends to be less sensitive to the initial data instability than TOPSIS (2002). R. Simanavičienė and L. Ustinovičius conclude that TOPSIS is also more sensitive than SAW and COPRAS methods (2011). Meantime, sensitivity to the initial data change between SAW and COPRAS is similar. However, V. Podvezko has performed analysis of SAW and COPRAS and has observed that when the maximizing indicators are included, the results calculated by using these methods coincide. Meanwhile, if the analysis includes minimizing indicators, SAW method becomes more stable than COPRAS (2011).

In conclusion, although there have been quite a few method researches and comparative analysis performed, according to R. Simanavičienė, it is still not determined which methods are the best for solving different tasks (2011). As a result, R. Ginevičius and V. Podvezko in their article claim that “in order to reduce the influence of individual multi-criteria assessment means on the calculation results it is adequate to evaluate the phenomenon using various methods and then finding their average” (2008a). The authors emphasize that in such case, disadvantages of one multi-criteria assessment method are exchanged by the advantages of another method. It is important to mention that in order to use and combine various methods, they must be synchronized. The authors mentioned above have carried out the research and concluded that by using correlation analysis and evaluating the relation between different methods, it is possible to determine whether the methods could be used as a package in order to achieve an accurate assessment of alternatives.

The choice of indicators used in a summative ratio is also quite significant. According to V. Podvezko, in order to achieve an adequate assessment, it is important to include all the essential magnitudes to the list of indicators (2008). For instance, A. Andriuškevičius (2010) performs contractors’ assessment by including 26 indicators, V. Podvezko et al. (2012) analyse the quality of construction contracts by using 9 indicators, meanwhile, J. Stankevičienė and A. Bernatavičienė (2010) perform the research about investment funds and only use 8 indicators. No doubt, involvement of different factors has quite a significant influence on the phenomenon assessment. This reveals that the accuracy of the methods’ results depends a lot on the perspectives of the researcher, as well as his choice of the indicators used in the assessment.

As V. Podvezko claims, establishment of ratios’ weight is as important as the choice of the indicators (2008). An interesting research has been carried out by M. Tvaronavičienė and others: they compared development in Baltic countries every time giving the greater importance to a different group of indicators this way determining how countries’ development has been influenced by economic or social factors (2008). This type of evaluation expands multi-criteria assessment’s use spectrum: it enables a comparison that is not limited to determining complex alternatives of a phenomenon, in addition, the evaluation allows to rate complex alternatives emphasizing different analyzed characteristics.

Some of the authors in scientific literature employ an expert evaluation in order to determine ratios’ weight (Stankevičienė, Bernatavičienė 2012; Stankevičienė, Gavrilova 2012; Ginevičius et al. 2013; etc.). Various methods are also used for this type of assessment, for instance, direct weighing method, AHP (Podvezko 2006; Simanavičienė 2011). It is worth mentioning that expert evaluation quite often leads to contradictory results: this happens when various groups of experts have different position or opinion about the analysed issue. Therefore, determination of ratios’ weight is quite a subjective aspect in the use of MCA.

In conclusion, the versatility, wide application and increasing popularity of these methods presuppose a demand in their use in order to evaluate Lithuanian II pillar pension funds: the methods enable a complex assess-
ment thus helping a member to choose the best old-age pension fund.

4. Methodology

Taking into account the fact that the most important indicators in pension funds’ evaluation are reward and risk, the research has been carried out by using average annual return rate and standard deviation. It is important to mention that Beta, which shows systematic risk, is also ascribed as a risk indicator, thus must be included. In addition, Jensen’s alpha ratio is also included: it shows the added value created by active managers; operations, and allows determining which funds acquire higher reward because of those actions. Finally, Sharpe and Treynor’s ratios mentioned above, combine both reward and risk, thus they are not used in funds’ evaluation when MCA is used. Therefore, four methods have been chosen: average annual return, standard deviation, Beta coefficient, and Jensen’s alpha ratio.

In order to avoid inaccuracies in expert evaluation, four alternatives have been used in the research: all the indicators are granted an equal amount of weights (i.e. 25%); a greater weight is given to the reward (in some cases reward indicators are granted 75%, and risk indicators – 25%). In other cases, respectively, 90% and 10% or risk indicators (risk indicators are granted 75%, and reward – 25%). In other cases, respectively, 90% and 10%), and then the conclusion about the use eligibility in pension funds’ evaluation is made. In the first case, these proportions are chosen to assign one indicator’s weight (i.e. 25%) to risk (reward) ratios, and the three remaining indicators’ weights are distributed to the ratios reflecting reward. The next case is aimed at minimally taking into account the risk (reward) (i.e. 10%) and evaluating the funds focusing on one aspect, then comparing the results with funds’ average annual return (and standard deviation).

The research deals with simpler methods, such as, SAW, VS, GA, and more complicated methods, for instance, TOPSIS, VIKOR and COPRAS. The calculations of multi-criteria assessment method indicators are carried out by using the techniques of R. Ginevičius and V. Podvezko (2008a, 2008b, 2008c, 2009) and V. Podvezko (2008).

SAW (Simple Additive Weighing) method is used the most widely: it combines the indicators and weights of the same direction (i.e. maximizing or minimizing). The research involves Beta ratio and standard deviation that are minimizing indicators, meanwhile, unit value change and Jensen’s alpha ratio are maximizing indicators, and therefore, the minimizing indicators are changed into maximizing ones using this formula:

\[
\frac{\min_j r_{ij}}{r_{ij}},
\]

\(\min_j r_{ij}\) – minimum value of i-th indicator to j-th fund; \(r_{ij}\) – value of i-th indicator to j-th fund.

Calculated indicators are normalized:

\[
\tilde{r}_{ij} = \frac{r_{ij}}{\sum_{j=1}^{n} r_{ij}}
\]

SAW method’s summative indicator is obtained by carrying out the normalization of indicators. Then the following formula is used in order to calculate SAW summative indicator:

\[
S_j = \sum_{i=1}^{m} w_i \tilde{r}_{ij},
\]

\(w_i\) – weight of a corresponding indicator.

Each fund obtains a serial number according to the calculated indicator: fund with the highest ratio is ascribed a first place. Hereby, funds are rated in descending order.

VS (sum of ranks) method is carried out by using the simplest manner: each fund is ascribed with the serial number according to each indicator; in addition, the summative indicator is calculated by using the following formula:
\[ V_j = \sum_{i=1}^{m} m_{ij}, \quad [4] \]

\[ m_{ij} - \text{place of } i\text{-th indicator to } j\text{-th fund}. \]

In this case, the lowest amount is ascribed the first place and all the funds are rated in ascending order.

**GA (geometric average)** method is calculated by applying the simplest geometric average formula:

\[ \Pi_j = \prod_{i=1}^{m} \frac{r_{ij}}{\sqrt{\sum_{j=1}^{n} r_{ij}^2}} \quad [5] \]

In this case, equally as in VS method application, ratios’ weights are not included. Serial number is ascribed after calculating funds’ summative indicator with the formula [5]: as well as in SAW method, the highest amount is given the first place, and in this manner, all the funds are rated in descending order.

**TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution)** method is used to carry out normalization in the following manner:

\[ \tilde{r}_{ij} = \frac{r_{ij}}{\sqrt{\sum_{j=1}^{m} r_{ij}^2}} \quad [6] \]

In order to calculate the summative indicator, this method also uses calculations of the best \( V^g \) and the worst \( V^b \) solutions:

\[ V^g = \{ V^g_1, V^g_2, \ldots, V^g_m \} = \left\{ \left( \max_j w_i r_{ij} / i \in I_1 \right), \left( \min_j w_i \tilde{r}_{ij} / i \in I_2 \right) \right\}, \quad [7] \]

\[ V^b = \{ V^b_1, V^b_2, \ldots, V^b_m \} = \left\{ \left( \min_j w_i r_{ij} / i \in I_1 \right), \left( \max_j w_i \tilde{r}_{ij} / i \in I_2 \right) \right\}, \quad [8] \]

\( I_1 \) – index set of maximizing indicators, \( I_2 \) – index set of minimizing indicators.

After these solutions are found, the distances of indicators to the worst \( D^b \) and the best \( D^g \) solution in each fund are calculated:

\[ D^g_j = \sqrt{\sum_{i=1}^{m} (w_i \tilde{r}_{ij} - V^g_i)^2}, \quad [9] \]

\[ D^b_j = \sqrt{\sum_{i=1}^{m} (w_i \tilde{r}_{ij} - V^b_i)^2} \quad [10] \]

Finally, the summative indicator is calculated by applying the following formula:

\[ C^*_j = \frac{D^g_j}{D^g_j - D^b_j} \quad [11] \]

Equally to SAW method application, summative indicator is rated in descending order: the first place is given to the fund with the highest ratio.

**VIKOR** (serb. VIKOR Vlase Kriterijumska Optimizacija I Kompromisno Resenje) is only applied for the maximizing indicators (maximization is carried out in the same manner as SAW method). The application of this method in indicators’ normalization is based on formula:

\[ \tilde{r}_{ij} = \frac{\max_j r_{ij} - r_{ij}}{\max_j r_{ij} - \min_j r_{ij}} \quad [12] \]

Then two auxiliary indicators are calculated:

\[ S_j = \sum_{i=1}^{m} w_i \tilde{r}_{ij} \quad [13] \]

\[ R_j = \max_i \left( w_i \tilde{r}_{ij} \right) \quad [14] \]

Finally, the summative indicator is found:
Funds are rated in ascending order by using the indicator calculated with formula [15]: fund with the lowest amount is given the first place.

**COPRAS (Complex Proportional Assessment)** method uses formula [16] to calculate a summative indicator, whereas normalization is carried out by using formula [17]:

\[ K_j = S_{nj} + \frac{s - \min \sum_{j=1}^{n} x_{ij}}{s - \min \sum_{j=1}^{n} S_j}, \]  

\[ \tilde{r}_{ij} = \frac{r_{ij}w_i}{\sum_{j=1}^{n} r_{ij}}, \]  

The calculated summative indicators are rated in descending order. It is worth mentioning that without the presence of minimizing indicators, COPRAS method is calculated in the same manner as SAW.

It is important to observe that all the indicators must be compatible in order to combine them and calculate their averages. Compatibility of the methods is examined separately in each fund group by using correlation coefficient: the higher correlation coefficient is discovered, the more compatible methods are.

### 5. Results of the Research

**Assessment of Conservative II Pillar Pension Funds by Using Calculations of MCA.** Summative indicators of all the conservative funds have been calculated by using five variations (see Table 4 and Table 1A), furthermore, the calculations between SAW and other methods have been carried out by using correlation coefficient. They revealed that the value of coefficient’s module was higher than 90% in almost all the cases (except from the cases where the greater weight of 75% was given to risk indicators). Fund correlation coefficient evaluated by using TOPSIS coincided with the results of SAW and reached 75%: this shows a strong correlation which allows combining both of the methods and calculating their common average position (Dancey, Reidy 2007).

It is worth mentioning that given the same weights to reward and risk indicators, the results of almost all the funds have coincided (see Table1A); however, order of the funds rated by MCDM method has been slightly different. Meanwhile, the results of SAW and COPRAS methods were practically identical which was caused by the similarities of calculation methods. Giving bigger weights for the reward (see Table1A), summative indicators calculated by using all the methods have shown that Finasta Conservative Investment fund was leading: the fund generated the highest amount of average annual return, however, it did not take too many risk. Nevertheless, after emphasizing the risk indicators (75%) (see Table 1A), only the summative indicator calculated by using TOPSIS method has shown the Finasta Conservative investment fund leading; meanwhile, other methods have shown that the leading fund was MP Stabilo II, which took the lowest risk. The results confirm that each method has its peculiarities which influence the differences in the results.

It is interesting to notice the gap of indicators themselves. Indicators have been given the same weights (see Table1A) therefore; summative indicators of Finasta Conservative investment and MP Stabilo II funds calculated by using SAW and GA methods have differed only in hundredths. However, when the reward or risk indicators are given greater weights, the gap varies: in one case, the benefit was on the side of Finasta Conservative investment fund, in another case, it was on the side of MP Stabilo II fund. Similarly insignificant indicators’ differences have been noticed when the same weights have been given and calculated by using GA method in Danske Conservative and Swedbank Pension 1 funds (rounded values equal to 0.09). After emphasizing reward...
(75%), the values of these funds calculated by using SAW method were also almost identical (up to 0.08); meanwhile, after emphasizing risk (75%), COPRAS method has shown that ERGO Conservative Investment and SEB Pension 1 funds were operating in a similar manner. Therefore it might be concluded, that even though positions of the funds after their rating may differ, an insignificant gap in the summative indicator shows that the funds operate quite likewise. Thus, when the funds are evaluated by using multi-criteria assessment method, it is important to pay attention to the gap of the summative indicator in respect to others, as well as to the position of the fund itself.

After having discussed the results of individual methods, some conclusions may be made about the calculations; furthermore, it is possible to compare the results of multi-criteria assessment methods with funds’ average annual return, standard deviation and Sharpe coefficient that combines both reward and risk.

Table 4 (and Table 1A) demonstrates that when the funds are evaluated by focusing on average annual return or a multi-criteria assessment method, both of which grant a higher value for return, in all the cases the leading fund is Finasta Conservative Investment fund. Nevertheless, the results of other funds are not unambiguous. MP Stabilo II fund is only given the 7th position when it is rated by emphasizing average annual return, since the average annual return has been only 2.5% in the period of its performance. Meantime, this same fund goes up to the second position when standard deviation is included in the assessment: standard deviation of MP Stabilo II fund is the least in the group of all the conservative funds (only 0.67%). It is worth mentioning that MP Stabilo II fund only operates since 2011, this excludes the results in the context of all the other funds thus making its assessment inadequate.

Table 4. List of the Top Conservative II Pillar Pension Funds Based on Calculations Made by Using Multi-criteria Assessment Method, Average Annual Return, Standard Deviation and Sharpe Coefficient

<table>
<thead>
<tr>
<th>Conservative Pension Funds</th>
<th>Finasta Conservative Investment</th>
<th>Aviva Europension</th>
<th>DnB Pension 1</th>
<th>ERGO Conservative</th>
<th>Danske Conservative</th>
<th>SEB Pension 1</th>
<th>MP Stabilo II</th>
<th>Swedbank Pension 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sequence when the weights are equal</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (75%)</td>
<td>1</td>
<td>2-3</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>2-3</td>
<td>6</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (90%)</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>The sequence according to annual average return</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (75%)</td>
<td>2</td>
<td>5-6</td>
<td>4</td>
<td>7</td>
<td>5-6</td>
<td>8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (90%)</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>The sequence according to average standard deviation</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The sequence according to Sharpe ratio</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: composed and calculated by the authors

It is interesting mentioning the analysis of DnB Pension 1: taking into account average annual return the fund is in the 3rd position (3.54% average annual return). However, when indicators reflecting risk are included, the fund drops to the 4th position, meanwhile, the fund goes back to the 3rd position when all the indicators are given equal weights. The results of Aviva Europension fund are changing according to the size of the risk weight: the fund falls to the lower positions when the weights of risk reflecting indicators are greater. The results of Swedbank Pension 1 and ERGO Conservative fund are contradictory: when risk indicators are
increased, Swedbank Pension 1 rises to the higher position, meanwhile ERGO Conservative fund drops to the lower position. This shows that even though the latter fund operates quite a significant amount of average annual return (3.04%), it is also the second one in regards of the highest risk (its standard deviation goes up to 2.27%).

The results are more alike when risk indicators are taken into account; however, particular differences are encountered when the funds are evaluated by using standard deviation. For instance, Swedbank Pension 1 is granted the 1st position, but after having included reward indicators, it falls to the 3rd place. This shows that even though the fund has a low risk, it also generates a lower return than the funds with a similar amount of risk. Finally, the evaluation of multi-criteria assessment method’s and Sharpe coefficient’s results (given the same weights) has revealed that the only Danske Conservative fund is granted the 6th position, the results are different for the rest of the cases. Sharpe ratio has shown that the lowest operating fund is Swedbank Pension 1; nevertheless, multi-criteria assessment method has revealed that the lowest operating fund is SEB Pension 1.

A deeper analysis of the funds' results has revealed that although SEB Pension 1 generates a higher average annual return (up to 2.61%), it has the lowest Jensen’s alpha ratio. Meanwhile Sharpe ratio including reward and risk indicators reveals that even though Swedbank takes a lower risk than SEB Pension 1 does, its reward is too low to pay off that risk. The opposite results are seen in cases of Aviva Europension and DnB Pension 1 funds: a higher position is given to Aviva Europension by using Sharpe ratio, nevertheless, DnB Pension 1 is granted the 3rd place by using MCA. Funds’ results indicate that Aviva Europension generates a higher return rate (4.46%, DnB Pension 1 – 3.54%), but it also takes significantly higher risk (standard deviation is 2.26, meanwhile DnB Pension 1 – 1.43). This has determined that according to MCA its position is becoming lower despite a fairly better Jensen’s alpha ratio. Therefore, it may be concluded that MCA methods are used by taking into consideration the position of the indictor in the context of the rest of the operating funds.

Thus, multi-criteria assessment methods have different results from the Sharpe ratio which is calculated in a traditional manner. MCA methods’ results include more indicators, at the same time taking into account the position of each indicator respectfully to others: this enables a comparison of fairly equally operating funds. **Assessment of Small Equity Share II Pillar Pension Funds Based on MCA Calculations.** Funds in this group have been evaluated using all five MCA methods: the results have shown that not all the correlation coefficients are close to one (see Table 2A). Results calculated by using MCDM method with the same amount of weights, have shown a weak correlation (-0.36), thus these results will not be included to the calculations of the summative indicator. Meanwhile, methods have had a strong or average correlation in the rest of the cases, which has allowed combining their results into a whole.

Giving the same weights to indicators has revealed that almost all the methods used gave the same results: summative indicators of Aviva Europension Plus and DnB Pension 2 funds have turned out to be quite alike. Meanwhile, Swedbank Pension 2 was in the last position in all the cases. As well as among the conservative funds, the best managed small equity share fund is owned by PLLC Finasta Asset Management. As it has been mentioned before, this fund has generated the highest amount of return since its establishment among all the 28 II pillar pension funds.

Emphasis of the return indicators has shown that all the methods give equal positions to the funds (see Table 2A); however, Finasta Growing Yields' fund stands out since summative indicators of its methods have turned out to be fairly higher than the others. Meanwhile, methods show contradictory results when the emphasis is put on risk indicators (75%) (see Table 2A). Results calculated using SAW (as well as COPRAS) and MCDM methods have given the first position to DnB Pension 2 fund, nevertheless, TOPSIS has given the same first position to Finasta Growing Yields fund. Results of all the methods have placed Aviva Europension plus fund to the second position. It is interesting to mention that summative indicators calculated by using TOPSIS (as well as SAW) method differed just a little, the difference was in tenths, apart from Swedbank Pension 2 which was given the last position. Therefore, all the funds of this particular group operated fairly efficiently and effectively despite their arrangement. After having discussed individual results of the methods in this group, it is possible to compare them with average return, standard deviation and Sharpe coefficient (see Table 5). It is interesting mentioning that the results
are identical in almost all the cases, contrary to the conservative funds. Regardless of evaluating the funds by emphasizing their return while increasing the amount of risk, funds’ sequence remains unchanged. Meanwhile, putting emphasis on risk indicators, it can be seen that when 25% weight is given to return indicators, Finasta Growing Yields and Swedbank Pension 2 funds exchange their positions. This reveals that even though these two funds operate a high amount of the risk, Finasta Growing Yields fund expresses a fairly higher amount of return: return indicator influences only 25% of all the weight, thus outweighing risk indicators. Sharpe coefficient does not oppose funds’ sequence either. Therefore, all the facts mentioned before, support the idea that the indicators included in MCA calculations are not contradictory: this shows that unambiguously Finasta Growing Yields fund is the best when seeking a maximum amount of return.

Table 5. The List of Top Small Equity Share II Pillar Pension Funds Based on the Calculations of MCA, Average Annual Return, Standard Deviation and Sharpe Coefficient

<table>
<thead>
<tr>
<th>Small Equity Share Pension Funds (up 30 per cent)</th>
<th>Finasta Growing Yield</th>
<th>Aviva Europension plus</th>
<th>DnB Pension 2</th>
<th>Swedbank Pension 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sequence when the weights are equal</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (75%)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (90%)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>The sequence according to annual average return</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (75%)</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (90%)</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>The sequence according to average standard deviation</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>The sequence according to Sharpe ratio</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: composed and calculated by the authors

Assessment of II Pillar Pension Funds’ Average Share Based on MCA Calculations. Methods’ correlation coefficient modules that are calculated in this group are close to one equally as the ones in the conservative funds (see Table 4A), thus the funds are compatible and combined into a one summative indicator.

Taking into account all the methods, MP Medio II is the best managed fund, however, it should not be overlooked that the fund has been only operating since 2007 therefore having avoided a negative influence of the crisis on the results. For that reason, it is not entirely adequate to exclude MP Medio II as the best one among the rest of the funds in this group because of the differences in their operational periods.

The results are quite contradictory when indicators are given the same amount of weights (see Table 4A). Despite the fact that all the methods’ calculations grant the second position to Danske Pension 50, TOPSIS method gives the second place to Finasta Active Investment fund which has the highest amount of average annual return. MCDM method grants only eighth position to this fund because of its advantage in risk indicators; nevertheless, after increasing the weight of return indicators, MCDM method, equally to the rest of the methods, places Finasta Active Investment fund to the second position.

After having emphasized risk indicators, the second position is unambiguously given to Danske Pension 50 fund which has a low standard deviation and a positive Jensen’s alpha ratio. Meanwhile, except from Swedbank Pension 4 which has been granted the last position by all he methods, other funds have not been equally placed. For instance, Finasta Active Investment fund’s position ranges from the third to the eighth: it has the highest average annual return, however, the fund invests taking more risks than the market and its standard deviation is one of the greatest. Thus, this particular fund is rated differently by every method because of its extreme results.

MCA summative indicators of some of the funds in this group are fairly equal, however, some of the funds are granted a lower position in the total sequence even though evaluating indicator is quite similar. For instance, SEB Pension 2, Swedbank Pension 3, and Aviva Europension Extra have almost equal summative indicators when they are calculated by using GA method. SAW and COPRAS methods have revealed the same results, meanwhile TOPSIS method has shown almost equal indicators for six funds (risk indicators have been given
90%): Finasta Active Investment, DnB Pension, ERGO Balans, SEB Pension 2, Swedbank Pension 3, Aviva Europension Extra (see Table 4A).

It is necessary to analyse the results of modelling after having concluded the sequence of the funds considering different MCA. Contrary to small equity share funds, the results in these funds are also fairly ambiguous. While analysing the sequences of funds that emphasize return, it is interesting to notice Finasta Active Investment fund: it drops to a lower position when its risk weight starts increasing. This shows (see Table 6) that the fund operates quite a significant amount of risk (its standard deviation is 8.71%).

Indicators emphasizing return ratios show that Aviva Europension Extra fund is the most significantly influenced by return indicator. When return weight coefficient is increased, the fund falls to the lower position: this indicates that even though the risk of the fund is lower than the average of the rest of the group, its return is fairly low thus other funds are able to outrun it. It is worth mentioning that Swedbank Pension 4 is given 9th position after having calculated the results by all the methods: this reveals that the fund operates neither high return nor low risk which would normally enable competition with other funds.

**Table 6. List of Top Average Equity Share II Pillar Pension Funds Based on Calculations Made by Using Multi-criteria Assessment Method, Average Annual Return, Standard Deviation and Sharpe Coefficient**

<table>
<thead>
<tr>
<th>Average Equity Share Funds</th>
<th>Finasta Active Investment</th>
<th>MP Medio II</th>
<th>DnB Pension 3</th>
<th>Danske Pension 50</th>
<th>ERGO Balans</th>
<th>SEB Pension 2</th>
<th>Swedbank Pension 3</th>
<th>Aviva Europension Extra</th>
<th>Swedbank Pension 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sequence when the weights are equal</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (75%)</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (90%)</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>The sequence according to annual average return</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (75%)</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (90%)</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>The sequence according to average standard deviation</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>The sequence according to Sharpe ratio</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

*Source: composed and calculated by the authors*

Comparison of the main MCA sequence (while given equal weights) with Sharpe ratio shows that contrary to the conservative funds, the last and the first positions are given to the same funds. The first place is granted to Swedbank Pension 4, meanwhile the first one – to MP Medio II; however, the latter should be evaluated with a particular attention to its operating period (the fund was established in 2007). It should be noted that the distribution of 2-4th positions is not arranged equally. According to Sharpe ratio, DnB Pension 3 is given the second position; meanwhile Danske Pension 50 also gets the second position when it is rated by using MCA, however, with Sharpe ratio it falls to the fourth place. It is worth mentioning that DnB Pension 3 has a higher amount of return (up to 5.10%) than Danske Pension 50 (its return goes up to 4.86%), however, the fund operates a higher risk too (respectively standard deviations are 5.03 and 4.84). Nevertheless, Danske Pension 50 has a higher Jensen’s alpha ratio (up to 0.54%) which is not evaluated by using Sharpe coefficient. Thus, it might be concluded that even though DnB Pension 3 generates more return in respect to the taken risk unit, Danske Pension 50 generates a higher added value as a result of active managers’ actions; in addition, it takes a lower
systematic risk (beta coefficient is lower).

**Assessment of Shares II Pillar Pension Funds by Using Calculated MCA.** As Table 3A shows, the modules of correlation coefficients are close to one, therefore, all the summative indicators calculated by using MCA are again combined into a whole.

MP Ekstremo II leads in this group, however, it is worth emphasizing its operational period (since 2007) which causes some complications and does not allow equal comparison with other funds. Generally, there are only two funds in this group that operate since 2004 (Danske Pension 100 and Finasta Rational Risk): this aggravates the comparison of this group’s funds. It should be noted that the methods in the analyzed group reveal fairly similar results: the first position is given to MP Ekstremo II, the second – Danske Pension 100, and only the positions of three funds varies.

When equal weights are given, the results of VS differ the most (see Table 3A); nevertheless, its summative ratio value in respect to the last three funds varies over one, which shows that funds evaluated by using this method operate quite similarly.

The comparison of pension funds’ modelling results with Sharpe ratio, standard deviation and return has shown that the results are more similar to the ones of small equity share funds: the results largely coincide (see Table 7). Only third and fourth positions are different: according to Sharpe ratio the 3rd place should be given to Swedbank Pension 5, meanwhile, the sequence calculated by MCA grants the 3rd position to Finasta Rational Risk fund. Table 3A reveals that both of the funds generate fairly equal return (5.66 and 5.65), however, Finasta Rational Risk fund operates much higher risk which results in a lower Sharpe ratio. However, Jensen’s alpha ratio is much higher, it goes up to 1.1%, meantime, the one of Swedbank Pension 5 is negative (-3.59). It is important to emphasize that people who invest into shares pension funds are young people who aim at receiving a maximum return as well as a maximum return achieved by managers’ active operations. Therefore, in this case MCA is more advanced since it emphasizes the ratio of risk and reward as well as it enables taking into account the added value created by the managers’ active operations.

<table>
<thead>
<tr>
<th>Shares Pension Funds (up to 100 per cent)</th>
<th>Danske Pension 100</th>
<th>MP Extremo II</th>
<th>Finasta Rational Risk</th>
<th>Swedbank Pension 5</th>
<th>SEB Pension 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sequence when the weights are equal</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (75%)</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The sequence when return indicators’ weight is greater (90%)</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The sequence according to annual average return</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (75%)</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>The sequence when risk indicators’ weight is greater (90%)</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>The sequence according to average standard deviation</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>The sequence according to Sharpe ratio</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

*Source: composed and calculated by the authors*

To conclude the results of the research, it might be stated that MCA enables the evaluation of the funds by combining more indicators: this allows choosing the best fund by emphasizing the aspects that are the most important for each member. The results have shown that when risk and reward indicators are emphasized, the outcome is contradictory, therefore, according to the authors, more attention should be paid to reward indicators: the aim of the funds is to accumulate maximum amount of assets for the long-term future pension and not only to protect the money from its depreciation. Nevertheless, risk indicators should be distinguished for individuals with a minimum amount of years left until their retirement thus protecting them from the loss of assets in case of a complicated situation in the market.
Conclusions

Analysis of the scientific literature has shown that the field of multi-criteria method’s assessment is constantly expanding and these methods are adequate in II pillar pension funds’ evaluation. The assessment of pension funds by using various MCA methods has revealed that the peculiarities of each method influence rating of the funds thus putting them into different positions. Therefore, it is still not determined which MCA methods are more appropriate for individual tasks: as a consequence, combining all the methods solves the problem and enables finding the most accurate sequence for evaluating the funds.

Some of MCA methods take into account value of the indicator and its position in respect to other indicators’ value: this allows a more accurate and complex evaluation of each fund respectively to others. Results of the research have contributed to a versatile assessment of the funds’ operation and have shown that it is important to evaluate the position of individual indicators as well as a size of a particular indicator and its separation in comparison with others when choosing a fund.

After having carried out funds’ assessment by using MCA, it might be concluded that in order to achieve an accurate evaluation of funds’ performance, it is necessary to include as many various indicators as possible since different indicators reflect limited information. It is important to note that MCA is a new way of combining risk and reward indicators: the results calculated by using MCA have turned out to be different from the funds’ sequence provided by Sharpe ratio. Therefore, MCA allows including more indicators and evaluating average annual return, standard deviation and other indicators that are relevant for funds’ assessment.

Since this article is the first in Lithuania’s scientific field to evaluate, shape and rate pension funds’ performance using MCA, the suggestions for further researches have been made:

- It is recommended to include more evaluating indicators; hereby it would be possible to find the best complex of indicators that would evaluate funds’ performance thus helping the members to make a proper decision.
- A wider variety of MCA methods should be used; in addition, the weight of indicators should be changed in order to find the most accurate algorithm while evaluating pension funds’ performance thus helping the members to make the most adequate choice.

Appendix

Table 1A. List of the Position Conservative II Pillar Pension Funds Based on the Calculations of MCA

<table>
<thead>
<tr>
<th>Conservative Investment Pension Funds</th>
<th>Indicators with equal weights</th>
<th>Correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finasta Conservative Investment</td>
<td>Aviva Europension</td>
<td>DaB Pension 1</td>
</tr>
<tr>
<td>Value</td>
<td>0,20</td>
<td>0,14</td>
</tr>
<tr>
<td>Position</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>VS</td>
<td>Value</td>
<td>8</td>
</tr>
<tr>
<td>Position</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>GA</td>
<td>Value</td>
<td>0,19</td>
</tr>
<tr>
<td>Position</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>TOPSIS</td>
<td>Value</td>
<td>1,18</td>
</tr>
<tr>
<td>Position</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>VIKOR</td>
<td>Value</td>
<td>0,00</td>
</tr>
<tr>
<td>Position</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>COPRAS</td>
<td>Value</td>
<td>0,20</td>
</tr>
<tr>
<td>Position</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
## Indicators reflecting return are given greater weights (75%)

<table>
<thead>
<tr>
<th>Average of Methods' Positions</th>
<th>1.33</th>
<th>3.83</th>
<th>3.33</th>
<th>7.00</th>
<th>5.67</th>
<th>8.00</th>
<th>1.67</th>
<th>5.17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colocation</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

**SAW**
- Value: 0.23, 0.17, 0.14, 0.07, 0.08, 0.06, 0.17, 0.08
- Position: 1, 3, 4, 7, 5, 8, 2, 6

**TOPSIS**
- Value: 0.41, 0.28, 0.24, 0.15, 0.17, 0.14, 0.26, 0.17
- Position: 1, 2, 4, 7, 5, 8, 3, 6

**VIKOR**
- Value: 0.00, 0.22, 0.41, 0.88, 0.82, 1.00, 0.55, 0.96
- Position: 1, 2, 3, 6, 5, 8, 4, 7

**COPRAS**
- Value: 0.23, 0.17, 0.14, 0.07, 0.08, 0.06, 0.18, 0.08
- Position: 1, 3, 4, 7, 5, 8, 2, 6

## Indicators reflecting risk are given greater weights (75%)

<table>
<thead>
<tr>
<th>Average of Methods' Positions</th>
<th>1.00</th>
<th>2.75</th>
<th>3.50</th>
<th>6.75</th>
<th>5.25</th>
<th>8.00</th>
<th>2.75</th>
<th>6.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colocation</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

**SAW**
- Value: 0.24, 0.19, 0.15, 0.07, 0.08, 0.05, 0.16, 0.06
- Position: 1, 2, 4, 6, 5, 8, 3, 7

**TOPSIS**
- Value: -3.13, -5.39, -4.01, -11.27, -5.15, -14.25, -3.27, -4.63
- Position: 1, 6, 3, 7, 5, 8, 2, 4

**VIKOR**
- Value: 0.45, 0.86, 0.65, 0.98, 0.80, 1.00, 0.00, 0.55
- Position: 1, 2, 4, 7, 5, 8, 3, 6

**COPRAS**
- Value: 0.18, 0.11, 0.12, 0.06, 0.09, 0.06, 0.24, 0.13
- Position: 1, 2, 4, 7, 5, 8, 6, 1

## Indicators reflecting return are given greater weights (90%)

<table>
<thead>
<tr>
<th>Average of Methods' Positions</th>
<th>1.00</th>
<th>2.50</th>
<th>3.50</th>
<th>6.33</th>
<th>5.25</th>
<th>7.75</th>
<th>3.00</th>
<th>6.67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colocation</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

**SAW**
- Value: 0.24, 0.19, 0.15, 0.07, 0.08, 0.05, 0.16, 0.06
- Position: 1, 2, 4, 6, 5, 8, 3, 7

**TOPSIS**
- Value: 0.33, 0.21, 0.15, 0.06, 0.06, 0.05, 0.16, 0.05
- Position: 1, 2, 4, 6, 5, 8, 3, 7

**VIKOR**
- Value: 0.00, 0.25, 0.46, 0.87, 0.84, 0.98, 0.66, 1.00
- Position: 1, 2, 3, 6, 5, 7, 4, 8

**COPRAS**
- Value: 0.24, 0.19, 0.15, 0.07, 0.08, 0.05, 0.16, 0.06
- Position: 1, 2, 4, 6, 5, 8, 3, 7

**Source:** composed and calculated by the authors
### Table 2A. The List of Position Small Equity Share II Pillar Pension Funds Based on the Calculations of MCA

<table>
<thead>
<tr>
<th>Small Equity Share Pension Funds (up 30 per cent)</th>
<th>Finasta Growing Yield</th>
<th>Aviva Europension plus</th>
<th>DnB Pension 2</th>
<th>Swedbank Pension 2</th>
<th>Correlation coefficient</th>
</tr>
</thead>
<tbody>
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<td>0.25</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>VS</td>
<td>Value 10</td>
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<td>8</td>
<td>14</td>
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<td>1-2</td>
<td>1-2</td>
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<tr>
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<td>4</td>
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<td>1.00</td>
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<td>4</td>
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#### Indicators with equal weights

<table>
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<tr>
<th>Indicators reflecting return are given greater weights (75%)</th>
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<tbody>
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</tr>
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<td>TOPSIS Value 0.49</td>
</tr>
<tr>
<td>Position 1</td>
</tr>
<tr>
<td>VIKOR Value 0.00</td>
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<td>Position 1</td>
</tr>
<tr>
<td>COPRAS Value 0.35</td>
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<tr>
<td>Position 1</td>
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#### Indicators with equal weights

<table>
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</tr>
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</tr>
<tr>
<td>TOPSIS Value -1.74</td>
</tr>
<tr>
<td>Position 1</td>
</tr>
<tr>
<td>VIKOR Value 1.00</td>
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<td>Position 4</td>
</tr>
<tr>
<td>COPRAS Value 0.25</td>
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<td>Position 3</td>
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#### Indicators reflecting return are given greater weights (90%)
Indicators reflecting risk are given greater weights (90%)

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<th>0,28</th>
<th>0,24</th>
<th>1,00</th>
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<td>Value</td>
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<td>-1,17</td>
<td>-1,17</td>
<td>-1,18</td>
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<tr>
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<td>2</td>
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<tr>
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<td>0,28</td>
<td>0,24</td>
<td>1,00</td>
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**AVERAGE OF METHODS’ POSITIONS**

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<td></td>
<td>3</td>
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</table>

Source: composed and calculated by the authors

Table 3A. List of Position Shares (up 100 per cent) II Pillar Pension Funds Based on the Calculations of MCA

### Indicators with equal weights

<table>
<thead>
<tr>
<th>Shares Pension Funds (up to 100 per cent)</th>
<th>Danske Pension 100</th>
<th>MP Extremo II</th>
<th>Finasta Rational Risk</th>
<th>Swedbank Pension 5</th>
<th>SEB Pension 3</th>
<th>Correlation coefficient</th>
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<td>0,16</td>
<td>0,18</td>
<td>0,14</td>
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<td>4</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>VS</td>
<td>Value</td>
<td>7</td>
<td>5</td>
<td>15</td>
<td>17</td>
<td>16</td>
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<td>1</td>
<td>3</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>GA</td>
<td>Value</td>
<td>0,22</td>
<td>0,28</td>
<td>0,16</td>
<td>0,18</td>
<td>0,13</td>
</tr>
<tr>
<td></td>
<td>Position</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>TOPSIS</td>
<td>Value</td>
<td>-1,96</td>
<td>-1,92</td>
<td>-2,07</td>
<td>-2,16</td>
<td>-2,18</td>
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<td>Position</td>
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<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>VIKOR</td>
<td>Value</td>
<td>0,50</td>
<td>0,00</td>
<td>0,87</td>
<td>0,90</td>
<td>1,00</td>
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<tr>
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<td>Position</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>COPRAS</td>
<td>Value</td>
<td>0,25</td>
<td>0,32</td>
<td>0,17</td>
<td>0,14</td>
<td>0,13</td>
</tr>
<tr>
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<td>Position</td>
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<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
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<td>1,00</td>
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<td>3,83</td>
<td>4,83</td>
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<tr>
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<td>1</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### Indicators reflecting return are given greater weights (75%)

| SAW                                      | Value              | 0,22 | 0,26 | 0,18 | 0,19 | 0,14 | 1,00 |
|                                          | Position           | 2    | 1    | 4    | 3    | 5    |      |
| TOPSIS                                   | Value              | 2,30 | 2,53 | 1,90 | 1,64 | 1,62 | 0,90 |
|                                          | Position           | 2    | 1    | 3    | 4    | 5    |      |
| VIKOR                                    | Value              | 0,21 | 0,00 | 0,47 | 0,88 | 1,00 | -0,90|
|                                          | Position           | 2    | 1    | 3    | 4    | 5    |      |
| COPRAS                                   | Value              | 0,26 | 0,30 | 0,19 | 0,13 | 0,12 | 0,92 |
|                                          | Position           | 2    | 1    | 3    | 4    | 5    |      |

### **AVERAGE OF METHODS’ POSITIONS**

<table>
<thead>
<tr>
<th></th>
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<th>1,00</th>
<th>3,25</th>
<th>3,75</th>
<th>5,00</th>
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<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### Indicators reflecting risk are given greater weights (75%)

| SAW                                      | Value              | 0,22 | 0,32 | 0,14 | 0,17 | 0,14 | 1,00 |
|                                          | Position           | 2    | 1    | 4    | 3    | 5    |      |
| TOPSIS                                   | Value              | -1,20| -1,19| -1,21| -1,22| -1,22| 0,89 |
|                                          | Position           | 2    | 1    | 3    | 4    | 5    |      |
| VIKOR                                    | Value              | 0,57 | 0,00 | 0,97 | 0,93 | 0,97 | -1,00|
|                                          | Position           | 2    | 1    | 5    | 3    | 4    |      |
Indicators reflecting return are given greater weights (90%)

<table>
<thead>
<tr>
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<th>Value</th>
<th>Position</th>
</tr>
</thead>
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</tr>
<tr>
<td>TOPSIS</td>
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<tr>
<td>VIKOR</td>
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</tr>
<tr>
<td>COPRAS</td>
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<td>2</td>
</tr>
<tr>
<td>AVERAGE OF METHODS' POSITIONS</td>
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<td>-</td>
</tr>
<tr>
<td>COLOCATION</td>
<td>2</td>
<td>5</td>
</tr>
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</table>

Indicators reflecting risk are given greater weights (90%)

<table>
<thead>
<tr>
<th>Method</th>
<th>Value</th>
<th>Position</th>
</tr>
</thead>
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<td>VIKOR</td>
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<tr>
<td>COLOCATION</td>
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</tr>
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</table>

Source: composed and calculated by the authors

Table 4A. List of Position Average Equity Share II Pillar Pension Funds Based on the Calculations of MCA

Indicators with equal weights

<table>
<thead>
<tr>
<th>Average Equity Share Funds</th>
<th>Finasta Active Investment</th>
<th>MP Medio II</th>
<th>DnB Pension 3</th>
<th>Danske Pension 50</th>
<th>ERGO balans</th>
<th>SEB Pension 2</th>
<th>Swedbank Pension 3</th>
<th>Aviva Europension extra</th>
<th>Swedbank Pension 4</th>
<th>Correlation coefficient</th>
</tr>
</thead>
<tbody>
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<td>0.17</td>
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<td>0.05</td>
<td>1.00</td>
</tr>
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<td>8</td>
<td>6</td>
<td>7</td>
<td>9</td>
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<tr>
<td>VS</td>
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<td>0.17</td>
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<td>0.13</td>
<td>0.11</td>
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<td>6</td>
<td>7</td>
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Indicators reflecting return are given greater weights (75%)

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<th>Value</th>
<th>Position</th>
</tr>
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<table>
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<tr>
<th>Average Equity Share Funds</th>
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<th>MP Medio II</th>
<th>DnB Pension 3</th>
<th>Danske Pension 50</th>
<th>ERGO balans</th>
<th>SEB Pension 2</th>
<th>Swedbank Pension 3</th>
<th>Aviva Europension extra</th>
<th>Swedbank Pension 4</th>
<th>Correlation coefficient</th>
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<td>0.12</td>
<td>0.13</td>
<td>0.11</td>
<td>0.10</td>
<td>0.10</td>
<td>0.09</td>
<td>0.05</td>
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<td>6</td>
<td>8</td>
<td>9</td>
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<tr>
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**Indicators reflecting risk are given greater weights (75%)**

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**Indicators reflecting return are given greater weights (90%)**

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**Indicators reflecting risk are given greater weights (90%)**

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**Source:** composed and calculated by the authors

**References**


ECPI Euro Ethical Government Bond. The Unit Value Index of 2004 - 2014 M. Bloomberg Terminal.


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COUNTRY’S COMPETITIVENESS AND SUSTAINABILITY: HIGHER EDUCATION IMPACT

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Abstract. The development of human resources is an important condition for ensuring the sustainability of the society and the development of the national economy. Knowledge is becoming more and more one of the basic factors for society sustainability and development. In the 21st century economy, which is based on knowledge, the innovation becomes one of the major factors to increase the competitiveness. It is confirmed by the experience of leading economic systems when investing considerable resources in the society educating. It is especially important for the Baltic States in the context of the creation of the knowledge based society declared in the EU space. Thus one of the basic aims of the Latvian economy policy is to create efficient, competitive and sustainable economy. One of the basic priorities of an up-to-date state development strategy is a modern education and science system as the education level and the development of human capital are the most important indicators that are creating the competitiveness and sustainability of the country. In the article there are considered the global tendencies of the higher education; also the connection of education with innovation and sustainability are analysed. The aim of this study is to focus on sustainable competitiveness concept and provide in-depth understanding of higher education impact on ensuring sustainable competitiveness on national level. In the research there are used primarily quantitative comparative research methods. Quantitative indicators are used to characterize specific features of the higher education impact on economics in the Baltics and Nordics. For the calculations, methodology and definitions the OECD methodology and World Economic Forum, global competitiveness concept is used.

Keywords: higher education, sustainability, innovations, competitiveness, Global competitiveness index.

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JEL Classifications: O1; O3

1. Introduction

The development of knowledge-based society and sustainable economy considerably depends on the ability to produce competitive goods and services and to distribute them in the global market. And vice versa the improvement of the higher education is promoted in order to ensure sustainable development and competitiveness of the country and its regions. Global economical activity changes fast and heavily impresses the competitive possibilities of developing countries; it is not easy to achieve and to save competitiveness. It is not enough only to be passively opened for the free market. The experience presents evidence that inquiring the competitive sources is possible only for technologically developed companies, which can get into the world manufacture system. Qualitative and fast mastering of new knowledge, piling and applying became the main source of the countries, regions and the businessmen’s competitiveness factors.

Knowledge creation and dissemination, as well as innovation, are keys to promotion of competitiveness. Economists working on growth theory and/or human capital development have showed two important, strongly
related phenomena. First, knowledge, which is embedded in human capital and created by research, has become as important means of production as labour and capital. (Aghion, 2006) Access to skilled people and research are issues of particular importance for small and medium-sized enterprises in order to ensure their ability to become globally competitive and thus to enable them to grow. (Hedin, 2009) Innovation, which is drawn more or less successfully from knowledge and the changes it implies, is the engine of the growth. (University Research.. 2009, p.40) Second, innovation is indispensable for country the closer the country is to the „technology and organizational frontier” (Aghion 2006). Indeed, less-advanced countries can still improve their productivity by adopting existing technologies or making incremental improvements in other areas, for those that have reached the innovation-driven stage of development, this is no longer sufficient to increase productivity. (The Global Competitiveness Report 2011). In other words, scientific progress and education (especially higher education) are the best sources of new solutions to contribute to prosperity; however, it is necessary, but not sufficient condition for further progress, because potential advances have to be correctly implemented by business leaders and governments.

2. Competitiveness and sustainability

The World Economic Forum defines competitiveness as the set of institutions, policies and factors that determine the level of country productivity. The concept thus involves 12 pillars of competitiveness, including the innovation, higher education, and training. (The Global Competitiveness Report, 2014). Throughout the second half of the 20th century, data showed that increasing productivity and economic growth went hand in hand with better and improving living conditions. The ranking of the global competitiveness index is an important source of information about the economic situation of countries; it uses a unified system to reveal the strengths and weaknesses of every country in the field of competitiveness.

Since 2011, the Forum has embarked on a major effort to deepen understanding of how sustainability relates to competitiveness and what this means for the development path of economies, resulting in a conceptual analysis and the calculation of the sustainability-adjusted global competitiveness index. The sustainable competitiveness index is a composite indicator which measures the drivers of long-term competitiveness. The central idea is to measure how sustainable is the productivity level of an economy with respect to environmental stewardship and social sustainability. Sustainable competitiveness implies achieving competitiveness gains today without compromising future competitiveness. Sustainable competitiveness is the set of institutions, policies and factors that make a nation remain productive over the longer term while ensuring social and environmental sustainability. (The Global Competitiveness Report 2014)

The social sustainability is the set of institutions, policies and factors that enable all members of society to experience the best possible health, participation and security; and to maximize their potential to contribute to and benefit from the economic prosperity of the country in which they live. (The Global Competitiveness Report 2011)

For social sustainability, the Forum identifies three conceptual elements:
• access to basic necessities: access to sanitation, access to improved drinking water, accessibility of healthcare services;
• vulnerability to economic exclusion: extent of informal economy, social safety net protection, vulnerable employment;
• social cohesion: income Gini coefficient, youth unemployment, social mobility.

Sustainable competitiveness requires a number of elements: the basic structures (infrastructure, and the maintenance of infrastructure), business environment, and last but not least, quality education and R&D capabilities, which are directly or implicitly interrelated with education outputs.

One of the key developments in the policy space over the past decade has been the advancement of concepts related to environmental sustainability and more recently inclusive growth. Such conceptual schemes comprise
social, economic, and environmental components of sustainability, and they provide an intellectual basis for societies around the world to coalesce around the principles of sustained and universal levels of prosperity. Although the attainment of a certain level of economic prosperity is essential for achieving high standards of living, within this exercise, countries are assessed also for their ability to generate this long-lasting prosperity for their citizens in a sustainable way. In other words, competitiveness is a necessary but not sufficient condition for continued prosperity – hence the need for the additional social sustainability-adjusted and environmental sustainability-adjusted measures of competitiveness.

Despite financial and structural challenges, Scandic countries continue to feature prominently among the most competitive economies in the world. All of them are among the top 20 in global competitiveness index: Finland (4th), Sweden (10th), Norway (11th), Denmark (13th). All of Scandic countries are in 3rd stage of development: innovation-driven economies (see table 1). However, Europe is also a region with significant disparities in competitiveness, with several countries from the region significantly lower in the rankings (Shwab, 2013).

In spite of Baltics is in transition stage to innovation driven economy, Estonia remains the best performing country in Eastern Europe reach 29th overall. The country boasts a solid competitiveness profile with an excellent educational system (20th), as well as a strong commitment to advancing technological readiness (29th). In opposition competitiveness performance of Lithuania and Latvia is evaluating by 48th and 52nd place within 144 countries. Similar situation is in the Sustainability-adjusted GCI list of all Scandic countries. It should be emphasized that countries in this region have high social sustainability component value and it has growing tendency. for instance social sustainability – adjusted GCI in Norway is 6.43 points, Finland – 6.38, in Latvia – 4.64, but with stable value (-5%-+5%). (see Table 1)

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*Source: Shwab, 2014;

The latest available data (2014) show that among 144 countries the competitiveness of Latvia’s higher education is placed in the 31st position (Estonia – 20th place, Lithuania – 26th place). Scandic countries, in turn, according to this indicator, are stable among top 20, similarly as according to GCI indicator. Global competitiveness index structure shows that Denmark also continues to receive a first-rate assessment for its higher education and training system (10th), which has provided the Danish workforce with the skills needed to adapt rapidly to a changing environment and has laid the ground for high levels of technological adoption and innovation. A continued strong focus on education would help to reverse the downward trend in the country’s ranking and to maintain the skill levels needed to provide the basis for sustained innovation-led growth.

Finland, which performed consistently well on the components of the global competitiveness index, shows that, biggest competitiveness strength lies in its capacity to innovate, where the country leads the world rankings (1st). Very high public and private investments in R&D (3rd), with very strong linkages between higher education and industry (1st) coupled with an excellent education and training system (1st) and one of the highest levels of technological readiness (11th) drive outstanding result.
Sweden (10th) has a rather stable competitiveness profile across all areas. Due to strong focus on education over the years Sweden has developed a very sophisticated business culture (8th) and is one of the world’s leading innovators (7th). Sweden has managed to create the right set of conditions for innovation and unsurprisingly scores very high in many of the dimensions that are key to creating a knowledge-based society. More precisely, the Swedish education and training system (14th) is of high quality and seems to deliver the right set of skills for an innovation-based economy; ICT adoption (3rd) is among the highest in the world; and, in terms of innovation capacity (7th), firms are among the best performing. In addition, the country has also formed highly competitive markets (17th), which produce the right set of incentives to quickly transform those knowledge assets into new products and services with higher value-added (see figure 1.).

![Fig.1. Comparison of the indicators of the Global Competitiveness Index among selected countries in 2014-2015.](image)

*Source: author created by Shwab, 2014.*

Raising productivity and competitiveness is crucial to sustaining economic growth and enhancing prosperity in a country. The ninth pillar, innovation, is particularly important for countries that have reached the high-tech frontier, as it is the only self sustaining driver of growth. Also for the innovation index Latvia takes only the 70th position, while Lithuania and Estonia – 44th and 30th correspondingly. The innovation index in Finland is 5.78, in Sweden – 5.37, in the USA – 5.49, but in Latvia – only 3.27 points that is the lowest indicator among the neighbour countries. Innovations and the qualitative aspects of the business sophistication is the determining factor of the economic development for the creation and development of the knowledge-based economy. In Latvia the low level of cluster development (90th place), the low availability of scientists and engineers (106th place) as well as the low cooperation of higher educational institutions and branches in the field of research (63rd place), country capacity to retain (64th place) and attract (107th place) talent, quality of the education system (65th place) deserve particular attention.

### 3. Higher education and sustainable competitiveness

The importance higher education has concerning economic, social and cultural development is stressed by OECD (*Higher Education and Regions...* 2007). In order for regions to be integrated into and competitive in the globalising knowledge economy, knowledge-intensive goods and services have to be produced. Here access to new technologies, knowledge and skills are considered essential. The world practice shows that the increasing distribution of the higher education is strongly related to the work productivity and the economy.
competitiveness in general. Linking of knowledge with capital, technologies and manpower, their constantly increasing proportion in every product and activity create necessity for inhabitant education, knowledge and competences.

Education and training are emerging as key drivers of competitiveness. As the global economy has become more complex, it has become evident that to compete and maintain a presence in global markets it is essential to boost the human capital endowments of the labour force, whose members must have access to new knowledge, be constantly trained in new processes and in the operation of the latest technologies. The analysis of the pillars and factors determining the competitiveness in Latvia when compared to other Baltic and Scandic countries is carried out within the global competitiveness monitoring.

The fundamentals for achieving sustained growth in transition economies to innovation-driven stage: education and training (5th pillar), technological readiness (9th pillar), business sophistication (11th pillar), innovation (12th pillar), including university-industry collaboration in R&D. Education has been a particularly important driver in the development of the capacity for technological innovation, as the experience of Finland, Korea, Taiwan, and Israel clearly shows.

Latvia and Lithuania lags behind the Scandic countries both by the rating of the higher education and by other indicators related to the education: innovations, level of technologies, and efficiency of the labour market. Similar situation is also with innovation and knowledge based economy indices. The World Bank evaluates the knowledge based economy (KEI) of Latvia being in the 32nd place, which is the lowest indicator among the Baltic countries, but the Nordic countries are leading in the field of knowledge based economy development (see Table 2.). Higher level of education promotes both fundamental innovations and adoption and imitation of the global high-tech practice. Still, Latvia does not use these possibilities.

| Table 2. Indices of higher education, innovation and knowledge based economy in different countries |
|--------------------------------------|-----------------|-----------------|-----------------|
| Norway | 8 | 5 | 16 |
| Sweden | 14 | 1 | 2 |
| Finland | 1 | 2 | 6 |
| Denmark | 10 | 3 | 9 |
| Estonia | 20 | 19 | 25 |
| Lithuania | 26 | 32 | 40 |
| Latvia | 31 | 37 | 33 |

*Source: Shwab, 2014; Global Innovation Index.. 2013; Knowledge Economy Inex 2012.*

The analysis of the interrelations of a country’s competitiveness index with the economic development pillars makes it possible to identify the factors having the greatest influence on a country’s competitiveness. In the global scale, higher education (0.93) and innovation (0.91) pillars have one the highest value of the correlation coefficients with the competitiveness index. The main differences are related, firstly, to the fact that the correlation coefficients with GCI for the 5th pillar (higher education) have decreased from 0.93 to 0.88 accordingly, which can be explained by the “saturation” effect – infrastructure and education are well developed and their minor changes have no major effect on competitiveness. (Hiļķevičs, Štefenberga, 2013) (see Table 2.)
Figure 2. shows the relationship between the GCI and the higher education and training pillar.

Fig.1. The Global Competitiveness index and higher education pillar interrelation

Source: author created by Shwab, 2014.

Such countries as Denmark, Sweden, Norway and Finland are consistently performing higher education reforms, constantly improving the efficiency stimuli both in the system in general and in its components. The most actual changes were directed to the improvement of the higher education: the structure of the resource investment indicators was improved, the system reorganization was conducted, the students’ mobility is actively developing (stressing the importance of the mobility of outgoing students), also the systems of the higher education performance indicators are being improved (Jermolajeva, Aleksejeva 2013). In this way the higher education of these countries have gradually ensured the competitiveness and sustainable development of the country what is confirmed by the leading positions in the global competitiveness index, global innovation index and other indicators. The reforms of the previous decade include the associations, integration, structural cooperation and creation of strategic alliances in Norway, Denmark, Finland and other European countries. Many of these processes had been initiated by the country.

When paying more detailed attention to the higher education system of Finland and examining its interrelations with processes of national economy, it can be concluded that, first, the economic policy of Finland was created on the basis of integration of different branches (Aho et al., 2006). The basis of the education system development is taken by mid-term political decisions that are based on stable state values: equality of education opportunities, general scope of secondary education, state-financed all-round education. This mid-term policy anticipates integration of education and vocational training systems, involvement of the private sector and manufacturing in the evaluation of the education system quality, in formulation of requirements and in monitoring (Salberg, 2006).

Secondly, the strategic framework of the education system development and reforming has a long-term character. Thirdly, the influence of the state administration and institutions has a significant role in the policy of the higher education and in the implementation of the education and economic reforms (Sahlberg, 2009). Efficient state administration and high development level of public institutions have a significant role in the creation and execution of the policy of society’s subsystems as well as in the implementation of the changes planned. Fourthly, well-educated human resources and their wide involvement in continuous education guarantees reproduction and improvement of human capital that is necessary to ensure higher education services and economic growth. The most important changes in the higher education took place in the beginning of 90’s of the 20th century when
the majority of state regulatory functions was cancelled but education opportunities and directions – widened (Aho, et al., 2006; Routti, Yla-Anttila, 2005). In the same way, the state regulatory influence in the private sector was diminished, as well as more flexible standards were introduced. It all together ensured the development of network interaction in the field of academia-industry-government (state and region)(Tvronavičienė, et al. 2015; Branten, Purju 2015; Laužikas, et al. 2015;)

The integrated policy and the long-term state strategic planning ensured the Finnish higher education system took leading positions in the whole world as well as the country’s competitiveness and successful development of the private sector. A constant dialogue between state and private higher educational institutions permitted to achieve mutual understanding about the anticipated results and factors of society and knowledge economy development. As the result, education institutions, too, are more actively involved in the introduction of experiments by using creative technologies, developing business skills and positive attitude of students towards work. Strong integrated policy frameworks and long-term strategic visions have enhanced sustainable leadership in education and private sector developments (Sahlberg, 2006)

Despite the comparatively high indicators of the higher education achievements, the higher education systems in the Scandic countries are still in the reforming process. The same is true about the Baltic countries where the higher education systems undergo intensive reforms since 1990’s and whose performance is not so outstanding yet, but they continue to search for a better system management and governance mechanism and directions of the general system development (Čirjevskis 2015).

In terms of social sustainability Nordic countries also continue to perform well overall and display specific areas of improvement. Finland, despite an inclusive social system and a track record of managing resources responsibly, has to address a rather high level of youth unemployment (approximately 19%), depleting fish stocks, diminishing forest cover, and limited protected areas. Norway attains the strongest social sustainability performance of all the countries in the 144 country sample in 2014, balancing low inequality and social protection with high mobility and low level of unemployment. Social development factors encompass a range of investment in human development from healthcare to education, to protection of the environment to the effective management of urbanization. In terms of creating and sustaining wealth, nations need to provide jobs and income to their populations. Quality and availability of education in the past are an indication for today’s R&D and innovation capabilities, and today’s education performance reflect future innovation capabilities (Tvronavičienė et al. 2015; Branten, Purju 2015; Matetskaya 2015). Strength and depth of R&D activities is the basis for the development of value-added technologies and services

Higher education institutions are now called upon for tasks that go far beyond their traditional teaching and research functions, such as regional engagement, innovation boosting, and, perhaps most significantly, collaboration with business (Regions matter: economic recovery,...). Functional linkage between higher education, industry and society is a prerequisite to sustainable development. Universities, with their triple role as providers of the highest level of education, advanced research and path-breaking innovation have the potential to be crucial drivers of Europe’s ambition to be the world’s leading knowledge-based economy and society. (COM, 2009)

Furthermore, higher education institutions at academia-industry-government interaction network have emerged as important power of changes that stimulates high and digital technologies and serves as the basis of intellectual capital for entrepreneurship. Social environment as well globalization, localization, glocalization processes more often influence competitiveness, not only in economic competitiveness level, but also in social sustainability effects. The concept of sustainable competitiveness emphasizes very essential task of any innovation policy; together with innovations that facilitate competitiveness to provide sustainable development of the whole society not only in the context of economic growth, but also ecological and social sustainability (Laužikas et al. 2015; Oganisjana et al. 2015; Tunčikiene, Drejeris 2015). Thus, the emphasis should be placed on the role of creative society for providing sustainable competitiveness in the context of sustainable natural environment and international environment.
Conclusions

In this new economic context, higher education is becoming a crucial object of national policy. It forms an essential component of the knowledge economy and, therefore, is increasingly addressed by newly adopted national innovation policies. On the other hand, the macroeconomic policy, including social sustainability stimuli may provide considerable impulse for the development of higher education (demand-driven higher education) in different ways. For instance, when supporting the business sector and promoting the stability of the labour market, it is also possible to achieve the development of the higher education system, of course, it is a long-term activity, and vice versa – a highly developed higher education system with the help of synergy effect promotes the macroeconomic growth, providing balanced development of regions and increase of the country’s sustainable competitiveness.

Knowledge transfer between universities and business will work best where there is a general framework of cooperation and mutual understanding, involving partnerships, joint projects and the exchange of people, respectively using social environment aspects. Thus competitiveness will be achieved; in turn, realization of higher education goals alongside with accomplishment of business tasks involves entrepreneurs into socially responsible action providing sustainable competitiveness.

Therefore it is very important to increase society’s understanding about coherence between knowledge, skills and competences and development of knowledge based economy, as well as to advance the development of social infrastructure and sophistication of environmental aspects.

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SAFETY AND SECURITY IN THE EU: PERCEPTION OF LATVIAN RESIDENTS

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Abstract. The implementation of external and internal politics of the state cannot be considered without taking into account socially psychological challenges, which constantly are taking place in the social reality of all its residents. A transformation of cognitive, attitude-related, motivational components of psychological space of every person living in the country, in accordance with the cardinal changes of geographical and political determinants, has not been studied well enough. This fact does not allow, from the scientific point of view, reforming the educational, political and emigrational strategies of the state. The individual concepts often derive from the social representations prevailed in the society. Very often it is the only way to receive the information on the required subject. Social representations based on information from mass media, knowledge received from the other people’s experience, including rumours, gossips, beliefs, etc., provide a good ground for the individual concept of the phenomena. Joining the European Union in May 2004 caused an important transformation of social reality and ‘life-space’ of residents of the Baltic States through their reflection of life in the new European Community. It caused a cardinal reconstruction of social representations of a new environment of its residents. The increased mobility of population of the Baltic States, the war in Ukraine, acts of terrorism in some European countries, recently have taken place in this part of the world. All these events have made a big impact on social representations about EU countries. The study on social representations of personal security of EU states among Latvian residents is a part of research-project on Social Representations about EU countries among Latvian residents. The objective of the given research is to shape the content and follow the transformation of social representations of European Union countries in modern Latvian society. One hundred Latvian residents 18-65 years old (Mean = 33.82; SD = 10.70) have participated in the study held in 2015 in addition to 2329 Latvian residents who participated in the study in 2005. The results received in both studies are compared are discussed.

Keywords: social representations, mental maps, personal safety and security, EU-states

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1. Introduction

According to Maslow (1943), the individual’s safety needs take precedence and dominate behavior as soon as the physical needs are relatively satisfied. It means that when the physical safety is not satisfied – due to war, natural disaster, family violence, childhood abuse, etc. – individuals may experience an avalanche of unpleasant emotional states due to post-traumatic stress disorder or transgenerational trauma. Therefore living in a definite region of the world the representation of personal security in this area becomes a question of a great importance. Representation of spatial objects, such as geographical regions, for example, the world in general, Europe or its particular country, a city, or its district mobilizes the concept of mental maps. This concept emerged in the 1960s from the encounter between spatial psychology and geography. On one hand, psychologists generally focused on the notion of cognitive space proposing the hypothesis that space is full of meanings
and values. On the other hand, geographers tend to focus on analysis of the link between representations of
space, spatial behaviour and practice (Lynch, 1960; Saarinen, 1987; Gould & White 1997). From this perspec-
tive, the representation of the world depends on a knowledge database that is the result of information flows
received from various sources of different scales: personal experience, advice of parents or friends, national
discourse taught in textbooks, internet and global media (Didelon-Loiseau & Grasland, 2014).

As soon as each person belongs to the society, where he lives and communicates with others, the socially
generated experience becomes a common property for its members by means of the processes of social repre-
sentations. The social representations are usually defined as a set of knowledge and beliefs about objects and
concepts, which help us to cope with a world around us (Dortier, 2002). The term of social representations was
originally introduced by Moscovici in his study on the reception and circulation of psychoanalysis in France
(Moscovici, 1961). Valsiner (2002) notes that Moscovici’s theory of social representations starts from the diver-
sity of individuals, attitudes and phenomena, in all their strangeness and unpredictability. Its aim is to discover
how individuals and groups can construct a stable, predictable world out of such diversity (Moscovici, 1984).
This diversity becomes organized by social representations that carry with them constructed meanings of the
past, and make these available for new applications. Social representing is a process of selective construction
of a meaningful view of the world, followed by its continuous verification. Social representations are values,
ideas, and collectively practiced forms of cognition shared within society, which facilitate the understanding
and communication of the world (Moscovici, 1984). They are cognitive systems with their own language and
logic. They do not represent ‘beliefs about’, ‘images’, or ‘attitudes’, instead, they are ‘theories’, and ‘knowl-
edge systems’ ready to organize reality (Moscovici, 1981). The aim of every (social) representation is ‘to make
something unfamiliar or unfamiliar itself, familiar’ (Moscovici, 1984, p.24).

Moscovici (1998) defines two kinds of social representations that can be distinguished in relation to their gen-
esis: social representations, which are predominantly belief-based and those, which are predominantly
knowledge-based. Beliefs are usually rooted in culture, traditions and language and they are characterised by firmness
and rigidity of conviction. The believer neither searches for proof, nor for evidence relating to object. They may
be unconsciously transmitted through collective memory, implicit communication and traditions. (Moscovici &
Markova, 2000). But all beliefs are different in durability, strength and the degree of engagement. Some beliefs
are more easily changed than others. Other kinds of social representations are predominantly knowledge-based.
Common knowledge involves different kinds of knowing. It can involve transformed scientific knowledge or
knowledge based on the experience of interpersonal relations, conversations, daily routines and so on. To know,
just like to believe, means to hold something true. To know is to examine, as far as possible independently of
others, the nature of the phenomena in question. Of course, the notion ‘independently’ has a relative meaning
because we can hardly totally ignore knowledge circulating in public discourse. Knowledge in social repre-
sentations is always social; however, the relation between the knower and the object of knowledge is not fixed
but is open (Markova, 2003). The difference between knowledge and beliefs does not concern the content of
propositions expressing one or the other (Moscovici, 1998). Propositions expressing knowledge and beliefs
can have the same content. However, whether such propositions are ascribed the status of beliefs or knowledge
rests in the style of thinking and the method of searching for ‘truth’. If individual or groups search for evi-
dence of the truth concerning that object, the resulting social representations are knowledge based. If, on the
other hand, representations are formed and maintained through the consensus with others, representations are
belief-based. Farr (1995) proposes that in reality, social representations always involve both knowledge and
beliefs’ and it is unlikely that we could find a system of thought that would be based purely on one or the other,
whether it is science or religion. The question as to whether social representations are based predominantly
on knowledge or on beliefs could have important applications for social practices. For example, belief-based
social representations may inspire social categorization and exclusion of groups and individuals. That is why
self-help, just groups like governmental campaigns, attempt to change belief-based representations and thus
reduce or eliminate exclusion and discrimination. Philogue (2001) notes, that after Moscovici laid down the
framework of social representation theory in 1961, the first generation of scholars to work with him on the
theory expanded on its various components. Three scholars in particular contributed to the theory by develop-
ing specific theoretical foundations for the empirical application of the theory. Abric (1976) elaborated a theory
of central core that gives a structure to the representation and endows it with meaning. The second extension of Moscovici’s original social representation framework was provided by Doise (1985), who focused on the anchoring process by which the representation is rendered familiar. The third extension of original approach to social representation was carried out by Jodelet (1989) who argued that a representation always originates from a previous one, having altered mental and social configurations in the process. He emphasizes that the dynamic nature of social representations, which is to be capable of continuous change, is rooted in its genesis, that is, in its linkage to pre-existing representations. The structural approach based on the concepts of core and periphery continues to develop (Abric, 2002; Flament, 2002). This showed, that social representation can be described as an organized set of basic elements of two kinds, with a hierarchy. Nowadays it is concerned with different functions of the core and periphery, between different social representations. The school of social representations in Aix-en-Provence has developed the original structural approach to the study of social representations. According to that approach, social representations are organised into a structured body of information, beliefs, opinions, and attitudes, which consists of the central core and peripheral elements. These elements are organized and structured so as to constitute a particular type of social cognitive system (Abric, 1976, 2002; Flament, 2002). There are two processes anchoring and objectification, which play central roles in the construction of any social representation, that is, the ways social representations are generated, maintained and changed (Flick, 1995). With the two processes of anchoring and objectification, the theory of social representations offers a model for the genesis and transformation of knowledge and its function in communication and interaction. Thus, social representations are the result of interactive processes. In these interactions, social representations are generated, changed and exchanged, and spread through social groups. The symbolic nature of social representations embraces the social, cultural and historic aspects of social representations. It refers to the social significance of objects and events that is dependent upon the common meanings in verbal and non-verbal gestures by members of a community. These common meanings are, in turn, dependent upon a community’s social norms and values and their common history (Puckhardt, 1993). Thus, social representations are complex wholes of signification that provide the direction for constructive interpretations of life events by individuals. These interpretations entail processes of dialogical kind, where different suggestions are in opposition with one another (Valsner, 2002). Markova (2003) considers that dialogical nature of social representations is an important concept of the theory. When individuals or groups share the same social representations, actions are understood in the same way. Jodelet (1993) describes the relations between representations and social communications as: forms of social thinking used to communicate, understand and master the social and intellectual environment.

A social representation would simply be an individual’s representation of a social object. For instance, Breakwell (2001) considers the individual’s relationship to any social representation, which can be described along a number of dimensions. In fact, the process whereby the social representation is generated and sustained is a continuing exchange between personal representation and social influence mediated through communities. However, the nature and scope for individual, impact upon social representation concerned and upon the structure of the social representation itself. Burr (2002) suggests that our perceptions of the world are mediated by social representations, but through our social interactions with others we also contribute to their continuing change and reformulation. We are therefore active agents in the production and reproduction of our social environments. We play a substantial role in the process of genesis of social representations. We are not passive products of society, and through our cognitive processes of anchoring and objectification our psychology puts its own spin on the representations that emerge from our social interactions. Rogers (2003) notes that the social representation available to individuals enables them to make sense of their experiences and their life-world, and they use them to choose different courses of action in different situations. But crucially, a person’s social representations are not seen as locked in their individual mind. Rather they are culturally available and mediated resources, arising, for example, from the messages of the mass media, and in their interactions with experts (such as scientists, teachers or doctors).

Sommers (1998) considers that a theory of social representations conceptualizes the cognitive structure and social dynamic of popular knowledge. Social representations are more or less popular cognitive representations of relevant social phenomena. These phenomena include scientific theories (e.g. psychoanalysis, physics),
social roles (woman, child) or such phenomena as ‘illness’ or ‘culture’ or whatever else. The most interesting latest studies focusing on social representations get in touch with a wide variety of different topics and social aspects of human society (Leone, Siag & Sarrica, 2014; Howarth, 2014; Salesses & Romain, 2014, Ben Alaya, 2013; Vala , 2013, etc.). The complicated image of European Union is implemented with social representations about Europe and its states through transaction of geographical and economic space of Europe into the space of emotions of individuals and their selective behaviour towards EU. Several studies examined this complicated multifaceted problem in scientific literature. Rutland (1996) examined how different social anchors indicating a belonging to specific social groups (i.e. social class, travel experience and parental attitudes), in addition to age, affect British children’s social representations of Europe.

Grasland, Dideon, & Beauguitte, (2012) developed the global project EuroBroadMap, which was implemented by twelve international interdisciplinary research teams and combined the different visions of Europe in the world. Chaban & Holland (2014) focus on external perceptions of Europe in the world combining the different approaches in attempt to reevaluate the Radical changes on the European continent. The aim of presented research is to shape the structure of social representations about EU states prevailed in the modern Latvian society. Besides, there are four tasks of this particular study: (a) to explore if the social representations about personal safety and security in EU states are important component of the representations about the country; (b) to analyse the most important correlations of social representations about safety and security in EU states; (c) to compare the general rating of the perception of personal safety and security in EU states among Latvian residents in 2005 and 2015; and finally (d) to compare the impact of predicting factors of social representations about personal safety and security in EU states between measurements held in 2005 and 2015.

2. Method

A total number of participants including pilot study and two basic studies held in 2005 and 2015 within the frame of global research on social representations about EU countries among Latvian residents exceeded 2500 people. Calculation of the number of participants and their individual peculiarities is based on proportional spread and number of people: a) living in different regions (statistical regions); b) ratio of male/female population; c) ratio of Latvian/Russian speaking residents; d) ratio of rural/urban inhabitants. In order to enable a comparison between two measurements on social representations about EU states taken in 2005 and 2015 the methodology and the obtained results for the comparison with the current study were taken from the study held in 2005 (Ruža, 2006).

2.1. Pilot study

In 2005, two months before the main phase of the research had been started, in order to shape the most important indicators characterizing any EU country, a group of respondents of different age 18-65 \( (N=100, \text{ Mean}=36.5; \text{ SD } = 8.62) \) were offered a blank with a modified REP-test. Respectively they were asked to find similarities (constructs) and differences (contrasts) between 25 European countries grouped by three countries in one line. Grouping in three was performed in random order. The analysis of data has distinguished 10 most frequently used constructs (see Table 1). These common constructs formed the basic content of social representations about EU countries. Here we need to point to research limitations, since a lot of factors, which affect sustainable and secure development and contribute to attractiveness of a country can be indicated (Shatrevich, Strautmane, 2015; Oganisjana et al. 2015; Rezk et al. 2015; Grubicka, Matuska 2015; Tvaronavičienė et al. 2015; Starineca, Voronchuk 2015; Dalati 2015; Vinokurova 2015; Giessen, 2015; Dezellus et al. 2015; Raudeliūnienė et al. 2015; Caurkubule, Rubanovskis 2014; Dobele et al. 2015; Kriviņš 2015; Tvaronavičienė, Černevičiūtė 2015; Mačiulis, Tvaronavičienė 2013; Račkauskas, Liesionis 2013; Ignatavičius et al. 2015; Travkina, Tvaronavičienė 2015; Tvaronavičienė, Černevičiūtė 2015).
Table 1. REP-test results: the most frequently used constructs of EU countries (N=100).

<table>
<thead>
<tr>
<th>Similarities (constructs) / differences (contrasts) found between EU countries</th>
<th>Number of cases (N_max=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy power</td>
<td>46</td>
</tr>
<tr>
<td>Beauty of the nature</td>
<td>33</td>
</tr>
<tr>
<td>Suitability for living</td>
<td>31</td>
</tr>
<tr>
<td>Attractiveness of local people</td>
<td>30</td>
</tr>
<tr>
<td>Beauty of the cities and towns</td>
<td>27</td>
</tr>
<tr>
<td>Political power in EU</td>
<td>26</td>
</tr>
<tr>
<td>Industrial power</td>
<td>19</td>
</tr>
<tr>
<td>Developmental potential</td>
<td>17</td>
</tr>
<tr>
<td>Personal safety and security</td>
<td>11</td>
</tr>
<tr>
<td>Military power</td>
<td>9</td>
</tr>
</tbody>
</table>

These results show, that economy was the dominant theme (31.78% of cases including ‘industrial potential’ and ‘fast developing’). The outer attributes such as ‘nice nature’, ‘attractiveness of local people’, and ‘beauty of the cities and towns’ follow (27.5%) the theme of personal attitudes related to EU countries takes 21.5%, including ‘suitability for living’ and ‘safeness and security’. In our opinion, the theme of relationship across European borders was not represented in full measure. That is why we decided to add two more possible constructs referring to relationships within European Union: ‘countries, that have cultural influence (actively spreading its culture)’ and ‘countries helping my country’ and transferred them into 12 statements. In result of the pilot study there were distinguished 12 statements characterizing the key concepts of Latvian residents shaping social representations about any EU country.

2.2. Study (1) held in 2005

In presented study 2329 Latvian residents were offered to rate 25 EU countries with 12 statements formulated in the pilot study along a 5-point scale. Besides, the participants were given a blank in which they were asked to provide information about their age, gender, living place, education, occupation, mother tongue, etc. as well as to point out the main sources of information which provide the most of information about EU states, where participants could choose several variants of choice at the same time. They have also got some additional tasks in order to rate their level of knowledge about each EU country including border drawing task in a counter map of Europe and association task. The results of the study were presented in the framework of one PhD dissertation project (see Ruža, 2006) and partly published in some Latvian local interdisciplinary (see Vorobjovs, Ruža, Raščevskis, & Murašovs, 2006a; 2006b) and military journals (see Vorobjovs, Ruža, Raščevskis, & Murašovs, 2010; Ruža, Ruža & Vorobjovs, 2011).

2.3. Study (2) held in 2015

The same study was performed ten years later with 100 participants (55 females and 45 males) aged between 18 and 65 (Mean = 33.82; SD = 10.70) in order to discover a dynamics of social representations about EU states among Latvian residents. The only difference from the previous study was a number of EU countries, which was extended to 28 including new comers Bulgaria, Croatia and Rumania.

3. Method

The assessment of twelve qualitative statements expressing the basic characteristics of all 25 EU states showed that the most of mean values of these statements in opinion of the Latvian participants correlates with each other (see Table 2).
Table 2. Correlation matrix between mean values of 12 statements characterizing the content of social representations about EU countries (data received in 2005).

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
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<th>3</th>
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<th>6</th>
<th>7</th>
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<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy power</td>
<td>1</td>
<td>.960**</td>
<td>.347</td>
<td>.428**</td>
<td>.517**</td>
<td>.943**</td>
<td>.557**</td>
<td>.600**</td>
<td>.857**</td>
<td>.567**</td>
<td>.805**</td>
<td></td>
</tr>
<tr>
<td>Developmental potential</td>
<td>1</td>
<td>.333</td>
<td>.879**</td>
<td>.430**</td>
<td>.514**</td>
<td>.930**</td>
<td>.675**</td>
<td>.654**</td>
<td>.920**</td>
<td>.628**</td>
<td>.804**</td>
<td></td>
</tr>
<tr>
<td>Beauty of the nature</td>
<td>1</td>
<td>.324</td>
<td>.798**</td>
<td>.734**</td>
<td>.407**</td>
<td>.200</td>
<td>.822**</td>
<td>.281</td>
<td>.739**</td>
<td>.396**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Military power</td>
<td>1</td>
<td>.439**</td>
<td>.618**</td>
<td>.968**</td>
<td>.624**</td>
<td>.953**</td>
<td>.703**</td>
<td>.761**</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Suitability for living</td>
<td>1</td>
<td>.762**</td>
<td>.519**</td>
<td>.571**</td>
<td>.849**</td>
<td>.452**</td>
<td>.817**</td>
<td>.691**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attractiveness of residents</td>
<td>1</td>
<td>.649**</td>
<td>.411**</td>
<td>.756**</td>
<td>.566**</td>
<td>.821**</td>
<td>.548**</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Political power in EU</td>
<td>1</td>
<td>.637**</td>
<td>.688**</td>
<td>.939**</td>
<td>.729**</td>
<td>.824**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Relationships with Latvia</td>
<td>1</td>
<td>.652**</td>
<td>.785**</td>
<td>.691**</td>
<td>.841**</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Beauty of the cities and towns</td>
<td>1</td>
<td>.672**</td>
<td>.935**</td>
<td>.760**</td>
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<tr>
<td>Industrial power</td>
<td>1</td>
<td>.736**</td>
<td>.820**</td>
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<tr>
<td>Cultural influence</td>
<td>1</td>
<td>.717**</td>
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<tr>
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</table>

(* p>0.01;  ** p>0.05)

Perception of personal safety and security in EU countries among Latvian residents had strong significant correlations with all indicators characterizing the content of social representations about EU countries. This fact together with the other fact, that construct itself appeared during pilot study and was mentioned 11 times as an important indicator characterizing EU country could be served as indirect evidence of the importance of such representation. The same tendency was represented in the study held ten years later (see Table 3).

Table 3. Correlation matrix between mean values of 12 statements characterizing the content of social representations about EU countries (data received in 2015).

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
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<th>9</th>
<th>10</th>
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<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy power</td>
<td>1</td>
<td>.843**</td>
<td>-.063</td>
<td>.824**</td>
<td>.603**</td>
<td>.440**</td>
<td>.899**</td>
<td>.451**</td>
<td>.486**</td>
<td>.850**</td>
<td>.796**</td>
<td>.828**</td>
</tr>
<tr>
<td>Developmental potential</td>
<td>1</td>
<td>-.091</td>
<td>.840**</td>
<td>.522**</td>
<td>.420**</td>
<td>.787**</td>
<td>.366</td>
<td>.481**</td>
<td>.893**</td>
<td>.720**</td>
<td>.831**</td>
<td></td>
</tr>
<tr>
<td>Beauty of the nature</td>
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<td>-.074</td>
<td>.500**</td>
<td>.669**</td>
<td>.062</td>
<td>.451**</td>
<td>.706**</td>
<td>-.129</td>
<td>.100</td>
<td>.078</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Military power</td>
<td>1</td>
<td>.553**</td>
<td>.339</td>
<td>.821**</td>
<td>.307</td>
<td>.443**</td>
<td>.859**</td>
<td>.696**</td>
<td>.838**</td>
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<td></td>
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<tr>
<td>Suitability for living</td>
<td>1</td>
<td>.769**</td>
<td>.715**</td>
<td>-.251</td>
<td>.802**</td>
<td>.490**</td>
<td>.707**</td>
<td>.655**</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Attractiveness of residents</td>
<td>1</td>
<td>.591**</td>
<td>-.203</td>
<td>.867**</td>
<td>.359</td>
<td>.614**</td>
<td>.545**</td>
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</tr>
<tr>
<td>Political power in EU</td>
<td>1</td>
<td>.261</td>
<td>.619**</td>
<td>.831**</td>
<td>-.907**</td>
<td>.907**</td>
<td>.810**</td>
<td></td>
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</tr>
<tr>
<td>Relationships with Latvia</td>
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<td>.446**</td>
<td>.182</td>
<td>.230</td>
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<td></td>
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</tr>
<tr>
<td>Beauty of the cities and towns</td>
<td>1</td>
<td>.404**</td>
<td>.658**</td>
<td>.599**</td>
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</tr>
<tr>
<td>Industrial power</td>
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<td>.682**</td>
<td>.802**</td>
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<tr>
<td>Cultural influence</td>
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<td>.710**</td>
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<tr>
<td>Personal safety and security</td>
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</tbody>
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(* p>0.01;  ** p>0.05)

However, in the study conducted in 2015, two indicators: beauty of the nature and relationship with Latvia showed no significant correlations with personal safety and security item. The indicator: beauty of the nature has the weakest correlations in both studies with other items, which is logically explained: the beauty of the nature of any country is determined mostly by its geography and is little related with social and economic factors, which are mostly determined by people living in that country. But the country’s relationship with other country may significantly impact the attitude towards its residents and affect the perception of personal safety and security in that country. In 2005, the most of Latvian residents believed that if a country in general demonstrates a good relationship to Latvia, it is an additional reason to perceive this country as safe and secure place. Ten years later, Latvian residents changed this representation.

In order to observe the general dynamics of social representations about personal safety and security in EU countries the mean values received in both studies were compared. The figure 1 shows that perception of personal safety and security in EU countries in social representations of Latvian residents has been rapidly decreased for the last decade.
The comparative analysis using Paired-Sample T-Test reveals significant differences between two measurements on personal safety and security perception (see table 4). Three new members of EU Bulgaria, Romania and Croatia showed only 2015 rating.

Table 4. The comparative analysis of personal safety and security perception between two studies 2005 and 2015 (Paired-Sample T-Test).

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td>Study (1) 2005</td>
<td>3.54</td>
<td>0.442</td>
<td>8.885***</td>
</tr>
<tr>
<td>Study (2) 2015</td>
<td>2.94</td>
<td>0.348</td>
<td></td>
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(*p>0.01) (**p>0.01)

All European countries, except Latvia, in the modern representations of Latvian residents are not perceived any longer as safe and secured as in 2005. The interesting result obtained from comparison, is that Latvia, in perception of its residents, is the only country in EU, which became more safe and secured to its residents for the last decade. The real reason of that fact needs to be learned from additional study. But speculatively one can suppose that it happened not only because the perception of personal safety and security in Latvia objectively increased among its residents, but because of rapid decrease of perception of personal safety and security in other EU countries, which in 2005 were perceived as much more safe and secured. Analyzing the impact of predicting factors affecting social representations about security in EU states, a linear regression modelling was performed. The models were constructed independently for both studies entering the same variables in order to determine and understand the differences in social representations about safety and security among Latvian residents in 2005 and 2015. In all models the dependent variable was “personal safety and security”; the independent variables were indicators presented in tables 2 and 3, which were strongly correlated with dependent variable; the method of all linear regression models was “enter”. The most interesting models, which brightly show the difference between results obtained from 2005 and 2015 studies in relation with predictors’ impact on perception of “personal safety and security” in EU states are presented respectively in Tables 5 and 6.

Table 5. Linear regression analysis of social representations about personal safety and security predicting factors in 2005.

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>SE</th>
<th>B</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy power</td>
<td>.294</td>
<td>.077</td>
<td>.537</td>
<td>3.799***</td>
</tr>
<tr>
<td>Suitability for living</td>
<td>.218</td>
<td>.075</td>
<td>.239</td>
<td>2.900***</td>
</tr>
<tr>
<td>Military power</td>
<td>-.073</td>
<td>.096</td>
<td>-.113</td>
<td>-.758</td>
</tr>
<tr>
<td>Relationships with Latvia</td>
<td>.521</td>
<td>.103</td>
<td>.476</td>
<td>5.050***</td>
</tr>
</tbody>
</table>

*R²=0.787 (**p>0.01)
The results show, that in 2005, the most important predictors of the social representations about personal safety and security in EU countries among Latvian residents were following indicators: *Relationships with Latvia, Economy power* and *Suitability for living*. It means, that the most safe and secure EU countries in perception of Latvian residents were those, having good relationship with Latvia and a strong economy, which potentially would provide a good place for living. Ten years ago, a military power of a country had no significant impact on social representation about personal safety and security in perception of Latvian residents.

**Table 6.** Linear regression analysis of social representations about personal safety and security predicting factors in 2015.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>B</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy power</td>
<td>.280</td>
<td>.189</td>
<td>.354</td>
<td>1.485</td>
</tr>
<tr>
<td>Suitability for living</td>
<td>.179</td>
<td>.170</td>
<td>.188</td>
<td>1.058</td>
</tr>
<tr>
<td>Military power</td>
<td>.452</td>
<td>.172</td>
<td>.449</td>
<td>2.620**</td>
</tr>
<tr>
<td>Relationships with Latvia</td>
<td>-.011</td>
<td>.085</td>
<td>-.020</td>
<td>-.125</td>
</tr>
</tbody>
</table>

*R²=0.911 (**p>0.01)*

Ten years later, the situation has changed dramatically. *Relationships with Latvia, Economy power*, and even *Suitability for living* have no significant impact on social representations about personal safety and security in EU countries any longer. The only indicator, which has an enormous effect on these representations, becomes a *military power* of a state.

**Conclusions**

It is evident, that social representations in general are constantly changing and are very sensitive to processes, which are taking place around the world we live in. Social representations about personal safety and security in EU states have a distinct dynamic nature led by communication and shaped by mass media, which supply with information about events happening in this part of the world. The results of the study show that European Union and its countries in modern social representations of Latvian residents are not as safe and secure as they were considered to be in 2005. The perception of basic determinants of personal safety security in EU countries also has changed. Ten years ago, the most important compounds of personal safety and security in EU country were considered to be a power of economy, relationship with Latvia and suitability for living. In 2015 all these indicators have little effect on perception of personal safety and security in EU countries. The only indicator, which really matters, became a military power of the state, which had no significant effect on social representations about personal safety and security in EU countries a decade ago. Why did it happen? The answer becomes more or less evident if we take into account the most important events, which have taken place in European countries for the last decade. The terrible acts of terrorism in the United Kingdom, Spain, France and Norway, in spite of their economy power, relationship with Latvia and assessment of the potential suitability for living for Latvian residents have shaken the world. The war in Ukraine used to be the most dominant theme and widely discussed topic in interpersonal communication and mass media during 2015. The presence of NATO forces, American tanks, joint military exercises, geopolitical discussions on possibility of Russia’s military invasion into the Baltic region and NATO response in Ukraine were widely presented in mass media and have caused a big public resonance. It has been widely discussed in interpersonal communication at all levels in Latvia and caused an important transformation of social representations about personal safety and security of EU countries. In result, the military component of personal safety and security of the country has brought to the fore, but all the other aspects of it suddenly became insignificant. It is possible to conclude, that new social, economic and political challenges, which European Union countries will face in the nearest future, definitely would shape the content of the social representations about personal safety and security of the residents in this part of the world.

**References**


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CONSTITUTIONALISM AS THE INSTRUMENT OF SECURITY AND SUSTAINABILITY IN EUROPEAN UNION LAW

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Abstract. The objective of the research is to define the development of constitutionalism and socio-cultural challenges related to the formation process of the European Union’s legal identity. To achieve this goal, the concept of constitutionalism and its changes during the period of the European Union’s development are examined. Tendencies of the European Union Member States’ constitutionalism process are analysed and socio-cultural tensions of the formation of the contemporary European Union’s legal identity, which arise between security and freedom, order and justice and government and society are identified. The article states that the sustainability of public democratic processes and the functioning of the European Union is possible only if the constitutional values are protected. The research also reveals that the further evolution of European constitutionalism and legal identity still needs to enhance the development of the rules which could influence the creation and activities of the independent, self-governing EU’s political community.

Keywords: constitutionalism, liberal democracy, the European Union, identity, security, freedom, order, justice, government, society.

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JEL Classifications: F52, K39, Q01.

1. Introduction

The research of European and the European Union (hereinafter – the EU) Member States’ legal identity is actualized by the specific issues, which arise with development of the EU (Vaško, Abrhám 2015; Schröder, M.; Prause, G. 2015; Štitilis, Klišauskas 2015; Balkytė, Tvronavičienė 2010, 2013). According to the Communication of European Commission, 2020 Europe: A strategy for smart, sustainable and inclusive growth, Europe will succeed only by working together. However, the deep assumptions of collaborative actions which establish the European legal identity and influence the creation of a unified law and order of the European Union lack consensual explicitness and it turns into an important challenge for jurisprudence. This situation was caused by two groups of factors: the multidimensional value-based nature of European identity (Inglehart & others 2000) and the diverse strategy and practice of the EU’s Member States’ in realization of social justice and sustainability relationship in the upholding of liberal democracy (Rudzkienė & Kanopka 2013).

The EU was born and developed during the period of peace, which has been the longest in Europe. Permanent efforts of peaceful activities, avoidance of conflicts and inner transformative power become the innate features of the EU. But this was only possible to achieve with the help of the United States. As M. Leonard (2005,
p. 5) emphasizes, ‘For fifty years, under the cover of an American security blanket, Europe has been creating a ‘community of democracy’ and using its market size and the promise of engagement to reshape societies from the inside’. Therefore, Europeans are not interested in classic geo-politics when they talk to other countries. They start from the other end of the spectrum: What values underpin the State? What are its constitutional and regulatory frameworks means that it can completely transform the countries it come into contact with, instead of just skimming the surface (Leonard 2005, p. 9).

Over fifty years of peace in Europe, the EU’s legal identity was developing not only through policy of constitutionalism and the protection of legality within its limits, but also through the development of the concept of constitution. The previous concept of constitution was changed by the concept of substantive constitution, which aims to define the principles of fair society (or political community) by constitutional means (Jarašiūnas 2003, p. 132).

Thus, the contemporary logic of the development of European legal identity is based on the establishment and implementation of the system of constitutionalism provisions. As W. Waluchow (2012) reminds, ‘constitutionalism is the idea, often associated with the political theories of John Locke and the founders of the American Republic, that government can and should be legally limited in its powers, and that its authority or legitimacy depends on its observing these limitations’. This idea is continuously reconsidered and extended in the process of the development of the EU legal identity e.g. through the concept of multilevel constitutionalism and its aspects (Pernice 2001, Jiunn-Rong & Wen-Chen 2008, Scott 2013, Walker 2009 etc.).

However, the further success of the development of the EU legal identity within newly emerging multipolar world is a serious challenge to the European identity formation as well. This proposition is based on two insights:

1. ‘The modern world-system ( … ) has entered into a terminal crisis and ( … ) the period of transition will be a terrible time of troubles, since the stakes of the transition are so high, the outcome so uncertain, and the ability of small inputs to affects the outcome so great’ (Wallerstein 1999, p. 1).
2. ‘( … ) the EU’s response to the crisis of the Eurozone cannot be understood ( … ) without adding the dimension of domestic politics, previously often ignored due to the absence of public interest in the EU’ (Vilpišauskas 2013).

The formation of a multipolar world also changes the political rhetoric of some EU Member States, which has already expressed their focus on the development of illiberal democracy and separatist sentiments towards NATO (Lucasas 2014).

Therefore the goal of our research is to define the development of constitutionalism and socio-cultural challenges related to the formation process of the EU’s legal identity. To achieve this goal, we have examined the concept of constitutionalism and its changes during the period of the EU’s development. We also have analysed tendencies of the EU Member States’ constitutionalism process and identified socio-cultural tensions of the formation of the contemporary EU’s legal identity, which arise between security and freedom, order and justice and government and society. The research is based on the philosophical, comparative and systemic analysis of constitutionalism, politics and politics of law.

2. The concept of constitutionalism and its changes during the period of the EU’s development

According to G. Sartori (1962, p. 856), if in the 19th century the term ‘constitution’ as an over-all basic agreement was definite and clear, in the 20th century, few decades following the first World War, this term acquired two senses: a constitution as any ‘state order’ and constitutionalism as a specific ‘content of guarantees’. According to the latter sense, it becomes improper to say that every state, which has a constitution, is a constitutional state.

The concept of constitutionalism is based on the perception of constitution as specific guarantees and on the idea that the political order is subject to a stable and independent of various (first of all political) changes
'higher law'. The constitutional system which relies on this idea is characterized by three essential features: (1) limited and accountable government, (2) adherence to the rule of law, and (3) protection of fundamental rights (O'Donohue 2013, Yeh & Chang 2008). However, as the analysis of international treaties and agreements indicates, these features may be found on broader than national level. Therefore, J. Rubenfeld (2002, p. 394-395) talks about international constitutionalism that has emerged over the last several decades: ‘On this view, it is not particularly important that a constitution be itself the product of a national participatory political process, expressing that nation’s fundamental values or commitments. What is important is that a constitution must recognize human rights, protect minorities, establish rule of law, and set up democratic institutions that will remain stable for the indefinite future. If national ratification of some kind is important in this story, it is important almost instrumentally’.

The trend of constitutionalism to transcend nation-state boundaries provides the basis for analysis of the EU (supranational) model of constitutionalism. In 1951 six European countries - Belgium, Luxembourg, the Netherlands, Italy, France, and West Germany - signed the Treaty establishing European Coal and Steel Community and in 1957 the Treaties establishing the European Economic Community and the European Atomic Energy Community. Since then, the new supranational entity – the EU – which emergence is based on the mentioned treaties, is still moving towards two interrelated directions: enlargement and integration. Currently the EU unites 28 Member States and has signed a number of association agreements with a few countries. Some of those countries aim to become the Member States of this supranational entity in the future.

However, the EU enlargement does not guarantee a successful integration process, which along with new memberships becomes more complicated not only because of the specifics of new Member States’ national regimes, but also because of the ambiguous attitude of citizens (and their representatives) of the old Member States towards the EU’s enlargement and the impact on the well-being of their own and of the whole society (Eurobarometer 2006). It might be assumed that this was one of the main reasons that led to the collapse of the European constitution draft.

On the other hand, according to I. Pernice (2001, p. 2), these days no state is able to guarantee the protection of freedom, peace, security and welfare of its citizens on its own: ‘International crime and terrorism, global trade and financial markets, climate change and unlimited communication worldwide etc. need new structures of government’. Thus, despite the fact that the Treaty establishing the Constitution for Europe was rejected, the EU still remains an important guarantee of political and economic security and stability of its Member States. However, there is a reasonable question, is it still possible to speak about the EU constitutionalism? If so, what is typical to the EU constitutionalism model?

I. Pernice (2001, p. 4) believes, that European Constitution consists from (1) the primary EU law, laid down in the Treaties on the European Union, The European Community and Euratom, (2) the precedents or the law made by European judges in Luxembourg and (3) the national constitutions and the related jurisprudence of the national constitutional courts. This approach enables the scientist to talk about the multilevel European constitutionalism model where: ‘The European constitution, thus, is, one legal system, composed of two complementary constitutional layers, the European and the national, which are closely interwoven and interdependent ( ... )’ (Pernice 2001, p. 4). In addition, as the analysis of Treaty on European Union (Lisbon Treaty) and Treaty on the Functioning of the EU reveals, these treaties establish inter alia the essential ideas of constitutionalism: the central position of its citizens, transparency and democratic legitimacy of its actions, the role of national parliaments, the rule of law, voluntary membership, etc (Pernice 2009, p. 40).

These facts suggest that even if European constitutionalism as a political process confronts the issues of public acceptance, it remains a significant element of EU integration and identity on the legal level as far as by the legal means it protects and consolidates the EU’s common values, and thus it leads to a better self-understanding of the EU’s political community (Nolte 2005, p. 4) and coordination of common actions in order to achieve the political and economic security and stability of the EU as a supranational structure and its Member States.
3. Tendencies of the EU Member States’ constitutionalism process

After the collapse of the Soviet Union the fourth wave of the development of constitutions has risen and constitutionalism has been established in Central and Eastern European countries. Constitutions that were adopted during this period have such integral features of the constitutional regulation as attention to human values, democratic regulation of public affairs, constitutional control and new priorities of modern life. According to E. Jarašiūnas (2005, p. 28-29), although the constitutional regulation in each country differs, new constitutions also have common features: a detailed description of fundamental human rights and freedoms, constitutionally regulated political pluralism, activity of political parties, media, protection of ethnic minorities, market economy, and ownership, the idea of legal social secular state, principle of powers’ separation, a European model of constitutional control, etc. During this period the trend of constitutional establishment of state’s functions in international area has emerged. Thus, the text of constitution usually includes provisions concerning principles of state’s foreign policy, solutions of international conflicts, war and peace issues, the relationship between national and international law, state powers to sign, ratify and denounce international treaties, etc. In addition, the state often participates in various international organizations and regional integration processes. Thus, new provisions, which enable national authorities to dispose some powers to supranational organizations, appear in the constitutions of the EU Member states (Jarašiūnas 2006, p. 22-23). However, constitutions of this period are also characterized by the emphasis of the continuity of statehood since almost all countries of the region suffered heavy losses of their sovereignty in their history (Jarašiūnas 2002, p. 52).

It is necessary to mention that the fourth wave of constitutionalism raised the role of a constitution in a political life, which had so long been dominated solely by political interests. From a philosophical point of view this means that the exclusivity (absoluteness) of postmodern interest groups is essentially limited to the system of constitutionalism provisions that is public (Mesonis 2003, p. 83-121).

More than a decade after the collapse of Soviet-totalitarian system thirteen new countries joined the EU. The EU membership raises important constitutional issues of state’s sovereignty. In other words, the question is whether the state retains the essential attributes of statehood after becoming the member of the EU. Moreover, taking into consideration the fact that a constitution is a fundamental law that reflects the core values of state’s political community, it is necessary to investigate whether the EU membership is acceptable from the value-based point of view, whether it complies with the interests of the state and its citizens, and whether it is compatible with established norms and principles.

Basically all constitutions of the EU Member States’ postulate the principles of state sovereignty, independence, and democracy. However, these principles did not prevent the states from becoming the EU members because the sovereignty and independence cannot be understood in an absolute sense and they cannot be linked to any de facto possible public powers possession. This perception, according to I. Jarukaitis (2011, p. 264), is denied by the concept of constitutionalism, which limits absolute powers of the government as well as by increasing international cooperation and states’ inter-dependence. However, after becoming the member of the EU, the state retains the control over the most important national issues solution which ensures both its statehood and the solution of the issues concerning its membership in the union. Although the EU’s powers are broad, they are defined by the EU functions and the EU remains based on the principle of its given powers. The membership in the EU does not limit national identity and common European identity, which is based on common values, it emerges next to it (Vadapalas 2012, p. 272).

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1 There are four milestones (‘waves’) of the development of constitutional regulation distinguished in legal literature. The first wave covers the period from the XVIIIth century until the end of the 1st World War, the second wave covers the period between the two world wars, the third - the period from the 2nd World War until the end of XXth century and the fourth one covers the period from the end of XXth century until the present day.

Before entering the EU most states had to face the question of the constitutional basis of the EU membership. For instance, in the case of the Republic of Lithuania it was necessary to answer the question whether the basics of membership in international organizations enshrined in the Article 136 of the Constitution are sufficient. The constitutional amendments, formulated according to this article, provided the basis for the Lithuania’s membership in the EU. Thus, on 13th July, 2004 the Constitutional Act of the Republic of Lithuania on Membership of the Republic of Lithuania in the European Union was adopted. The first part of this Act establishes the contractual referral of powers of the Lithuanian state to the EU in order to fulfil its responsibilities. The second part of this act states that the norms of European Union law are a constituent part of the legal system of the Republic of Lithuania and they are applied directly, while in the event of collision of legal norms, they have supremacy over the laws and other legal acts of the Republic of Lithuania. According to the Constitutional Court of the Republic of Lithuania, this Constitutional Act constitutionally approves Lithuania’s membership in the European Union (Constitutional Court of the Republic of Lithuania, 2011).

Another important trend of constitutionalism development during the analysed period is an increasing role of constitutional control institutions in state’s political life. Many European countries have chosen a European model of constitutional justice, which is characterized by the functioning of a specific monitoring body - the Constitutional Court. Constitutional justice institutions on the national and the EU levels occur in accordance with the following principle: although the EU’s legal norms are integrated into legal systems of the EU Member States, the EU legal system remains independent. According to V. Vadapalas, this means that the national legislative bodies cannot abolish the EU law and the national courts cannot declare the EU law null and void. This is the prerogative of the European Court of Justice. This Court is empowered to supervise the legality of the EU legislature, to ensure that the Member States comply with the obligations arising from treaties and to interpret the EU law on the request of national courts (Vadapalas 2012, p. 271).

Thus, according to E. Jarašiūnas, the development of constitutionalism of each EU Member State is characterized by two trends: national constitutionalisation and harmonization of national legislation with EU law. At the same time, given these two national development trends, the future of a special constitutional protection authority - constitutional courts - is planned. Constitutional courts as the most important instruments of constitutionalisation of law should become the guardians of borders between national and the EU law (Jarašiūnas 2002, p. 58).

4. Socio-cultural tensions of the formation of the contemporary EU’s legal identity

Constitutionalism is about the fundamental rules and the identity, or better the self-understanding, of any particular political community. In different ways, the self-understanding has become somewhat insecure over the past few years (Nolte 2005, p. 4). More than half a century (from 1950 Schuman Declaration) the EU’s identity has been developed in the period of peace guaranteed by the East-West power symmetry, called the Cold War. However, now we have to admit there is no longer a bipolar world and 2014s may be regarded as the beginning of the functioning of the real multipolar world. Therefore, the retention policy and countries’ security systems based on the symmetry of the bipolar world power are not working anymore. The leaders of non-democratic and illiberal states clearly understand that geopolitical situation has changed radically, that local wars become potentially possible again, and that it is possible to apply military methods, which have already been tried elsewhere, in Europe (Deutsche Welle 2014). This means that at any extent real hybrid nature local war in Europe and any inter-state political blackmail on this ground not only undermine the confidence in international law but also change the tensions between security and freedom, order and justice, government and society which were stabilized during long-term peace (especially after the fall of Berlin wall).

3 Some constitutions of the EU Member States include the provisions on the membership in international organizations. They are usually the states which have adopted these provisions when the supranational nature of the European Community has not been so clearly expressed and later those constitutions have not been altered for a variety of reasons. However, some EU states, whose constitutions include the basics of such formal membership in international organizations, added to their constitutions rules which directly refer to the EU membership while ratifying the Maastricht Treaty.
These tensions will inevitably get stronger in this multipolar world, where the interests of non-democratic, democratic and liberal democratic states constantly confront and this process will have a negative impact on social trust in law. It is necessary to examine the development of these eternal tensions from the viewpoint of constitutionalism since their dynamic is not only the context of the formation of the EU legal identity but also its consequences. In other words, the dynamic of tensions between security and freedom, order and justice, government and society are the shifting sources of socio-cultural challenges to the EU’s legal identity as well as to constitutionalism.

4.1. The tension between security and freedom

Modern European identity is developing on the base of liberalism and democracy coalescence. Therefore, we can’t imagine non-liberal democracy. However, the idea of non-liberal democracy is vital (Shvarz & Varkentin 2014), e.g. it was revitalised by the Russian Federation. The main contradiction between liberal democracy (i.e. constitutional liberalism) and democracy arises from the fact that the laws and their application do not meet the specific requirements of liberal constitutionalism (Elster & Slagstad 1997, p. 106), and the powers of the executive branch are concentrated without clear restrictions. Constitutional liberalism is based on the limitation of powers of the government while the democracy is based on their mobilization and implementation (Zakaria 2003, p. 105). Anti-liberal tendency also occurs when democracy is functioning, but its procedures are extended without tolerance strengthening and protection of legality within the requirements of liberal constitutionalism.

Thus, in terms of legal philosophy, the fundamental differences between liberal democracy and non-liberal democracy are related to ambiguous interpretations of the concept of ‘freedom’, which is not an object of present analysis. However, it is important to emphasize that freedom is the fundamental basis of human spiritual and material existence, interiorisation of values and creative activities. Freedom is the possibility of decision and action, which is defined by the interaction of personal qualities and external conditions. Thus, the liberal democratic decision is always difficult since it contains two essential elements: the idea of equal freedom and the requirement of appropriate social conditions for its implementation. We emphasize the idea of equal freedom most often as if it was sufficient. However, the implementation of spontaneously equal freedom is not possible especially in cases where appropriate social conditions for its implementation are not under the complete control of the individuals themselves, nor their democratically formed state authorities.

Freedom is always related to security. A human being experiences larger or smaller insecurity tension permanently. According to B. Buzan (1997, p. 71), most threats to the individual appear from the fact that people are living in a social environment that generates the inevitable social, economic and political pressure. Security is understood as the condition of safety and protection against the risk, as trust in own knowledge. This also includes objective security, a sense of security (subjective security) and trust in security (absence of doubts). While examining security we also deal with various problems of values’ protection. According to Maslow’s hierarchy of needs is the second most important group of needs of individuals after biological and physiological needs such as air, food, drink, shelter etc. It seems that contemporary post-modern societies do not perceive aforementioned values anymore, because the latter European generations do not lack neither food nor security. However, the cynicism (Linkevičius 2014), the growing revisionist power as well as an attempt of the Russian Federation to dictate new international rules of the game (Lucas 2014) destroys the foundations of European security system.

The relationship between freedom and security is expressed by all human rights and freedoms. We have already accustomed the European practice of the extensive legal interpretation of human rights and freedoms under the conditions to of a rising life quality. This trend occurs without coincidence since during a relatively long period of peace in Europe and growing life quality European societies have established the conception of human rights as the standard of the relationship between social security and individual freedom. At the same time we forget the dependence of the relationship between freedom and security on social changes. Society tends to place more emphasis on the importance of social security and to limit the scope of individual freedoms in periods of war, social upheaval and the recovery of the life quality. And vice versa, in periods of growth of life quality society emphasizes tolerance and expands the scope of individual freedoms.
Governments and international organizations of the multipolar world are committed to international law differently. It is the fundamental cause of the successful formation of an international terrorist network and threats of war that come from some states. These facts not only potentially undermine the quality of social life, but also determine the formation of a new social security policy in the EU. Here the ordinary rhetoric of implementation of human rights is no longer sufficient to ful protection of the achieved life quality. Indispensable prevention of attacks of international terrorist organizations and of hybrid threats of war will continue to make a negative impact on the extensive interpretation of human rights and freedoms in the future. This is a matter of concern of human rights defenders, as if it could be possible to maintain the same standards of individual freedom, which we used at the time of peaceful coexistence without appropriate preventive actions.

4.2. The tension between order and justice

The decrease of social (communal) safety inevitably forces societies of the EU members to assess national law and order more strictly and to raise the question of justice more often. The societies of Eurozone, which have not recovered after the economic crisis in 2008 yet, observe the actions of politicians and bankers accurately because they already know that law as a sense of justice does not match the law as an order regulated by legislation. This situation is also proved by the EU’s economic and security crisis, the depth of which in different EU Member States was determined by incomplete fulfilment of legal liability assumed by their national governments. In other words, the primary reason of any social crisis, which occurs under conditions of liberal democracy, most often arises from the crisis of the application of law. Therefore, the growing difference between justice and order can be considered as a deep source of distrust in law and politics. Therefore, the European Central Bank President Mario Draghi stresses that at an unacceptably high level of unemployment in the euro area as the biggest risk can be the cause of losing the confidence in the future (Kaupinis 2014).

H. Berman (1999, p. 41) was one of the first authors who revealed the distinction between justice and order in the development of the Western legal tradition. He emphasizes that perhaps ‘( … ) failure to provide the fundamental changes in time and respond to them (are) determined by an internal contradiction which is rooted in the nature of the Western legal tradition, one purpose of which is to protect the order and the other - to implement justice. The procedure itself is understood as that which covers the inner tension between the need for change and the need to maintain stability. Justice ( … ) involves the tension between individual rights and public welfare. The implementation of justice was proclaimed as the mechanistic ideal of law. ( … ) The overthrow of previously existing law as order was justified by the revival of more fundamental law as justice’.

Justice is the concept of society’s obligations to its members (or the concept of the common good) and its practical implementation. Public obligations are moral, social, political and legal ones. Obligations refer to what is appropriate and what must be done. We explain their performance from the normative approach: justice is the rules according to which freedom, rights and duties, the various material goods are distributed. Justice as rules of social distribution is subordinated to the concept of common good. This means that the distribution of freedoms, rights and duties or different material goods must comply with the concept of the common good. Justice can also be interpreted as a subjective feeling, which in most cases is formed through the implementation of social justice (allocation of resources).

Liberal democratic ideology relates to the concept of common good with the protection of human rights. The interaction of different ideologies at international politics level on the second half of the 20th century made the concept of social justice more relevant. ‘Social justice first appeared in United Nations texts during the second half of the 1960s. ( … ) Why was it that social justice appeared on the agenda of the United Nations by the end of the 1960s? ( … ) The separation in the United Nations between human rights activities and the work being carried out to promote economic and social advancement was completed in the 1960s. Linked in the United Nations Charter, as they are in human experience, these two domains became identified with different disciplines (law for human rights, and economics for what the Charter refers to as ‘social progress and better standards of life’, which came to be called ‘development’), and also with different political philosophies ( … ), and with different clients and constituencies ( … ). The promotion of economic and social advancement, or development,
became a global cause, strengthened by the provision of substantial resources and the creation of a number of funds and programmes’ (United Nations 2006, p. 52-53).

However, the attitude of the EU’s political elite towards social justice is weakened by the search of solutions of the EU’s development and integration of its Member States issues. On the one hand, the practice of the social justice implementation in the spirit of neo-liberalism must comply with the principle of subsidiarity, but on the other hand, we need to pay attention to the fact that after the Second World War, European public law went ahead riding simultaneously two horses: the constitution as any ‘State order’, and constitutionalism as a specific ‘content’ of guarantees (Sartori 1962, pp. 856). Thus, in terms of constitutionalism, it is necessary to provide more legal guarantees for the protection of social justice within Central and Eastern European societies in order to strengthen the security of the EU. Therefore, according to the UN International forum for Social Development, ‘Notwithstanding the implied associations between social justice, redistributive justice, and justice as a more general concept, the fact is that the explicit commitment to social justice has seriously deteriorated; over the past decade, the expression has practically disappeared from the international lexicon and likely from the official language of most countries’ (United Nations 2006, p. 13).

In order to assess social justice members of society there is a usage of two relatively independent - micro and macro - principles of justice that meet the individual and state levels. Micro justice is based on the attitude that distribution of social resources is best performed by the market (market justice). Macro justice is defined by the attitude that justice is better achieved when social resources are distributed within the social security system (political justice). The difference of the perception of these principles reflects the assessment of the relationship between market justice and political justice. At a national level, the elite of society exercises the collective choice, while at the micro level, each individual has to find his best suitable methods and strategies how to adapt oneself to changing market conditions. Studies have shown that people’s choice to rely on a micro or macro principles of justice depends on their trust in the government (Burinskienė & Rudzkienė 2013).

The perception of social justice varies in different countries. The global network of social scientists WVS (World Values Survey) together with EVS (European Values Study) conducted a representative study of societies of 97 countries, which covers the period 1981-2007. The comparative analysis of this study data enables V. Rudzkienė and A. Kanopka (2013, p. 11-14) to maintain that the social justice was rated much better in the economically developed countries. On this basis they conclude: ‘the success of the implementation of social justice is determined not as much by the society’s development model as by the principles of its implementation, the compatibility of social policy with expectations of the population, historical-cultural experience of countries and traditions’.

The analysis of this study reveals that on the one hand, more successfully developing societies pay more attention to the purposeful pursuit of coherence between market justice and political justice, expressed in terms of the relevant legislation. In this case, emphasis is placed on liberal democratic model of the majority, which is based on the idea that ‘the nation as unity’ is involved in the government of a state and the search for social justice. But, on the other hand, in terms of functionality of civil society, more developed EU Member States tend to implement pluralist liberal democratic model, which is based on the idea that democracy is more efficient when a nation is involved in the government through competing interests of different social groups. In the latter case the EU Member States, transnational and supranational EU organisations play the role of political lobbying agents, the interactions of which at the EU legislative level often become enacted mistakes. According to M. Leonard (2005, p. 12), there are plenty of mistakes starting from absurd EU common agricultural policy and the weakness of the immigration policy ending with the absence of active international policy and excessive zeal in developing standards. The increase of the number of legislation, which meets interests of lobbying groups, promotes a gradual latent increase of the discrepancy of perception of legal order and social justice. This process is most often noticed when the difference reaches dangerously critical limits: increased tension between the perception of rights of the individual and understanding of the public welfare, or between the law as justice (the common good) and the law as an organised order (rules of distribution). Such a process has a negative impact on the concept of law: members of society feel that positive concept of law lacks justice.
The conscious differentiation of law as justice and law as organized order becomes the feature of the political elite in Western societies. However, the perception of the unity of order and justice is characteristic to the mentality of the Western societies, social groups and individuals that wish to base the legal system on it. Therefore, the strengthened legal power of state government (legal positivism) inevitably actualizes the dilemma between law as justice and law as order in society because the sense of justice of various social groups is different. This is one of the deepest sources of the rise and development of constitutionalism because different social groups hope that the drafting and adoption of the constitution in society will help to avoid this dilemma or at least to limit the pace of its emergence.

4.3. The tension between government and society

This tension is not relevant yet because the majority of EU citizens consider the social problems of their own or of their nation as more important. Many EU Member States still lack the awareness that even the strongest EU Member States remain extremely vulnerable in contemporary world without cooperation (Česnakas 2014).

The alienation of government and society or the absence of tension between government and society is as dangerous as its excessive growth. One of the main reasons of wrong public policy practices is inadequate assessment of existing situations, which are influenced by inappropriate and inadequate system of citizens’ participation in decision-making (Bartle & Leunenberger 2006). On the one hand, EU citizens do not have any influence on the EU-wide political and legal decisions. On the other hand, they try to affect the EU Commission and Parliament very rarely. This situation is dangerous for the further functionality of the EU. As political commentators emphasize, the EU crisis will continue as long as the EU is conceived through the prism of internal policy and short-term national interests rather than through the common good, which allows to ensure economic prosperity and the creation of a favourable international environment (Česnakas 2014).

In fact, the EU is a child of political elite of Western Europe. In all cases the primary goal of the creation of the EU was the political one, which is being implemented mainly through economic means (Castells 2006, p. 326). On the other hand, the role of law was often narrowly perceived as the help to legalize political objectives and economic measures. In this context the European constitutionalism, which might be considered as an example of international constitutionalism, was developing respectively.

The concept of international constitutionalism was influenced by the emergence of liberal political philosophy. In its terms, at the end of XX century the modern representative, constitutional and secular democracy, based on a strong market economy was considered as the only one model of democratic government. ‘However, the current triumph of liberal democracy did not eliminate alternatives ( … ). The choice is basically between two versions of liberal democracy as between the two versions of equality’ (Beneton 2009, p. 265). The first is so-called essential equality, which is based on a political recognition that humans are characterized by the same inherent dignity, which demands equality and freedom. The second version of equality is a procedural or formal: liberal democracy is identified with the rules of the game, procedures designed to give people who do not have a common principle and inherent goals, the opportunity to achieve personal goals (Beneton 2009, p. 331).

From the viewpoint of the concept of formal equality, we talk not about human equality but about the equality of citizens, which follows from the equality of opinions and the latter comes from the fact that there is no truth. Everyone has his or her own ‘truth’ and no one can claim to have the only Truth. Pluralism of approaches is proclaimed as an exceptional value. The use of political rights is simplified: ‘Citizen is inherently autonomous, so there is no need to teach him; his choice has the same value, no matter by what it was dictated: a mind or an emotion; even the distribution according to the mind and emotions is pointless; it is not necessary to take into account constitutional forms because simple rules of the game are enough’ (Beneton 2009, p. 331).

The essential political equality has completely different reasons. Equality of citizens is only an agreement, but this agreement complies with primary human equality and dignity the most. Entrenchment of the principle of democracy - granting votes to modest, unknown and not influential individuals - means that the version of
essential equality is related to the social position and its change towards the greater integration of society. According to P. Beneton (2009, p. 332), rules of the game are not sufficient to create a political society because many things depend on the actors’ behaviour. He emphasises the irreplaceable value of social communication, political duties or rules of conduct while developing the essential equality and liberal democracy. Therefore, for instance, the distinction between liberal democracy and the people is very dangerous. However, the concept of international constitutionalism is not suitable for the European Union if we want to create a European identity.

We should pay attention to the fact that constitutionalism is also the practice of politics according to ‘rules of the game’, which insure effective restraints upon governmental and other political action, and the theory — explanatory and justificatory — of this practice (Friedrich 1968). Therefore, we need such ‘rules of the game’, which could lead to the development of the European nation. For instance, the US, French and German constitutional systems, with their respective characteristic judicial practice and cultures of interpretation — their constitutionalism — concern the same object: the rules concerning the working of an independent and self-governing political community of human beings and their fundamental rights. ‘European constitutionalism’, on the other hand, seems to embody something which is both more removes from ‘the people’ and more vague than national constitutional law. However, the development of European integration makes these differences disappear. This is not only due to the fact that Europe becomes similar to that of the state. This is also because the European states themselves and their characteristic constitutionalism are being transformed by the process of European integration. This is visible most clearly in the jurisprudence of European Courts in Strasbourg and Luxembourg. The jurisprudence of the European Court of Human Rights necessarily influences and harmonizes national human rights jurisprudence. To a lesser extent, similar developments are taking place in the area of state organization (Nolte 2005, p. 5). However, the European constitutionalism still needs to enhance the development of rules, which could influence the creation and activities of the independent, self-governing EU’s political community and its fundamental rights.

Conclusions

1. Constitutionalism is based on the perception of constitution as specific guarantees and on the idea that the political order is subject to a stable and independent of various changes ‘higher law’. The constitutional system, which relies on this idea is characterized by three essential features: limited and accountable government, adherence to the rule of law, and protection of fundamental rights. These features are also revealed in the main EU documents, which are considered as the EU’s constitutional basis, so we can reasonably talk about the EU’s constitutionalism.

While the EU is still moving towards enlargement and integration, European constitutionalism as a political process confronts the issues of public acceptance. However, it remains a significant element of the EU integration and identity on the legal level.

2. Constitutions of the EU Member States were adopted at different stages of their development and reflect both the changes of constitutional regulation and changes of the attitude towards the constitution. The constitution has long been seen as a symbolic document which declares the basic principles and legitimizes the rule of law. Lately, it gradually forced the state to recognize its autonomy and supremacy as the only real pedestal of the state governed by the rule of law. States, faced with the question, what is the constitutional basis of the EU membership, mostly states supplemented their constitutions with norms which directly designate the EU membership.

Supremacy of the Constitution implies the establishment of its effective security mechanism. Therefore, one more trend of the development of constitutionalism is the increasing role of constitutional control of institutions in the political life. At the national level those institutions are constitutional courts (European model of constitutional justice) or courts of general jurisdiction (American model of constitutional justice), at the EU level this role is attributed to the European Court of Justice. In the twentieth century constitutional justice has become the most effective form of legal protection of a democratic regime established in the constitution.
3. The study of dynamic of security and freedom, order and justice and government and society tensions causes suggests that they will continue to influence the further formation of the EU’s identity.

3.1. The growth of the tension between security and freedom within EU will be influenced by substantial actions of a multipolar world. For more than 50 years the EU and its legal identity has been developed under symmetry conditions of a bipolar world. They guaranteed the international security system of the European states. This enabled the EU Member States and the EU institutions to develop the judicial practice of extended interpretation of human rights and freedoms. Now the EU Member States’ security situation is changing since it is affected by the multipolar world states’ interactions. It will take uncertain transitional period until this fundamental international security change will be perceived by the EU Member States and the EU’s supra-national judicial authorities. One thing is clear, that the practice of extended interpretation of the rights and freedoms does not meet the essential changes of the EU’s security conditions anymore.

3.2. The growing tension between security and freedom will inevitably promote the strict interpretation of national law and order. It will also raise questions more often about justice and social justice in particular. Therefore, one can predict that in the near term, the classical tension between order and justice will increase in the EU. In this case the EU should purposefully enhance the legal regulation of immigration, employment and social protection, transparency in polity and business relations and prevention so that the potential growth of the tension between order and justice will not become a threat to the integrity of the EU.

3.3. The growing tensions between security and freedom, order and justice will inevitably actualize the tension between government and society not only in the EU Member States, but across the EU. From the viewpoint of the EU’s legal identity, the relationship between the EU’s government and society still functions very weak. The procedural version of equality was too exaggerated during the development of European constitutionalism and possible alternatives to liberal democracy were not noticed on time. This situation was determined by a permanent pursuit of the EU’s supra-national institutions to avoid the discrimination phenomena and to respect multicultural conditions of the EU Member States functioning emphatically. Consequently, the development of European constitutionalism has accepted the liberal democracy as the rules of the game, which did not result in the creation of the European nation. From the long-term perspective and in the context of growing tensions between security and freedom, order and justice, the formal European constitutionalism does not meet the needs of the EU’s internal integration. Therefore, the further evolution of European constitutionalism still needs to enhance the development of the rules, which could influence the creation and activities of the independent, self-governing EU’s political community.

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Abstract. Sustainability project is an important part of project management and depends on many factors, such as financial resources, human resources, scheduling operations and especially potential risks. This paper presents a way to work with uncertain information processing project risk analysis with regard to its sustainability. Risk management is an important part of various disciplines, e.g. Project management, Crisis management, Change management, Information Security Management System, etc. Risk analysis is mostly based on expert estimates. However, this may be a problem with brand new tasks as identification of different threats and their numerical evaluations can be interpreted as a decision-making task which can be formalised as a decision tree. A decision-making task solution requires knowledge of all relevant input information items (III), such as probabilities, penalties and profits. If all those numerical values are known then the well-known methods of decision trees evaluations can be used. However, if complex project management problems are solved then a substantial set of relevant data items is missing or its accuracies are prohibitively low. The aim of this paper is to present easy approach how missing elements of the III set can be obtained and integrated into incomplete data sets. The paper contributes a common sense heuristics to obtain missing elements of the III set which can generate all numerical values, i.e. a problem under complete ignorance is solve, and a reconciliation mechanism based on linear programming which allows results of common sense heuristics simply integrate into incomplete data set, i.e. a problem under partial ignorance is solved. The results are therefore divided into two parts. In the first part solves a problem under total ignorance. The second part of the case study evaluates some unknown probabilities, therefore solves a problem under partial ignorance. Both tasks, i.e. partial and total ignorance are demonstrated using a quasi-realistic decision tree. The decision tree has one root node, 6 lotteries and 15 terminals; the total number of unknown probabilities is 21 under total ignorance and 18 probabilities are evaluated under partial ignorance.

Keywords: project risks, sustainability projects, decision tree, total ignorance, partial ignorance, reconciliation.

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1. Introduction

Project management is a widely used discipline whose spectrum of different applications is very broad, e.g. politics, economics, sociology, ecology, see e.g. (Chan et al. 2011; Hwang et al. 2014; Kuo & Lu 2013; Čirjevskis 2015; Tvronavičienė et al. 2015; Lace et al. 2015; Oganisjana et al. 2015; Vaško, Abrhám 2015; Laužikas et al. 2015; Dobele et al. 2015; Prause 2015; Beifert 2015; Schröder, Prause 2015; Pelše et al. 2015; Ignatavičius et al.; Endrijaitis, Alonderis 2015). From the perspective of project management is important to realize that the management of the project does not end with the termination of its implementation (investment) phase, but continues operating phase. In both phases of the project is necessary to assess and manage its sustainability. Project
sustainability is the set of characteristics that affect performance, outcomes, and achieving objectives. Project sustainability is generally a time for which must be project outputs unchanged retained (Chuanmin et al., 2012; Shen et al., 2011). Usually it is a period of 5 years from the date of completion of the physical implementation of the project, see e.g. (Khan, 2015, 1995).

The authors Poveda and Lipsett present the Wa-Pa-Su project sustainability rating system presents an integrated approach to sustainability assessment by integrating three distinctive areas of knowledge: 1) sustainable development theory and fundamentals supports the ultimate goal of the rating system, which is to contribute to sustainability, with the aim of finding a path to balance social, economic, and environmental needs; 2) continual performance improvement becomes essential due to the duration of the projects, as it is critical to allow organizations or projects to improve performance over time; and 3) multi-criteria decision analysis assists with the assessment process through stakeholder engagement and participation, and the design and implementation of a criteria weighting system (Poveda and Lipsett, 2014). The research by the authors Pereira et al. presented a methodology that uses the Monte Carlo Method to estimate the behavior of economic parameters which may help decision, considering the risk in project sustainability. This methodology was used on a Grid-Connected Photovoltaic System (GCPVS) of 1.575 kWp (da Silva Pereira et al., 2014). In the case study authors Zhang et al present an improved SDA (Sustainable Development Ability) prototype model that incorporates the effects of dynamical factors on project sustainability. This involves the introduction of two major factors concerning technological advancement and changes in people’s perceptions (Zhang et al., 2014).

From the nature of the concept of project sustainability indicate that directly relate mainly to the project risk management (MacAskill and Guthrie, 2013), but also with financial planning, human resource planning and scheduling operations. Risk analysis is among the basic processes of project management and with projects sustainability directly related. The need to manage the risk of projects is included in the international standards ISO 31000 Risk Management - Principles and guidelines and IEC 62198 Managing risk in projects - Application guidelines (Cooper et al., 2014).

This paper presents a way to work with uncertain information processing project risk analysis with regard to its sustainability. Risks evaluations are essential activities of management process of project risk and directly determines the success or failure of a project under study (Czech Standards Institute 2002) and are often based on vague, inconsistent, partially subjective data / knowledge items of interdisciplinary nature (Chen et al. 2009). The importance of the risk management and its complexity is reflected by a broad spectrum of formal tools, such as cause and effect diagrams, risk tree, risk maps, brainstorming, simulation, see e.g. (Bergantiños & Vidal-Puga 2009; Hwang et al. 2014; Relich 2012, 2010), expert estimates, see e.g. (Chan et al. 2011), and widely used fuzzy sets, e.g. methods of fuzzy logic, fuzzy numbers, etc.(Peker et al. 2014).

The method of fuzzy logic applied to the risk management process is described in (Nasirzadeh et al. 2014). The authors present an integrated fuzzy system dynamic modelling for quantitative risk assessment. The values of the various factors, which are characterized by the nature of uncertainty, are defined by fuzzy numbers. The proposed model was simulated at different levels of risk; the optimum level of risk is determined by the point at which the minimum cost of the project, see e.g. (Nasirzadeh et al. 2014).

The same risk issues of construction projects are presented by authors Yao-Chen Kuo and Shih-Lu Tong. This study deals with a fuzzy multiple criteria decision making approach to systematically assess risk for a metropolitan construction project where twenty risk factors were identified. Triangular fuzzy sets are used for describing of identified factors. The overall risk level of the project depends on the individual impact of individual risk factors; the scheme was evaluated based on the relative impact and likelihood. They note that the suggested model for risk assessment is more reliable, more convenient than traditional statistical methods, and that this model can be used to efficiently identify risks metropolitan construction projects, see (Kuo & Lu 2013).

An article by Nieto Morote-and-Ruz Vila is a methodology for risk assessment based on fuzzy set theory, which is an effective tool for dealing with subjective assessments. The proposed methodology is based on the knowl-
edge and experience gained from many experts. Risk factors are evaluated by qualitative criteria in the form of trapezoidal fuzzy numbers. Fuzzy numbers describe the uncertainty variables at the language level, see e.g. (Nieto-Morote & Ruz-Vilas 2011).

Application of fuzzy logic in project risk management of Czech authors is also engaged by Peták. The author informs about the appropriateness of using fuzzy methodology in project risk management. For a description of risks uses ordinal scale: small, medium, large risk, which is ‘sharp’ description of dynamic phenomenon. Subsequently author recommends the scale transform on fuzzy concepts using fuzzy sets of the complete system, see e.g. (Peták 2011).

In the study ‘The Moderating effect of risk on the Relationship between planning and success’ authors Zwikael, Pathak, Singh, Ahmed deal with examination the relationship between the project planning process and its success. They show the level of success (measured in the form of risk) associated with the project plan. They conclude the high risk projects must be carefully planned, see e.g. (Zwikael et al. 2014).

Most of above noted decision tasks (Relich et al., 2014) can be represented by single root trees, i.e. decision trees, and sets of available III (input information items), such as probabilities, penalties, plausibility etc., see e.g. (Thipwiwatpotjana & Lodwick 2014). In the practice, the complete III set is usually not available. The above noted literature review revealed there is main problem, such as lack information and information uncertainty. Problem of information uncertainty is usually solved using fuzzy sets. Problem of lack information is usually based on usage metaheuristics, see e.g. (Bradshaw 2000; Jegadeesh et al. 2004). Decisions are made under information shortage; therefore classical statistical methods are not applicable, see e.g. (Spanos 2010). When the information about uncertainty cannot be quantified in a simple probabilistic way, the topic of possibility decision theory is often a natural one to consider, see e.g. (Dubois 2014; Fargier et al. 2012). However, if the probabilities interpretation is not used then it is difficult for a decision maker from such branches as economics and engineering who has no relevant knowledge of the relevant methods of Artificial Intelligence to understand how the reconciliation results are achieved, see e.g. (Danielson et al. 2007; Nie et al. 2009). These studies focus on description of second-order representation which may significantly increase a decision-maker’s understanding of a decision situation. Relations of a complex set of pairs of Causes – Consequences can be formalized by a decision tree. A sophisticated set of knowledge items generates such decision tree which has many branches as a specific Cause has several Consequences. Therefore a methodology is needed to quantify the missing elements of the III set in the decision tree. This is a serious problem as experts of practice are often not willing to accept results based on algorithms which are not clearly understood or computationally demanding for them, such as Monte Carlo method, a discriminant analysis, logistic regression, artificial neural networks (multilayer perceptron), fuzzy logic, see .e.g. (Jaskowski et al. 2014; Mileris & Boguslauskas 2011; Zhang 2012). Moreover majority of these methods cannot feasibly absorb additional information which is usually not fully consistent with relevant sets of available III (input information items). Moreover above noted studies are based either on very sophisticated algorithms of reconciliation or free description of reconciliation. The studied models of reconciliation were created for specific situations. This is a serious problem as experts of practice, e.g. project management, often have a problem with the implementation of such models.

Therefore the aim of paper is to present new easy approach how missing elements of the III set can be obtained and integrated into incomplete data sets. The paper’s original contributions are the following. First, it provides common sense heuristics to obtain missing elements of the III set which can generate all numerical values, i.e. a problem under complete ignorance is solved. Second, it provides a reconciliation mechanism which allows results of common sense heuristics simply integrate into incomplete data set, i.e. a problem under partial ignorance is solved.

The rest of the paper is organized as follows. The next section discusses the relevant theory and methods about common sense heuristics and reconciliation algorithm. This section is followed by results. The results are demonstrated using a quasi-realistic decision tree. The decision tree has one root node, 6 lotteries and 15 terminals; the total number of unknown probabilities is 21 under total ignorance and 18 probabilities are evaluated under partial ignorance. The final section presents a discussion of findings and implications for future research.
2. Materials and Methods

2.1. Heuristics

Missing quantitative items of III must be evaluated in order to solve the risk tasks under study. Decision-makers are therefore often / sometimes ready to accept some general heuristics as the only way to compensate the missing numerical values. There are several possible common sense heuristics. The heuristic used in this paper is, see (Kubíčková et al. 2013):

\[ \text{The longer sequence of events is more probable} \]  \hspace{1cm} (1)

The heuristic (1) is based on a common sense assumption that if we know more about an event then this event is more probable. A broader spectrum of knowledge item related to an event is an indication that this event is studied for a longer time and consequently its behaviour can be more precisely predicted. However, if a user is not willing to accept the heuristic (1) then he/she can choose any other heuristic, e.g.

\[ \text{The longer sequence of event is less probable} \]

2.2. Total ignorance

A decision tree has one root node \( r \), see e.g. Figure 1. The following definitions are used:

\[ T \] Set of terminals, see e.g. nodes 2, 3, 4 and 5; see e.g. Figure 1.  
\[ N \] Set of all nodes.  
\[ s_{ij} \] Number of edges of the sub-tree where \( i \) is the root of the sub-tree and \( j \) is the node next to the sub-root, see e.g. \( s_{r1} = 4 \) namely the edges \( r-1, 1-3, 1-4, 1-5 \).  
\[ S_i \] Number of all edges of the sub-tree where \( i \) is the sub-root (resistance of \( i \)th node).

\[ S_i = \sum_j s_{ij}, \text{ see e.g. } S_r = s_{r1} + s_{r2} = 4 + 1 = 5 \] \hspace{1cm} (3)

where \( j \) represents nearest downstream node of the sub-tree next to the \( i \)th node.

\[ \alpha_{ij} \] is splitting ratio from \( i \)th node to \( j \)th node:

\[ \alpha_{ij} = \frac{s_{ij}}{S_i}, \text{ for all } j \in N - T, \text{ see e.g. } \alpha_{r1} = s_{r1}/S_r = 4/5 \] \hspace{1cm} (4)

\( P_j \) of \( j \)th terminal for \( j \in N \) is a probability of \( j \)th node. The value \( P_r \) of a root node is always equal one.
Non-root node probability is

\[ P_j = P_i \cdot \alpha_{ij}, \quad j = 1, 2, \ldots, K \]  

where \( i \) represents nearest forgoing node (the sub-root node of the sub-tree) and \( K = (N - T) \) is number of non-terminal nodes. The set of \( K \) linear equations (6), where the set \( P \) is a vector of unknown variables and the splitting ratios \( \alpha \) (4) are numerical constants, is denote as a set of balance equation which can be easily solved as system of linear equations \( A \cdot P = B \); see e.g. (Meluzín et al. 2012).

Solving system of equations (6) gives the probabilities of the terminals under total ignorance (only topology of decision tree is known).

### 2.3. Partial ignorance

A typical feature of all realistic decision tasks is a shortage of information. Isolated information items, e.g. probabilities of certain events, are known. The concept of the total ignorance represented by e.g. the heuristics (1) helps to incorporate a set of isolated specific information items within a general framework of metaheuristics; see e.g. (Kubičková et al. 2013). An incomplete set (7) of isolated specific probabilities

\[ R \equiv (R_1, R_2, \ldots, R_h) \]  

has \( h \) elements. Each element of the set \( R \) can be formally interpreted as an equation.

The answer to the question how to incorporate additional information into total ignorance gives reconciliation, see e.g. (Doubravsky and Dohnal, 2015).

Reconciliation is a solution of an over-specified set of linear equations (6) and trivial equations (7):

\[ E = A \cdot P = B \cup P = R \]  

The set of equations \( E \) has \( n + h \) equations and \( n \) variables \( P \) (see (6)). The set of equations (9) has nearly always no solution. An objective function \( F \)

\[ F = \sum_{j=1}^{h} d_j \]  

is chosen which is minimized. This function (9) is usually a sum of deviations \( d \) (10)

\[ d_j = P_j - R_j \]  

where \( j = 1, \ldots, h \). A methods of linear programming is used to solve the following problems (11)

\[
\begin{align*}
\min F \\
\text{s.t.} \quad a_i P_i &= b_i \\
&\quad \vdots \\
&\quad a_n P_n = b_n \\
P_{v_1} &= R_{v_1} \\
&\quad \vdots \\
P_{v_{vb}} &= R_{v_{vb}}
\end{align*}
\]
The reconciliation can be solved by a well-known algorithms of linear programming; see e.g. (Buckley 1988; Huang & Dan Moore 1993; Tan et al. 2007).

3. Results and Discussion

A medium-sized decision-making tree was chosen as a case study. A simplified version of this decision-making tree is seen on Figure 2. The nodes represent „Lotteries“, for details, see e.g. (Rose 1976), where the decision-maker is not in control.

The tree, Figure 2, has four levels. The nodes are described according the levels in Table 1.

![Figure 2. Decision-making tree](source: own processing)

<table>
<thead>
<tr>
<th>Level</th>
<th>Node</th>
<th>Importance</th>
<th>Level</th>
<th>Node</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (scenario)</td>
<td>1</td>
<td>Extending the project duration</td>
<td>IV (threat)</td>
<td>10</td>
<td>Resources lack</td>
</tr>
<tr>
<td>II (threat)</td>
<td>2</td>
<td>Stakeholders</td>
<td>IV (threat)</td>
<td>11</td>
<td>Resources loss</td>
</tr>
<tr>
<td>II (threat)</td>
<td>3</td>
<td>Resources</td>
<td>IV (threat)</td>
<td>13</td>
<td>Exaggeration durations</td>
</tr>
<tr>
<td>II (threat)</td>
<td>4</td>
<td>Plan</td>
<td>IV (threat)</td>
<td>14</td>
<td>High criticality tasks</td>
</tr>
<tr>
<td>II (threat)</td>
<td>5</td>
<td>Finance</td>
<td>IV (threat)</td>
<td>16</td>
<td>Cash flow loss</td>
</tr>
<tr>
<td>III (threat)</td>
<td>12</td>
<td>Poor allocation resources</td>
<td>IV (threat)</td>
<td>17</td>
<td>Cash flow interruption</td>
</tr>
<tr>
<td>III (threat)</td>
<td>15</td>
<td>Network graph</td>
<td>IV (threat)</td>
<td>18</td>
<td>Uneven allocation resources</td>
</tr>
<tr>
<td>IV (threat)</td>
<td>6</td>
<td>Poor project team management</td>
<td>IV (threat)</td>
<td>19</td>
<td>Resources overload</td>
</tr>
<tr>
<td>IV (threat)</td>
<td>7</td>
<td>Suppliers</td>
<td>IV (threat)</td>
<td>20</td>
<td>Incorrect task link</td>
</tr>
<tr>
<td>IV (threat)</td>
<td>8</td>
<td>Investor</td>
<td>IV (threat)</td>
<td>21</td>
<td>Incorrect milestones</td>
</tr>
<tr>
<td>IV (threat)</td>
<td>9</td>
<td>Others (government, media, citizens)</td>
<td>IV (threat)</td>
<td>22</td>
<td>Incorrect constrain tasks</td>
</tr>
</tbody>
</table>

*Source: own processing*
Case study is divided into two parts, namely total and partial ignorance.

3.1. Total ignorance

The following table shows the splitting ratios $\alpha$ (4) of each branch of Figure 2.

**Table 2. Splitting ratio**

<table>
<thead>
<tr>
<th>Branch</th>
<th>Splitting ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>0.238</td>
</tr>
<tr>
<td>1-3</td>
<td>0.286</td>
</tr>
<tr>
<td>1-4</td>
<td>0.333</td>
</tr>
<tr>
<td>1-5</td>
<td>0.143</td>
</tr>
<tr>
<td>2-6</td>
<td>0.25</td>
</tr>
<tr>
<td>2-7</td>
<td>0.25</td>
</tr>
<tr>
<td>2-8</td>
<td>0.25</td>
</tr>
<tr>
<td>2-9</td>
<td>0.25</td>
</tr>
<tr>
<td>3-10</td>
<td>0.6</td>
</tr>
<tr>
<td>3-11</td>
<td>0.2</td>
</tr>
<tr>
<td>3-12</td>
<td>0.2</td>
</tr>
<tr>
<td>4-13</td>
<td>0.167</td>
</tr>
<tr>
<td>4-14</td>
<td>0.167</td>
</tr>
<tr>
<td>4-15</td>
<td>0.667</td>
</tr>
<tr>
<td>5-16</td>
<td>0.5</td>
</tr>
<tr>
<td>5-17</td>
<td>0.5</td>
</tr>
<tr>
<td>12-18</td>
<td>0.5</td>
</tr>
<tr>
<td>12-19</td>
<td>0.5</td>
</tr>
<tr>
<td>15-20</td>
<td>0.333</td>
</tr>
<tr>
<td>15-21</td>
<td>0.333</td>
</tr>
<tr>
<td>15-22</td>
<td>0.333</td>
</tr>
</tbody>
</table>

*Source: own processing*

The following table shows the probabilities $P$ of threats (6), which were obtained by solving the problem (11).

**Table 3. Probabilities of threats**

<table>
<thead>
<tr>
<th>Node (threat)</th>
<th>Threat Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.0595</td>
</tr>
<tr>
<td>7</td>
<td>0.0595</td>
</tr>
<tr>
<td>8</td>
<td>0.0595</td>
</tr>
<tr>
<td>9</td>
<td>0.0595</td>
</tr>
<tr>
<td>10</td>
<td>0.0572</td>
</tr>
<tr>
<td>11</td>
<td>0.0572</td>
</tr>
<tr>
<td>13</td>
<td>0.0556</td>
</tr>
<tr>
<td>14</td>
<td>0.0556</td>
</tr>
<tr>
<td>16</td>
<td>0.0715</td>
</tr>
<tr>
<td>17</td>
<td>0.0715</td>
</tr>
<tr>
<td>18</td>
<td>0.0858</td>
</tr>
<tr>
<td>19</td>
<td>0.0858</td>
</tr>
<tr>
<td>20</td>
<td>0.0739</td>
</tr>
<tr>
<td>21</td>
<td>0.0739</td>
</tr>
<tr>
<td>22</td>
<td>0.0739</td>
</tr>
</tbody>
</table>

*Source: own processing*
3.2. Partial ignorance

The topology of the decision tree (see Figure 2) is known and isolated probabilities (7) of some splitting ratios (4) are known as well, see Table 4.

Let us suppose that the following splitting ratios are known (may be an expert estimation, data collected on the basis of historical data, etc.), therefore the III set is partially known:

Table 4. Known splitting ratios

<table>
<thead>
<tr>
<th>Branch</th>
<th>Splitting ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>0.5</td>
</tr>
<tr>
<td>5-17</td>
<td>0.6</td>
</tr>
<tr>
<td>12-19</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Source: own processing

The decision-making problem is solved as a reconciliation problem (8). The following table shows the splitting ratios (4) of each branch of Figure 2.

Table 5. Splitting ratio

<table>
<thead>
<tr>
<th>Branch</th>
<th>Splitting ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>0.238</td>
</tr>
<tr>
<td>1-3</td>
<td>0.119</td>
</tr>
<tr>
<td>1-4</td>
<td>0.5</td>
</tr>
<tr>
<td>1-5</td>
<td>0.143</td>
</tr>
<tr>
<td>2-6</td>
<td>0.25</td>
</tr>
<tr>
<td>2-7</td>
<td>0.25</td>
</tr>
<tr>
<td>2-8</td>
<td>0.25</td>
</tr>
<tr>
<td>2-9</td>
<td>0.25</td>
</tr>
<tr>
<td>3-10</td>
<td>0.6</td>
</tr>
<tr>
<td>3-11</td>
<td>0.2</td>
</tr>
<tr>
<td>3-12</td>
<td>0.2</td>
</tr>
<tr>
<td>4-13</td>
<td>0.167</td>
</tr>
<tr>
<td>4-14</td>
<td>0.167</td>
</tr>
<tr>
<td>4-15</td>
<td>0.667</td>
</tr>
<tr>
<td>5-16</td>
<td>0.4</td>
</tr>
<tr>
<td>5-17</td>
<td>0.6</td>
</tr>
<tr>
<td>12-18</td>
<td>0.4</td>
</tr>
<tr>
<td>12-19</td>
<td>0.6</td>
</tr>
<tr>
<td>15-20</td>
<td>0.333</td>
</tr>
<tr>
<td>15-21</td>
<td>0.333</td>
</tr>
<tr>
<td>15-22</td>
<td>0.333</td>
</tr>
</tbody>
</table>

Source: own processing

Table 6 shows the probabilities of all threats (6).
Table 6. Probabilities of threats

<table>
<thead>
<tr>
<th>Node (threat)</th>
<th>Threat Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.0595</td>
</tr>
<tr>
<td>7</td>
<td>0.0595</td>
</tr>
<tr>
<td>8</td>
<td>0.0595</td>
</tr>
<tr>
<td>9</td>
<td>0.0595</td>
</tr>
<tr>
<td>10</td>
<td>0.0238</td>
</tr>
<tr>
<td>11</td>
<td>0.0238</td>
</tr>
<tr>
<td>13</td>
<td>0.0835</td>
</tr>
<tr>
<td>14</td>
<td>0.0835</td>
</tr>
<tr>
<td>16</td>
<td>0.0572</td>
</tr>
<tr>
<td>17</td>
<td>0.0858</td>
</tr>
<tr>
<td>18</td>
<td>0.02856</td>
</tr>
<tr>
<td>19</td>
<td>0.04284</td>
</tr>
<tr>
<td>20</td>
<td>0.1110</td>
</tr>
<tr>
<td>21</td>
<td>0.1110</td>
</tr>
<tr>
<td>22</td>
<td>0.1110</td>
</tr>
</tbody>
</table>

*Source: own processing*

The probability values, see Table 6, are required with well-known method, such as RIPRAN method, scoring method see e.g. (Doležal et al 2012; Lacko 2014; Chan et al. 2011; Cleland 1998; Chan et al. 2011).

In analysis of risk projects expert estimates of values of probabilities threats are usually obtained using Delphi techniques, such as Team Delphi, see. e.g. (Lester 2014). These techniques are based on a subjective assessment of the probability of threats by each expert. Some modifications of these techniques use the arithmetic means of subjective assessments others use fuzzy numbers, see .e.g. (Kuo & Lu 2013; Nieto-Morote & Ruz-Vila 2011). More often is used a qualitative approach where threats are verbally assessed, e.g. High, Medium, Low, see (Lester 2014). Essential for all these techniques is that experts have given the value of probability to all considered threats.

The proposed approach allows to assessment only some threats (some probabilities are known from previous projects), the remaining threats are assessed on the basis of known topology of the decision / risk tree. This approach can also be used even if the decision tree topology is only available known information.

**Conclusion**

The importance of identification of risks attracts attention of many researchers. Identification of a complex risk related task involves identifying threats, scenarios and their evaluations. The article shows a possible approach to evaluation of identified threats of a scenario. The proposed approach is based on an easy to understand heuristic that uses the decision tree topology as the only available information. This new approach is shown in a case study. The relevant decision tree has 22 nodes. The case study is divided into two parts which represent the total and partial ignorance.

The problem of reconciliation of probabilities generated by the used heuristic and the available subset of probabilities is solved by using linear programming. The advantage of this approach lies in the fact that the objective function and the equations of the individual constrain are linear, and therefore easily solvable using commonly known simplex method.

Limitation of proposed approach is the need to build decision tree (it can be large for extensive projects). Also it should be noted that the proposed heuristics (1) is not the only one possible and it may not suit all decision-making problems. The choice of suitable heuristics depends on the type of solved decision-making problem.
The proposed approach have broad spectrum of applications, e.g. failure trees evaluations. Moreover it is possible to take into consideration tasks where the probabilities are given vaguely, e.g. using fuzzy numbers, or they are specified from different sources, e.g. from different members of project teams, experts of project management, etc.

Acknowledgments

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THE MANAGEMENT OF PUBLIC FINANCE LITERACY FOR SUSTAINABLE ECONOMICAL ENVIRONMENT

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Abstract. Understanding of the tax burden in public finance is probably an important issue for the each country’s growth. It affects the public sector and the development of the country’s and individual citizens’ lives. Therefore a significant focus on the general development of the public finance studies is obviously increasing. Moreover that process is organized in connection with the relevant higher education and research programs. On the other hand the finance management education are treated differently in different countries. In some countries, social scientists are still debating whether the public finance management can be seen as an important educational and scientific branch of study. That is becoming increasingly important provision that such a discussion does not directly benefit the common development of financial education in recent years. One of the possible ways to deal with personal finances in different economic conditions could be changing attitudes to finance knowledge among students in universities. The young people could be supported by financial education programs that are clearly incorporated into their underground or postgraduate courses. The correct management of these programs helps to improve student and cadets learning experience and the economic well-being. Moreover the learning based on the public administration and the public finance probably educate patriots of the country and people intolerant to non-transparent activities of public servants. Eventually the best ways to determine the country consolidated tax paid by natural and legal persons could be the tax burden rate. Besides the financial data supplied to the main European Statistics Authority – the Eurostat – by the national statistical institutions sometimes can be not very correct. Therefore even more important could be an issue that an ordinary country’s citizen who is living only from the income related to the labour relations (or corresponding relations of income) obviously has the much higher tax burden. Then we have an increase of the direct taxes burden by almost twice versus the official country’s tax burden. However the additional tax burden includes hidden taxes related to the aggregated spending of an employee’s income inside the EU. In that case the tax burden for an average employee could approach up to the two-thirds of the total (work-related) income. Then “the freedom from the taxes day” can be relocated to the second half of the year for the ordinary worker. This perception of the tax burden can encourage each citizen of the country to be responsible for the all public servant activities and for budget planning processes.

Keywords: education, public finance, taxation, economics, budget, tax burden

Reference to this paper should be made as follows: Dubauskas, G. 2016. The Management Of Public Finance Literacy For Sustainable Economical Environment. Journal of Security and Sustainability Issues 5(3): 403–409. DOI: http://dx.doi.org/10.9770/jssi.2016.5.3(8)

JEL Classifications: H2, H24, E65

1. Introduction

The historical understanding of financial theories and realistic conception of the educational process is one of the most important topics in economics and financial literacy across various countries (Njaramba et al. 2015). Nevertheless it is not usual that studies programs are supplied for free for university students. Therefore the first financial impact in majority of studies probably is a payment for the education. Cash theme has the all possible number of complex aspects as the permanent change in the market economy and the monetary policy
considerations. How much such knowledge is required in the higher university education is a quite permanent question (Matetskaya 2015; Starineca, Voronchuk 2015; Tarabkova 2014; Išoratė et al. 2014; Raudeliūnienė et al. 2014). Therefore can be argued that probably it is essential to study mentioned topics in the majority of universities’ programs.

Besides the municipal or local public authorities are the “first frontiers” in everyday relationships with the tax payers from these municipalities. Theoretically public servants are constantly trying to increase their tax base and to bill for their services they are expected to provide free of charge (i.e., for the taxes already collected). In this publication we discuss about the Lithuanian case (Tunčikienė, Drejeris 2015). Unfortunately that there are similar cases in the majority of the post authoritarian countries. From the transparency point of view expenditures of the local authorities must be accessible to the all taxpayers including quite detailed components, and possibly, with comments about the expediency of using the exact tax. Unlike the state budget legislation the local governments could be considered as a family that is not partially insulated from these observations about daily expenses and their municipal costs must be affordable. Municipal spending gives a theoretical examination for balancing the two key issues; increase of the the tax base, create new jobs and maintain the quality of life of the municipal community. Unfortunately this concept is probably poorly understandable in the post undemocratic countries both from the public servants and from taxpayer’s side.

2. A Concept of the Financial Educational Process

Especially important for the public finances to understand their publicity in any case during totalitarian times the public finances were called “the state’s finances” because the tax burden understanding was the quite secondary topic to the dominating idea of the creation of “a new world wide or at least nationwide socialism.” Sadly these provisions often remain in perceptions of some public servants staff and even in the new generation concepts. At the same time the typical country’s economic, financial ir administrative problems are almost always associated with the corruption and non-transparent situations in the public sector. Thus as it was mentioned these situations are probably the most common events in public finance management. Therefore finance and especially public finance literacy could be the one of keys solving state’s corruption perception. Moreover university and college students often do not realize the seriousness of risks they are sometimes making in their financial decisions (Durband, D. 2012). Furthermore approaches to that data are often reflected in the country’s position to the calculation of the tax burden. Therefore according to official figures Lithuanian tax burden’s rate is relatively low, i.e., approximately the 28.7 per cent of the Gross Domestic Product in the 2014th. Nevertheless these statistic data can be biased due to the evaluation of the social and health insurances payments which are interpreted quite differently. It is possible to admit from the several decades of the teaching practice in a different programs of non-financial studies the knowledge and literacy in the financial area is improving quite slowly (EC Economic Review of the Financial Regulation Agenda, 2014).

In general, the concept of public finances in the education process starts with the tax and budget concepts. The municipal tax revenues and budget structure can be presented as a good example in which persons could see structure of public finance functioning and it should be likely the closest pattern to the each citizen of a different country. On the other hand that approach could be more suitable for the second or third year students or especially in part-time studies or in the postgraduate programs. The majority of students come directly from high school in the undergraduate or bachelor’s degree programs and usually are unfamiliar with the self-living and self paying practice. Even more complicated is understanding of the State and National budgets or on the other hand the theoretical private enterprise finance (Išoratė, M. et al. 2014.) However the financing them from the revenues of the taxable and the non-taxable inflows. In terms of financial education that is the more or less significant. At the same time person begins to understand the role of the state (and municipalities) in the economy. Then materializes admittance to the State’s economic regulation functions as a redistribution function, social function and the control function. Financial education is also important to the knowing of the State and local governments revenue and expenditure structure, to the basic laws which provides a framework for the tax collection and the allocation of assignations.
Tax perception is frequently challenging. Since using the same concept of ‘taxes and fees for public sector directly received nothing, and charges for specific services (Jurgutis 1995). Therefore, confusion of terms is fairly constant, which once again shows the need for public finances literacy in the all areas of study programs for students or cadets. In recent years the official Lithuanian tax burden usually comprises a little bit less than 30 percent taken involvement of the country’s gross domestic product (Table 1). What often politicians and experts are talking to, it obviously means, we need to increase Lithuania’s tax burden. However, there may be a cardinal mistake that social insurance contributions and compulsory health insurance contributions to the funds are not calculated into private individuals and legal entities tax burden. This payments are usually seen as an insurance premium. But knowing the private health insurance funds and social aspects of the activity we see some differences between private and public insurance funds. In such cases, all known figures that are donated into a abundant amounts, i.e., 34 per cent contribution to the Social Insurance Fund (SIF or SoDra in Lithuanian) and six per cent to the Compulsory Health Insurance Fund (MHIF) from the first Euro of the gross (or pre-taxed) income. Therefore adding this number to the given tax burden of 32 percent could be calculated the other number, showing what is the tax burden of the private households (approaching seventy percent from the gross income) or particularly the total economy of the country would have tax burden near the fifty per cent that is very close to the Scandinavian taxation burden which is one of the European Union’s largest and is one of the largest in the world.

3. The Management of the Tax Burden for the Public Finances Perception

Thus for individuals with only income from the employment or corresponding relations this tax burden will certainly has much bigger impact (De Haan 2002). We probably should consider this concept of public finances educational aspects. If the average Lithuanian earnings before tax (gross) is 700 Euros (data is from the 2015th). The employer in the workplace cost would be 700 + 218.86 Euros, as against 30.98 rate amongst wage “on paper” (or gross) is transferred into a lush and even the employer contributions to the guarantee fund of 0.2 rate amongst (in our case, it would be 1.4 Euro). It does appear that the additional amount of the employer costs consists of 218.86 Euros for the average monthly wage. So the one workplace costs 918.86 Euros for the business doing individual per month. It is often officially declared as the average job cost to the employer. Thus, such an amount is required that the employee receives a monthly fee of 700 Euros before taxes, as we have often said in the jargon “on paper”. But after-tax employee’s salary will be 540.91 Euro, it is said, “in the hand”. And again, from many years of practice can be anticipated that for many workers it does not matter what is the wage before tax, or officially “on the paper”. That once again confirms the tax burden is probably not realized correctly.

Continuing further the proceeding since this work in the contract for the amount of fees paid that are attributable to the official tax burden, that is, is a rich (sometimes called the pension and social insurance), three more three per cent from the first salary of the Euro, because the tax-free amount of income TFI (or NPD in Lithuanian) does not apply here, there is also the transfers to the compulsory health insurance fund six three per cent, and even the personal income tax (PIT) 15 taken interest, which depending on the income level or amount of tax-free income (TFI). It should be noted that the TFI are no valid for salaries of 929 Euros before taxes. The monthly non-taxable income rate calculator, after December 2008 Lithuanian Seimas adopted reforms came the global financial crisis is such that TFI only applies to labour relations or corresponding relations related income (wages, bonuses, premiums). Tax period, a monthly non-taxable income is calculated taking into account only the basic salary, bonuses and premiums. It is calculated by the following formula:

\[
\text{Monthly TFI} = 166 \times 0.26 \times (\text{resident monthly labour relations or corresponding relations related income} - 290) \]

When calculated according to the formula ITF is negative, it is considered that it is equal to 0 (State Tax Inspectorate, STI 2015).

Thus the workplace to the employer has a price of 918.86 Euros. In additions 55.18 percent amongst paid taxes, for an average salary (700 Euros) the ITF still exists which is 59.4 euro, that this amount must be subtracted

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1 There are corrections from the January 2016th and it is a new formula for monthly tax free income TFI = 200 – 0.34 x (resident monthly labour relations or corresponding relations related income– 350 Euro) (State Tax Inspectorate, STI, 2016)
from 700 Euros to calculate the amount of personal income tax, therefore, the average monthly salary income tax is 13.73, so generally from the workstation price will be paid 53.91 per cent tax, or 495.36 Euros, and the same employee (taxpayer) remains 423.5 Euros. That is amount of money paid for the workplace by the employer 918.86 Euros.

Making a natural assumption that the average wage in the average monthly income brackets is spent for goods and services in Lithuania, then the average consumer indirectly pays 21 percent of the value-added tax, which accounts for 88.94 Euro, then money remaining for person is 334.57 Euros, or 36.4 percent of his or her gross salary. Therefore only 36.4 per cent, (or 334.57 from the 918.86 Euros), the person theoretically can manage by himself or herself. However the tax does not stop at this point. There are additional the public finance impacts on the private person labor income. There are additional excise taxes, natural resource taxes, municipal taxes, which can be conditionally called indirect taxes. Moreover the land taxes, real estate taxes, inheritance taxes are direct taxes of which we should take into the account also.

Of all the mentioned additional taxes one of the most important indirect tax is an excise tax on petroleum products, electricity, alcohol products and tobacco without a doubt (Hyman 2009, Dubauskas 2013). Depending on the consumption basket, and taking in mind that the excise tax is often up to half the price of goods, from the remaining 334.57 Euros our average taxpayer still can “write off” taxes about 10 per cent, i.e., 33.5 Euros. Then a citizen freely available amount of money consists of 301.07 Euros or 32.77 percent from his or her salary.

In addition to last greater indirect excise duty, the land, real estate taxes and stamp duties has not to be forgotten. Meanwhile a potentially significant part of Lithuanian citizens are owners of the land and property. Thus that contribute to another additional tax. Besides a major part of the citizens are home-owners, i.e., about 80 percent interest Lithuanian households live in their private apartments or houses. Thus, more taxes should be paid from the 301.07 Euros disposable net income. The last addition of indirect taxes is imports into the EU. Taxpayers nonetheless are paying customs duties. This represents an additional some Euros and wage earners are already capable of handling only 285 Euros, or 31 percent of her or his salary. Thus income from person’s labour or corresponding labour related activities is taxed about of 70 per cent. This is sometimes called as the taxation on labour versus to taxation on capital. In this context, the concept as the “Tax Freedom Day” can be mentioned (Roger, J., 2015).

The Tax Freedom Day, can be described when the average taxpayers stop to work for the state and start to work for their self. The non-governmental institutions described that for the all Lithuanian legal and natural persons Tax Freedom Day was in 15 May, 2015. Although under the new direction-European Reform Foundation jointly with the L’Institut économique Molinari (Tax Burden for Typical Workers in the EU, 2014) using a unified methodology survey conducted in the all EU countries, the date when working person starts to work for himself or herself for the year 2014 were as follows: March 21st in Cyprus, April 28th in Ireland and Malta, May 12th in United Kingdom, May 18th in Bulgaria, May 30th in Luxembour, June 6th in Portugal, June 7th in Denmark, June 8th in Slovenia, June 10th in Estonia, June 12th in Spain, June 13th in Croatia, June 14th in Poland, June 18th in Lithuania, June 19th in Czech Republic, June 20th in Finland, Slovakia and Latvia, June 21st in Netherlands, June 23rd in Sweden, June 30th in Italy, July 1st in Romania, July 11th in Germany, July 14th in Greece, July 16th in Hungary, July 25th in Austria, July 28th in France, August 6th in Belgium (Tax Burden for Typical work in the EU, 2014). That is the officially announced tax burden in various European Union countries. However Tax Freedom Day for persons living only from the labour related income or in other words only from the employment related or the corresponding relations financial gain probably is even not correct in the case of Lithuania, according to preliminary calculation presented above that day could be close to the August 15th. Maybe not a coincidence that this coincides with the old national and religious celebrations such as the Assumptions Day. Thus, in that case Lithuania even outrun Belgium where the Tax Freedom Day is on August sixth. Certainly it should be noted that the mentioned above study methodology could not calculate the taxes paid for the acquisitions of goods and services from the persons net wage. Nevertheless the tax freedom day probably could be a hyperbolic issue because without tax revenues existence of the state could be problematic. However the transparency of seventy percent taken from the person’s gross income for public interest is not
still adequate. Consequently the example of the tax burden as the basis of the public finances explanation could be an educational necessity.

Table No 1. Officially announced the tax burden in various European Union countries

<table>
<thead>
<tr>
<th>EU State</th>
<th>Tax burden percentage from the GDP</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>43</td>
<td>2014</td>
</tr>
<tr>
<td>Belgium</td>
<td>44,7</td>
<td>2014</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>28</td>
<td>2013</td>
</tr>
<tr>
<td>Croatia</td>
<td>26,6</td>
<td>2014</td>
</tr>
<tr>
<td>Cyprus</td>
<td>32,8</td>
<td>2013</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>33,5</td>
<td>2014</td>
</tr>
<tr>
<td>Denmark</td>
<td>50,9</td>
<td>2014</td>
</tr>
<tr>
<td>Estonia</td>
<td>32,9</td>
<td>2014</td>
</tr>
<tr>
<td>Finland</td>
<td>43,9</td>
<td>2014</td>
</tr>
<tr>
<td>France</td>
<td>45,2</td>
<td>2014</td>
</tr>
<tr>
<td>Germany</td>
<td>36,1</td>
<td>2014</td>
</tr>
<tr>
<td>Greece</td>
<td>35,9</td>
<td>2014</td>
</tr>
<tr>
<td>Hungary</td>
<td>38,5</td>
<td>2014</td>
</tr>
<tr>
<td>Ireland</td>
<td>26,4</td>
<td>2013</td>
</tr>
<tr>
<td>Italy</td>
<td>43,6</td>
<td>2014</td>
</tr>
<tr>
<td>Latvia</td>
<td>27,6</td>
<td>2014</td>
</tr>
<tr>
<td>Lithuania</td>
<td>28,7</td>
<td>2014</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>37,8</td>
<td>2014</td>
</tr>
<tr>
<td>Malta</td>
<td>34,5</td>
<td>2013</td>
</tr>
<tr>
<td>Netherlands</td>
<td>36,7</td>
<td>2013</td>
</tr>
<tr>
<td>Poland</td>
<td>31,9</td>
<td>2013</td>
</tr>
<tr>
<td>Portugal</td>
<td>34,4</td>
<td>2014</td>
</tr>
<tr>
<td>Romania</td>
<td>29</td>
<td>2013</td>
</tr>
<tr>
<td>Slovakia</td>
<td>31</td>
<td>2014</td>
</tr>
<tr>
<td>Slovenia</td>
<td>36,6</td>
<td>2014</td>
</tr>
<tr>
<td>Spain</td>
<td>33,2</td>
<td>2014</td>
</tr>
<tr>
<td>Sweden</td>
<td>42,7</td>
<td>2014</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>32,6</td>
<td>2014</td>
</tr>
</tbody>
</table>


Conclusions

As it has been discussed in a number of European Union countries the process of financial education and financial literacy has existent importance to the general civic education for improving the financial knowledge and skills paradigm. This is especially true in higher education institutions in connection with the relevant higher education and research programs. Frequently public finance management and a variety of educational programming interfaces separate programs are treated differently. In some schools of higher social scientists are still debating whether the financial management and, in particular public finance management can be seen as an important educational and scientific branches of study, but in recent decades, are becoming increasingly important provision that such a discussion does not lead to direct benefits. Based on the public finances, in Central and Eastern Europe, has been called the state’s finances, the model can develop their country’s patriots and those intolerant opaque phenomena. Very often, the best citizen’s participation in the governance of their country is the payment of taxes that are intended for the most important state functions. One way to determine the country’s aggregated or consolidated taxes paid by natural and legal persons could be the tax burden rate. Since such data to the Central European statistics authority of the national statistical departments or offices, often reflecting the country’s approach to the calculation of the tax burden. Thus, according to official figures Lithuanian tax burden is relatively low rate amongst 28.7 of gross domestic product in the 2014th year, but these statistics can be bias due to social and health contributions, which are interpreted quite differently. Even more
important is the the ordinary citizen living only from the labour relations or corresponding relations related income has obviously much higher tax burden. Then only the direct tax burden is almost double versus the officially presented figures as the national tax burden. Moreover including other taxes, sometimes referred to as hidden taxes or duties increase the tax burden for the labour related employee can reach even two-thirds of the all gross income. In the theoretical approach of the “freedom from taxes day” the ordinary worker starts to work for himself or herself only in the second half of the year. Therefore understanding of that tax burden can really encourage each citizen’s insistence for the transparency of public servants in their operations and budget planning processes. That also could be an outstanding financial literacy practice for a new generation seeking the country’s sustainability with greater involvement in political activities.

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ELECTRONIC BANKING SECURITY AND CUSTOMER SATISFACTION IN COMMERCIAL BANKS

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Abstract. The aim of this article is to examine the selected attributes of commercial banks security in relation to customer satisfaction. We focused on electronic banking products as these represent a significant segment of today’s bank activities. We compared the opinions of different social groups (men and women, university educated respondents and the others, respondents under the age of 35 and the elders). Our empirical research in the banking sector of Slovakia showed that only 71.96% of the respondents think their bank takes proper care over their money. Electronic forms of banking are used by more than 90% of the respondents, particularly by university educated ones. The trust in security of electronic payments was found to be at quite a low level of 78.19%. At the same time, 12.77% of the respondents declared they had been a target for hackers, men being a more frequent target.

Keywords: Commercial Banks, Bank security, Customer Satisfaction, Electronic Banking, Internet Banking

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JEL Classifications: G21

1. Introduction

An essential determinant of efficient and stable banking is trustworthiness. It is due to the fact that this sector transports scarce financial capital for its optimal utilisation thus it exists only if there is a sufficient number of economic subjects willing to deposit their surpluses in banks and at the same time a sufficient number of subjects relying on banks in case of money deficit. In this context it can be stated that a bank trades mainly with the trust of their clients.

Security is a significant issue in commercial bank management and is connected to a large number of bank activities. Ensuring security of banking is determined by various factors. Commercial bank security is a complex system including many activities, e.g. capital management in the context of credit, market and operational risks (i.e. capital adequacy management) etc.

Process security is focused on operational risk defined as a risk of loss resulting from internal processes or human capital failure or from external conditions (Polouček et al., 2013; Peker et al. 2014; Grubicka, Matuska 2015)

Physical security is linked to protection of cash in bank branches and ATMs. The system security includes all internal and external processes realised by informational system.
In this context, security of individual customers’ deposits (managing the liquidity of a commercial bank) and their payments is crucial. Security of customers’ deposits is the key factor of success for banks as exactly this factor heavily influences acquisition, retention or loss of customers. For this reason, it is vital for a commercial bank as a business unit to undertake such measures to ensure a proper and efficient protection of customers’ deposits.

The current situation demands from commercial banks to pay extraordinary attention to electronic banking security. Compliance with consumers’ needs and requirements (Bilan, 2013), comprehensive customer care and bank customers’ satisfaction is currently in the centre of attention of researchers and bankers, as it represents an important marketing variable for most companies, especially those working at highly competitive markets. (Belás and Demjan, 2014) Researchers are trying to find the main determinants for bank customer satisfaction and examine these issues from various perspectives (Belás et al., 2015; Chochoľáková et al., 2015; Doležal et al., 2015; Kombo, 2015; Paulík et al., 2015).

In this article, we examine the electronic banking security in the context of customer satisfaction.

2. Title of the chapter

The fast development of Information and Communication Technologies (ICT) over the past few years has led to a body of innovations in the banking sector, being electronic banking probably the most significant one. This new distributional channel offers various opportunities in the field of new financial products development and their distribution to clients through the Internet. Better technology, more distributional channels and their higher flexibility brings substantial effects in the bank products quality and after all, in higher levels of satisfying customer needs. (Sysáková and Slahor, 2010)

According to Polouček et al. (2013), electronic banking can be defined as providing bank products and services to customers via electronic channels. The utilisation of these channels has underlined the essential role of bank Security as the Internet environment is more sensitive to system attacks. (Koskosas, 2011; Dhillon and Torkzadeh, 2006). Koskosas (2011) declares electronic banking represents huge advantages for customers due to the simplicity and transactional costs reduction. Not less important, it also comes up with new challenges for banks in the financial systems Security.

The above mentioned development of ICT has changed the view of banks on their performance and activities and also the way consumers deal with their banks. (Eriksson, Kerem and Nilsson, 2008; Sayar and Wolfe, 2007)

Currently, commercial banks intensively use the Internet and offer their services through the Internet to their clients. Internet banking can be defined as providing banking products and services via computer network (the Internet).

Customers using Internet banking have a non-stop access to their accounts, they can make payments whenever and wherever they are willing to, display the bank statement to a transaction, pay out their debts and realise many more bank transactions electronically via webpages of their bank. (Yoon and a Steege, 2013; Yoona and Occeña, 2014)

From the point of view of a commercial bank, Pikkarainen, Pikkarainen, Karjaluoto, and Pahnila (2004) state two main reasons for development of Internet banking: firstly, the reduction of costs compared to traditional distributional channels; secondly, getting the branch network leaner by decreasing number of branches.

Internet banking has created an alternative to a traditional branch visit and the usage of this distributional channel has been growing since its introduction. Not even 15 million people used Internet in 1993 (0.3% of the world population), whereas this number had increased to 3 billion users in 2014 (40.4% of the world population). The overall population growth was in decline in the same period, from 1.47% to 1.14% annually. More details can be found in Table 1.
### Table 1. The growth of the world population and the Internet penetration

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Internet users</th>
<th>Annual growth of number of Internet users</th>
<th>The world population</th>
<th>Annual growth of the world population</th>
<th>The penetration of Internet among the world population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>2 925 249 355</td>
<td>7.85%</td>
<td>7 243 784 121</td>
<td>1.14%</td>
<td>40.4%</td>
</tr>
<tr>
<td>2013</td>
<td>2 712 239 573</td>
<td>7.99%</td>
<td>7 162 119 430</td>
<td>1.16%</td>
<td>37.9%</td>
</tr>
<tr>
<td>2012</td>
<td>2 511 615 523</td>
<td>10.52%</td>
<td>7 080 072 420</td>
<td>1.17%</td>
<td>35.5%</td>
</tr>
<tr>
<td>2011</td>
<td>2 272 463 038</td>
<td>11.71%</td>
<td>6 997 998 760</td>
<td>1.18%</td>
<td>32.5%</td>
</tr>
<tr>
<td>2010</td>
<td>2 034 259 368</td>
<td>16.09%</td>
<td>6 916 183 480</td>
<td>1.19%</td>
<td>29.4%</td>
</tr>
<tr>
<td>2009</td>
<td>1 752 333 178</td>
<td>12.18%</td>
<td>6 834 721 930</td>
<td>1.20%</td>
<td>25.6%</td>
</tr>
<tr>
<td>2008</td>
<td>1 562 067 594</td>
<td>13.77%</td>
<td>6 753 649 230</td>
<td>1.21%</td>
<td>23.1%</td>
</tr>
<tr>
<td>2007</td>
<td>1 373 040 542</td>
<td>18.62%</td>
<td>6 673 105 940</td>
<td>1.21%</td>
<td>20.6%</td>
</tr>
<tr>
<td>2006</td>
<td>1 157 500 065</td>
<td>12.41%</td>
<td>6 593 227 980</td>
<td>1.21%</td>
<td>17.6%</td>
</tr>
<tr>
<td>2005</td>
<td>1 029 717 906</td>
<td>13.15%</td>
<td>6 514 094 610</td>
<td>1.22%</td>
<td>15.8%</td>
</tr>
<tr>
<td>2004</td>
<td>910 060 180</td>
<td>16.89%</td>
<td>6 435 705 600</td>
<td>1.22%</td>
<td>14.1%</td>
</tr>
<tr>
<td>2003</td>
<td>778 555 680</td>
<td>17.49%</td>
<td>6 357 991 750</td>
<td>1.23%</td>
<td>12.2%</td>
</tr>
<tr>
<td>2002</td>
<td>662 663 600</td>
<td>32.37%</td>
<td>6 280 853 820</td>
<td>1.24%</td>
<td>10.6%</td>
</tr>
<tr>
<td>2001</td>
<td>500 609 240</td>
<td>21.09%</td>
<td>6 204 147 030</td>
<td>1.25%</td>
<td>8.1%</td>
</tr>
<tr>
<td>2000</td>
<td>413 425 190</td>
<td>47.20%</td>
<td>6 127 700 430</td>
<td>1.26%</td>
<td>6.7%</td>
</tr>
<tr>
<td>1999</td>
<td>280 866 670</td>
<td>49.38%</td>
<td>6 051 478 010</td>
<td>1.27%</td>
<td>4.6%</td>
</tr>
<tr>
<td>1998</td>
<td>188 023 930</td>
<td>55.70%</td>
<td>5 975 303 660</td>
<td>1.30%</td>
<td>3.1%</td>
</tr>
<tr>
<td>1997</td>
<td>120 758 310</td>
<td>55.95%</td>
<td>5 898 688 340</td>
<td>1.33%</td>
<td>2.0%</td>
</tr>
<tr>
<td>1996</td>
<td>77 433 860</td>
<td>72.69%</td>
<td>5 821 016 750</td>
<td>1.38%</td>
<td>1.3%</td>
</tr>
<tr>
<td>1995</td>
<td>44 838 900</td>
<td>76.15%</td>
<td>5 741 822 410</td>
<td>1.43%</td>
<td>0.8%</td>
</tr>
<tr>
<td>1994</td>
<td>25 454 590</td>
<td>79.74%</td>
<td>5 661 086 350</td>
<td>1.47%</td>
<td>0.4%</td>
</tr>
<tr>
<td>1993</td>
<td>14 161 570</td>
<td></td>
<td>5 578 865 110</td>
<td>0.3%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Internet live stats, (2014)

In 2014, the penetration of Internet grew by most in the countries of Africa, namely by 17% in Eritrea, Burundi and Nigeria. Only 2% of the population have access to Internet in these countries. The lowest growth rate was recorded in developed countries, such as Sweden, Norway, Iceland where the penetration is already higher than 90%. However, the world’s highest penetration is on Bermuda Islands (97.75%), Qatar (96.65%) and Bahrain (96.53%).

As Slovakia is among countries with the highest Internet penetration in the world, the pace of penetration growth was slower than the world’s average. The statistics is based on Eurostat surveying of individuals who were online at least once in the last 12 months regardless if it was a computer or a mobile connection. For more details, see Table 2.

### Table 2. The growth of the Slovak population and the Internet penetration

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Internet users</th>
<th>Annual growth of number of Internet users</th>
<th>Slovak population</th>
<th>Annual growth of the Slovak population</th>
<th>The penetration of Internet among Slovak population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>4 495 238</td>
<td>2.57%</td>
<td>5 415 949</td>
<td>0.09%</td>
<td>83.0%</td>
</tr>
<tr>
<td>2013</td>
<td>4 382 777</td>
<td>1.37%</td>
<td>5 410 836</td>
<td>0.12%</td>
<td>81.0%</td>
</tr>
<tr>
<td>2012</td>
<td>4 323 458</td>
<td>2.79%</td>
<td>5 404 322</td>
<td>0.22%</td>
<td>80.0%</td>
</tr>
<tr>
<td>2011</td>
<td>4 206 108</td>
<td>-1.23%</td>
<td>5 392 446</td>
<td>0.04%</td>
<td>78.0%</td>
</tr>
<tr>
<td>2010</td>
<td>4 258 424</td>
<td>5.49%</td>
<td>5 390 410</td>
<td>0.15%</td>
<td>79.0%</td>
</tr>
<tr>
<td>2009</td>
<td>4 036 801</td>
<td>5.76%</td>
<td>5 382 401</td>
<td>0.12%</td>
<td>75.0%</td>
</tr>
<tr>
<td>2008</td>
<td>3 817 005</td>
<td>14.58%</td>
<td>5 376 064</td>
<td>0.05%</td>
<td>71.0%</td>
</tr>
<tr>
<td>2007</td>
<td>3 331 372</td>
<td>10.72%</td>
<td>5 373 180</td>
<td>0.00%</td>
<td>62.0%</td>
</tr>
<tr>
<td>2006</td>
<td>3 008 840</td>
<td>1.82%</td>
<td>5 372 928</td>
<td>0.00%</td>
<td>56.0%</td>
</tr>
<tr>
<td>2005</td>
<td>2 954 977</td>
<td>3.79%</td>
<td>5 372 685</td>
<td>0.02%</td>
<td>55.0%</td>
</tr>
<tr>
<td>2004</td>
<td>2 847 094</td>
<td></td>
<td>5 371 875</td>
<td></td>
<td>53.0%</td>
</tr>
</tbody>
</table>

Source: Internet live stats, (2014)
Commercial banks have started to invest in Internet banking development not only to come up with an innovative way to boost the customer comfort, but also to reduce its own costs and increase its profitability. Strong competition has forced banks to search for new profitable areas where to expand. Internet banking is a profitable strategy for the newcomers in the banking sector. (Anderloni, Llewellyn, and Schmidt, 2009)

Electronic banking utilisation is closely connected to the customers’ perception of security which has its impact on customer attitudes and behaviour (Grabner-Krauter and Faullant, 2008). A perceived lack of Security is defined as a potential loss caused by a fraud or Internet banking hacking (Leeh, 2009; Featherman and Pavlou, 2003). Because of that, Security and privacy are stated as two basic determinants of customer trust in electronic banking (Kruck, Gottovi, Moghadami, Broom, and Forcht, 2002; Flavián and Guinalíu, 2006).

Customer satisfaction should be perceived as the basis of the financial performance of a bank. It is probable that satisfied customers will continue purchasing its products or even recommend this bank to other potential clients (Belás and Gabčová, 2014). Thus customer satisfaction with electronic banking could be of significant importance.

According to Nochai & Nochai (2013), Novickytė & Pedroja (2015), high quality Internet banking can increase customer satisfaction substantially as it offers access to a large scale of financial transactions. Most authors agree on these main indicators of customer satisfaction with Internet banking: ability to react, reliability, competences, data protection. When Internet banking is utilised by a large part of clients, banks have to develop strategies of ensuring customers’ trust in the quality of technology and functionality. The authors determined several basic attributes of customer satisfaction with Internet banking. Firstly, reliability, defined as a real time proper service providing and a fair charging for that. Secondly, transaction efficiency, defined as a solid accessibility of Internet banking without a big effort and additional costs connected to simplicity of using available information. The third attribute is customer support including the pre-sale and the post-sale support convincing customers they are treated well from the side of their bank. The fourth is service protection which means protecting personal and sensitive data, transactions and keeping bank secrecy. User-friendliness is the fifth attribute defined as simplicity to access Internet banking and keeping URL shortcuts and addresses simple. The next one is performance, i.e. proper functionality of Internet banking and the last attribute is service content defined as a need for a complex scale of services included in Internet banking.

Chu, Lee and Chao (2012) tested the relations among service quality, customer satisfaction, trust and loyalty in the context of electronic banking. Authors declare that if e-banks want to have strong relationships with clients, the essential factor is high quality of e-banking services which can have a direct impact on customer trust, satisfaction and loyalty.

Also Marimon, Yaya and Fa (2012) argue there is a direct relation between service quality and customer loyalty in electronic trade. Effectiveness is the most important determinant of customer loyalty, whereas system accessibility and privacy protection were found to have a lower impact. Effectiveness means customers can easily find everything needed, transactions are realised fast, information is well organised, there is a fast Internet connection and user-friendliness.

Chen, Hsiap and Hwang (2012) created an IBCS model (Internet Banking Customer Satisfaction) compound of six essential parts: content, accuracy, format, simplicity of use, timeliness and Security. This model emphasised that clients perceive sensitively the Internet Security. The study also found that content and format drive the highest costs what determines their crucial role in the IBCS model. The relative importance of other factors was as follows: accuracy, timeliness, user-friendliness and security. The possible explanation is that content, format, accuracy and timeliness are important requirements for giving access to private financial information via Internet banking. User-friendliness and security are other key areas by investing in which banks can attract customers to use e-services. Customers tend to have higher expectations as for user-friendly interface and Internet transactions security.
Hoffmann and Birnbrich (2012) examined security attributes of electronic banking. The aim of their research was to describe conceptual and empirical relations among bank activities in the field of protection against third party attacks, customer relationship management quality and customer loyalty. The authors declare security is crucial and is getting even more important in the current banking sector. The fraud prevention has become one of the priorities of banks, customers and even politicians as bank frauds harm both banks and customers. The results showed there is a positive relation between trustworthiness of a bank, its skills in the field of fraud prevention and customer relationship management quality. After all, customer relationship management quality has a positive influence on customer loyalty.

Regarding the differences between younger and older customers, research shows the older ones have better knowledge about security measures of banks focused on fraud prevention. At the same time, the positive impact of this awareness on the customer relations quality is less significant in the group of older clients. The possible reason could be a higher level of scepticism of older clients regarding the efficiency of the above mentioned measures. Fraud prevention is vital in customer relationship management quality for all customers regardless their education and income levels.

3. Research objective, methodology and data

The aim of the article was to examine selected attributes of commercial bank security in relation to customer satisfaction. We focused on products of electronic banking which represent a significant segment for the current banks. We compared the opinions of different social groups (men and women, university educated respondents and the others, respondents under the age of 35 and the elders).

Own research was conducted via a questionnaire survey in Slovakia in 2015. 321 respondents were reached, of which 61.37% were men and 38.63% were women. Regarding the age structure, 37.69 % of respondents were 18-30 years old, 55.76% of respondents were 31-62 years old and 6.54% of respondents were above the age of 62. The educational structure was as follows: 67.60% had a university degree, 27.41% had secondary education, and 4.98% had primary education. The random sampling method was used and the questionnaire was available online at http://www.iankety.sk/dotaznik/327968727/.

In our research, we set 5 scientific hypotheses using qualified estimation:

H1: Bank customers in Slovakia show high levels of trust in the accuracy of bank processes managing their money. More than 70% of clients believe their bank take a proper care of their money. In this area there are no statistically significant differences between men and women, university educated respondents and the others, respondents under the age of 35 and the elders.

H2: The intensity of electronic payments methods usage is high in Slovakia. More than 75% of respondents use electronic forms of banking. There are no statistically significant differences between men and women, university educated respondents and the others, respondents under the age of 35 and the elders in this area.

H3: More than 80% of Slovak bank clients believe the payments via electronic banking are safe. There do not exist any statistically significant differences between men and women, university educated respondents and the others, respondents under the age of 35 and the elders in this area.

H4: The level of Slovak bank customers’ trust in online banking security is generally high. More than 75% of clients rely on online banking security measures applied by their banks. In this area there are no statistically significant differences between men and women, university educated respondents and the others, respondents under the age of 35 and the elders in this area.

H5: Bank customers in Slovakia have only minimal experience with hacker attacks: less then 20% have such experience. The differences between men and women, university educated respondents and the others, respondents under the age of 35 and the elders are not statistically significant in this area.
The above mentioned hypotheses were validated by Pearson statistics. The significance level (α) was estimated at 0.05. To calculate p-value using the χ² goodness of fit test we used an online calculator available at: [http://www.socscistatistics.com/tests/chisquare2/Default2.aspx](http://www.socscistatistics.com/tests/chisquare2/Default2.aspx). To examine the differences between the selected social groups by z-test methodology we used an online calculator available at: [http://www.socscistatistics.com/tests/ztest/Default2.aspx](http://www.socscistatistics.com/tests/ztest/Default2.aspx).

Table 3 presents the research results regarding the customers’ belief that their bank takes a proper care of their money.

Table 3. Levels of customers’ belief in their bank taking a proper care of their money according to selected social groups

<table>
<thead>
<tr>
<th>Do you believe that your bank takes a proper care of your money?</th>
<th>Men (M) in (%)</th>
<th>Women (W) in (%)</th>
<th>University degree (UD) in (%)</th>
<th>Others (O) in (%)</th>
<th>Under 35 (-35) in (%)</th>
<th>Above 35 (+35) in (%)</th>
<th>p-value*** M/W</th>
<th>UD/O</th>
<th>-35/35+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Yes</td>
<td>70.56</td>
<td>74.19</td>
<td>71.89</td>
<td>72.11</td>
<td>71.08</td>
<td>72.90</td>
<td>0.4777</td>
<td>0.9681</td>
<td>0.7188</td>
</tr>
<tr>
<td>2. No</td>
<td>29.44</td>
<td>25.81</td>
<td>28.11</td>
<td>27.89</td>
<td>28.92</td>
<td>27.10</td>
<td>0.4777</td>
<td>0.9681</td>
<td>0.7188***</td>
</tr>
<tr>
<td>χ²</td>
<td>0.4984*</td>
<td>0.0018</td>
<td>0.1314</td>
<td>0.7170</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.4802**</td>
<td>0.9664</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own research and calculation

Notes: *χ² comparing the responses of men and women in general, ** p-value comparing the responses of men and women in general, *** p-value using the z-test methodology, **** in case of questions with only two possible answers, p-values are identical for both answers and thus will not be calculated in the subsequent sections. P-values calculated by χ² test and z-test tend to be at similar levels.

The results showed in Table 3 confirmed the first part of H1 as the overall level of belief was higher than 70% and also the levels of belief in the selected social groups were in every case higher than 70%. The test criteria (χ² and p-value) confirmed the second part of H1 as well. We did not find any statistically significant differences between men and women, university educated respondents and the others, respondents under the age of 35 and the elders in the question of trustworthiness of Slovak banks. H1 was confirmed.

The results regarding the intensity of usage of electronic banking in Slovakia are introduced in Table 4. These results show the electronic forms of banking are utilised by more than 90% of respondents what confirms the first part of H2.

The values of the test criteria (χ² and p-value) partially confirmed the second part of H2. We found no statistically significant differences between men and women and between the respondents under the age of 35 and the elders. On the other hand, there were statistically significant differences between university educated respondents and the others in the intensity of electronic banking usage (p-value = 0.0040). P-value of z-test showed that respondents with a university degree use electronic forms of payments more often than other respondents (p-value = 0.0041). H2 was partially confirmed.
Table 4. Levels of intensity of electronic forms of payments usage according to selected social groups

<table>
<thead>
<tr>
<th>Do you use electronic forms of payments?</th>
<th>M in (%)</th>
<th>W in (%)</th>
<th>UD in (%)</th>
<th>O in (%)</th>
<th>-35 in (%)</th>
<th>+35 in (%)</th>
<th>p-value***</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/W</td>
<td>UD/O</td>
<td>-35/35+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Yes</td>
<td>91.37</td>
<td>92.74</td>
<td>94.93</td>
<td>85.58</td>
<td>94.58</td>
<td>89.03</td>
<td>0.6599</td>
</tr>
<tr>
<td>2. No</td>
<td>8.63</td>
<td>7.26</td>
<td>5.07</td>
<td>14.42</td>
<td>5.42</td>
<td>10.97</td>
<td>0.0041</td>
</tr>
<tr>
<td>χ²</td>
<td>3.122</td>
<td>0.0688</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own research and calculation

Table 5 contains the research results regarding the customers’ evaluation of electronic payment security.

Table 5. Evaluation of electronic payments security by selected social groups

<table>
<thead>
<tr>
<th>Do you believe that payments via electronic banking are safe?</th>
<th>M in (%)</th>
<th>W in (%)</th>
<th>UD in (%)</th>
<th>O in (%)</th>
<th>-35 in (%)</th>
<th>+35 in (%)</th>
<th>p-value***</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/W</td>
<td>UD/O</td>
<td>-35/35+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Yes</td>
<td>80.71</td>
<td>74.19</td>
<td>80.18</td>
<td>74.04</td>
<td>81.33</td>
<td>74.84</td>
<td>0.1676</td>
</tr>
<tr>
<td>2. No</td>
<td>19.29</td>
<td>25.81</td>
<td>19.82</td>
<td>25.96</td>
<td>18.67</td>
<td>25.16</td>
<td>0.2113</td>
</tr>
<tr>
<td>χ²</td>
<td>1.6507</td>
<td>0.1560</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.4689</td>
<td>0.4935</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own research and calculation

The levels of trust in electronic payments security differ among the selected social groups from 74.19% (women) to 81.33% (respondents under 35). The overall trust in electronic payments security was at 78.19% thus the first part of H3 was not confirmed. However, the second part of H3 could be accepted as we found no statistically significant differences between men and women, university educated respondents and the others and respondents under the age of 35 and the elders. All in all, H3 was partially confirmed.

In Table 6 we display the customers’ evaluation of banks’ security measures. The first part of H4 could be accepted: 83.13% of respondents rely on the security measures applied by their bank in the area of online banking. At the same time, the second part of H4 was proved as there were no statistically significant differences between men and women, university educated respondents and the others and respondents under the age of 35 and the elders in the question of evaluation of online banking security measures. To sum up, H4 was confirmed.

Table 6. Customers’ evaluation of the security measures applied by banks from the point of view of selected social groups

<table>
<thead>
<tr>
<th>Do you rely on the security measures of your bank in online banking?</th>
<th>M in (%)</th>
<th>W in (%)</th>
<th>UD in (%)</th>
<th>O in (%)</th>
<th>-35 in (%)</th>
<th>+35 in (%)</th>
<th>p-value***</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/W</td>
<td>UD/O</td>
<td>-35/35+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Yes</td>
<td>83.76</td>
<td>82.26</td>
<td>85.71</td>
<td>77.88</td>
<td>83.13</td>
<td>83.23</td>
<td>0.7263</td>
</tr>
<tr>
<td>2. No</td>
<td>16.24</td>
<td>17.74</td>
<td>14.29</td>
<td>22.12</td>
<td>16.87</td>
<td>16.77</td>
<td>0.0784</td>
</tr>
<tr>
<td>χ²</td>
<td>0.1221</td>
<td>0.0005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.7268</td>
<td>0.9822</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own research and calculation
Moving on, Table 7 presents the research results in the question of customers having experience with hacking attacks.

**Table 7** Levels of customers’ experience with hacking attacks according to selected social groups

<table>
<thead>
<tr>
<th>Have you ever experienced a hacking attack or a bank fraud?</th>
<th>M in (%)</th>
<th>W in (%)</th>
<th>UD in (%)</th>
<th>O in (%)</th>
<th>-35 in (%)</th>
<th>+35 in (%)</th>
<th>p-value***</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Yes</td>
<td>17.77</td>
<td>4.84</td>
<td>15.21</td>
<td>7.69</td>
<td>13.25</td>
<td>12.26</td>
<td>0.0007</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-35/35+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. No</td>
<td>82.23</td>
<td>95.16</td>
<td>84.79</td>
<td>92.31</td>
<td>86.75</td>
<td>87.74</td>
<td></td>
</tr>
<tr>
<td>χ²</td>
<td>11.4156</td>
<td>0.0007</td>
<td>3.5639</td>
<td>0.0591</td>
<td>0.0712</td>
<td>0.7896</td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Own research and calculation

According to our research, 87.23% of all clients do not have any experience with hacking attacks or bank frauds. The first part of H5 was thus confirmed. Nonetheless, the second part of H5 could be accepted only partially. Although there were not any statistically significant differences between respondents with a university degree and the others and between the respondents under the age of 35 and the elders, the responses of men and women varied significantly. More men than women declared they had experienced a hacking attack or a bank fraud ($\chi^2 = 11.4156$, p-value = 0.0007). As a result, *H5 was partially confirmed.*

It is possible to view the relationship between electronic banking and bank customers’ satisfaction from different perspectives. The electronic banking security is a crucial issue in the current banking (Hoffmann and Birnbrich, 2012; Chen, Hsiao, Hwang, 2012). The quality of electronic banking can increase customer satisfaction substantially (Nochai and Nochai, 2013; Chu, Lee, and Chao, 2012). Murugiah and Akgam (2015) discovered an interesting fact within their research. They found a negative relation between customer satisfaction and bank security. The authors state that a 1% growth of bank security causes 30.3% decrease in customer satisfaction. The reasons for that are complex bureaucratic procedures, i.e. excessive documentation in case of increasing bank security. Overrated security measures (e.g. complex security certificates in Internet banking) make the communication between customers and their bank more complicated and thus deteriorate their overall satisfaction.

Survey results as for drivers of satisfaction in the Czech Republic present the fact that most clients are satisfied with the possibilities of e-banking. This answer was elected by 74.64% of respondents. In the second place, respondents were satisfied with the availability of branches (49.54%), followed by a developed network of ATMs (40.25%). The possibility of using e-banking as the most important factor of satisfaction was preferred the most by women (more than men), young people up to 30 years and clients with higher education. In the banking sector of Slovakia the most important factor of satisfaction was the possibility of using e-banking service, the second most important satisfaction determinant was the availability of bank branches and the third place was taken by developed network of ATMs. This research has shown statistically significant differences among individual social groups. The possibility of using e-banking service is more significant for younger clients and customers with higher education in Slovakia. (Belás, Cipovová, and Demjan, 2014)

Within our own research presented above, we found out only 71.96% of respondents believe their bank takes a proper care of their money. We assume that quite low level of trust is caused by a complex understanding of this question by different respondents. We assume that clients did not evaluate only the security aspects of the problem but also the economic parameters of taking care of their money (such as interest rates levels).

Moreover, our research showed more than 90% of respondents use some form of electronic banking. These results are comparable to the data in Table 2. The overall level of trust in electronic payments security was found
to be at relatively low level of 78.19%. At the same time, 12.77% of respondents stated they had experienced some kind of hacking attack or a bank fraud.

According to Furnell, Bryant and Phippen (2007), Internet currently represents the biggest threat of attacks on commercial bank clients. Clients are aware of Internet threats and know it is their duty to protect themselves against these attacks although they usually do not have sufficient knowledge to do so completely. Hackers are trying in various ways to obtain private data from bank clients in order to abuse them. Attacks on electronic banking have become more and more common over the past few years threatening mostly bank clients, their private data and financial resources.

Kaspersky Lab (2014) declares that an organised hacker gang which has attacked a hundred of banks in 30 countries all over the world (Russia, USA, Germany, China, Ukraine, Canada, Hong Kong, Taiwan, Romania, France, Spain, Norway, India, Great Britain, Poland, Pakistan, Nepal, Morocco, Iceland, Ireland, the Czech Republic, Switzerland, Brazil, Bulgaria and Australia) since 2013 has stolen more than a billion of USD. The hackers come mainly from China, Russia and Ukraine and they obtained the money via infiltration into internal systems of banks. They developed methods how to gain an access to internal systems of banks by phishing, constant monitoring of employees’ behaviour and infiltrating a malware called Carbanak. Afterwards, they were able to trace servers for security cameras what enabled them to stalk employees realising electronic payments for clients and then make cash transfers to selected accounts in China and USA. In other cases, they got into the systems of accounts management where they changed the account balances and sent the differences to their own accounts immediately. For example, they increased the balance from 1,000 USD to 10,000 USD a then they transferred the difference (9,000 USD) to their accounts. From the customer’s point of view, the account balance was kept at the same level so he/she did not even realise any fraud transaction were made via their account. Moreover, the hackers obtained money also by reprogramming ATMs from which they withdrew cash afterwards. They operated in smaller amounts not to attract the attention. From every single of the 30 hacked banks, they stole at most 10 million USD and the average attack last two-four months. Kaspersky Lab also states that currently, the hackers are trying to expand the attacks in the countries of Central and Eastern Europe, the Middle East, Asia and Africa.

Based on the described example as a representative one, it can be opined the current situation demands a permanent process of software programmes improvements. Biometric methods represent the future in the area of customer identification and authentication and there is still large space for their wider application. Despite the fact some of the biometric methods have become a standard (e.g. fingertip scanning), the opportunities of their abusage still represent security risk. It is possible to eliminate this risk by applying a combination of simpler and less expensive biometric methods. Doing so, the reliability of these methods would increase significantly and at the same time, it would optimise the costs of new technologies implementation for commercial banks.

The massive development of ICT, particularly mobile devices in the past few years has driven the need for innovative bank applications usable in smart phones and tablets interfaces. The character of such applications can vary substantially, from the QR code scanner, to contactless mobile payments via NFC technologies, to searching for the nearest ATM or branch. The future will probably bring the combination of bank applications and biometric methods what would enhance the functionality of applications and in the meantime, it would make the clients’ access to bank products and services easier. New trends in this area are also personalised applications customised according to specific needs and interests of a single client.

The protection against hacking attacks and frauds is not only the issue of commercial banks; it should also be conducted by clients themselves as they are cyber attack targets most often. The protection from the clients’ perspective means an optimal choice of antivirus, antiphishing, antispam, antispyware, firewall, private zones detection and antithreft diagnostics software programmes. The proper protection also includes regular updates of the above mentioned programmes and checking the account balance and transactions.
Conclusions

The banking sector has vastly developed electronic communication with their clients in the current years. This process was driven mostly by an increase of number of Internet users. Improving electronic distributional channels of banks is on one hand connected to better availability of products and services for clients; on the other hand it also leads to a potential risk increase. This risk is represented by a possible private data theft, then access of hackers to clients’ accounts and in the end by stealing the money from clients.

The electronic banking security is a challenge for current bank management all over the world what has been confirmed also by numerous successful attacks on commercial banks and their customers.

Our own research has shown more than 70 % of respondents in Slovakia believe their bank takes a proper care of their money. We also found electronic forms of banking are utilised by more than 90 % of clients, most frequently by university educated ones. The trust in the payments via electronic banking is at average levels as there appear hacking attacks and bank frauds from time to time.

The results thus confirmed that security issues currently influencing also customer satisfaction and loyalty have become a crucial element of bank activities. Commercial banks which base their business mostly on their own trustworthiness are forced to constantly improve applied technologies and protect themselves against potential hacking attacks. A vital component of this is also the customers’ awareness of security measures and threats. It cannot be declared that banks in Slovakia do not realise such activities but resulting from our research we opine the banks do not do it in a correct way. If they did, we assume the level of trust in electronic payments security would be at higher levels.

Acknowledgments

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References


OPPORTUNITIES FOR SUSTAINABLE DEVELOPMENT AND CHALLENGES IN NANOTECH INDUSTRY IN LATVIA

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Abstract. In the coming decade, implementation of smart specialisation strategy concept will be topical for all EU member states given a special focus made on the areas of technology and innovation. Members of academic community conduct research in these areas to identify the challenges and offer optimal solutions to the complicated problems. It is of particular importance for the countries with a relatively modest capacity for innovation. Some of the aims of the Latvian smart specialisation strategy are to establish a platform for cooperation between research community and the private sector and to develop nanostructured materials industry. The paper analyses research results in the field of nanotechnology in Latvia using the data on the publications and projects, as well as publication citation indices. Publicly available information on performance results of the selected enterprises in the field of nanotechnology is analysed and benchmarked using public data on performance indicators of the manufacturing industry with regard to technological intensity.

Keywords: sustainable development, smart specialisation, SME, nanotechnology

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JEL Classifications: L60, O10, O30

1. Introduction

The concept of smart specialisation strategy emerged in 1995 considering the economic gap between Europe and the USA based on productivity problem evaluation and sector analysis (van Ark et al. 2008, Foray et al. 2012; Shatrevich, Strautmane 2015; Tvaronavičienė 2014; Rezk et al. 2015; Travkina, Tvaronavičienė 2015). At present, analysis of the factors influencing smart specialisation concept and the issues of practical implementation of theoretical findings in the EU member states are widely discussed by the academic community (Foray et al. 2011, Foray et al. 2012, Sandu 2012, McCann, Ortega-Argilés 2015; Branten, Purju 2015; Lace et al. 2015; Tvaronavičienė et al. 2015a; 2015b). The Strategy for Smart Specialisation is one of the most important regional development and innovation promotion areas within Europe 2020 strategy. The need to carry out economic transformations is conditioned by regional development processes and the aim to support high-productivity industries. Therefore, planning innovations to receive financing from the EU Structural Funds at the national level each member state determines priority sectors with the established competitive advantage. It means that the selected prioritates are connected with the existing economic structure of the state, and the necessity to recognise and open new opportunities to implement real structural changes to increase general welfare level becomes topical.
It is maintained (Dougherty 1998) that the nature of innovation process and related concepts can be difficult to fully account for, as innovation comprises all social activities ranging from education, research, intellectual property protection, manufacturing process management, market research and product sales. This process overlaps with all other activities related to business environment improvement and establishment of the structures supporting innovation. Baier et al. (2013) point out that the EU smart specialisation concept has two dimensions, namely, a policy or governance dimension and economic or market dimension.

Innovation potential of an enterprise of any size, of small enterprises in particular, is determined by the ability to integrate knowledge into business, literally, to commercialise it. Ortega-Argilè (2012) stresses that small and medium-sized enterprises (SME) play a special role in the implementation of smart specialisation strategies (3S) in the EU regions, and this role should be recognised. The aim of regional development is specialisation based on core research areas and technologies of a concrete region, and according to Foray et al. (2011), this process involves different economic entities – enterprises, research institutions, and higher education institutions (HEI). Ortega-Argilè (2012) points out that the development should not be limited to one specific industry, it is important to promote cross-sectorial cooperation, niche development and internationalisation (Izsak et al. 2013).

In the present paper, the authors consider the market dimension related to manufacturing of innovative multifunctional materials using nanotechnology in SME segment in Latvia. The authors review literature on the role of small enterprises in the development of nanotechnology and provide insights into the development of the priority field of materials science in Latvia in the recent years and business unit performance. Research methodology includes four stages: 1) summary and analysis of research results in the field of nanoparticles in Latvia; 2) selection, processing and analysis of statistical data on the manufacturing industry with regard to technological intensity; 3) selection of enterprises involved in nanostructured material manufacturing; 4) retrieval, processing and analysis of performance indicators of the selected enterprises for 2013 and 2014 based on Lursoft database data.

2. Development of the research field in Latvia

In 2004, the European Commission approved the report on nanosciences and nanotechnology and adopted an Action Plan for Europe 2005 – 2009, as a considerable amount of research was devoted to nanotechnology applications in various research fields (Kaufmane et al. 2007). In 2006, nine priority research areas were defined in Latvia covering the fields in which basic and applied research projects of the Latvian Council of Science were implemented. Targeted state research programmes were launched in the respective fields as a public contract for research activities to promote the development of these areas and facilitate applied research. The National Development Plan of Latvia for 2014-2020 determines medium-term development areas; it also defines concrete target values for performance indicators – to increase the percentage of innovative enterprises until 15% from the total number of enterprises and raise innovative product sales until 25% from the total turnover by 2020. To reach this aim it is planned to establish a platform to promote cooperation between research community and the private sector and to develop nanostructured materials industry; the EU financial instruments, state budget and private funding will be used as the primary sources of finance.

One of the nanotechnology-related development areas in Latvia is closely connected with materials science – design and synthesis of functional nanomaterials and a new generation of composite materials. According to the definition adopted by the European Commission on 18 October 2011, nanomaterial is «a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50% or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm - 100 nm». Nanosized particles have different physical properties than bulk materials, and that is the reason why nanotechnology is a promising area with a huge development potential, which may be hard to predict. As in case of any other technology, the development of nanostructures and nanosystems is described as a sequence of generations. Inventions in this area led to the discovery of passive nanostructures around 2001, which are seen as the first generation (nanostructured metals, polymers and ceramics). First-
generation passive nanostructure materials can perform one particular task. The second generation – active nanostructures – appeared around 2005, in combination with other microscopic systems they are capable to react to external environment. Fields of application include transistors, reinforcing agents, and adaptive structures. Starting with 2010 it is possible to talk about the third generation of nanostructures – three-dimensional nanosystems with heterogeneous nanocomponents and various assembling techniques. It is envisaged that the fourth generation will emerge around 2020. It will be molecular nanosystems with heterogeneous molecules based on biomimetic processes and new design (Roco 2005). Currently in Latvia the application of the first two generations of nanomaterials is highly topical, including the use of nanocoatings, nanoparticles and nanostructured materials in mechanical engineering, electronics, medicine, cosmetics, textiles, chemical and coating industries.

It is possible to trace the level of academic development of a concrete technology using both publications in ISI databases and patent application dynamics. It is recognised that the work of an enterprise aiming at long-term development is based on available resources, investments and technologies (Hart, Milstein 2003). There are studies attesting that: 1) intellectual property is an essential factor in nanotechnology commercialisation; 2) enterprises working in the field of nanotechnology are characterised by multistage (differentiated) financing; 3) enterprises should participate in partnerships, cooperate and consolidate, and unite into clusters (Miller et al. 2004).

In order to implement the changes in the context of smart specialisation strategies, it is necessary to establish groups of active participants capable of initiating change (Gianelle, Kleibrink 2015). One possible solution is creation of clusters, which are formed for a specific purpose and serve as a basis for smart technology implementation. Industry clusters stand to denote a close linkage of existing products within a value chain in a definite industry and its presence in the economy, as well as the link between the products and the existing labour skills and research capacity of a particular country. Systemic relations between enterprises are realised as outsourcing implying the use of technology, adding products to the range, and usage of specific skills (accounting, marketing). Clusters, similar to products and enterprises, develop in cycles going through several consecutive stages: 1) embryonic stage (specific research expertise, incoming investment, innovative discoveries, geographically clustered groups with specific needs); 2) growth stage (product development, vigorous entrepreneurial activity); 3) maturity (characterised by lowering costs which become a competitive advantage, products are imitated at a larger scale); 4) decay (the products become fully replaceable by lower cost substitutes) (Rosenfeld 2002 ).

In Latvia information on numerous clusters is publicly available. Each cluster has different aims and unites different partners:

1) The aim of the Industrial Energy Efficiency Cluster Latvia (21 partner) is to raise export capacity of the Latvian manufacturing enterprises and providers of energy efficiency services to ensure that Latvian manufacturers in the long term reduce total energy costs, which undermine product competitiveness in the foreign markets (Latvian Environmental Investment Fund 2015);

2) The main task of the Space Technology Cluster (44 partners) is to promote cooperation among space and high-tech industry enterprises, research institutes, universities and non-governmental organisations to increase their competitiveness and export performance (Ventspils High Technology Park 2015);

3) The aim of the Green Energy and Environmental Technology Cluster (about 100 partners) is to create new business opportunities, competitive advantages and added value for the participating enterprises in cooperation with municipalities, research, educational, business support and other institutions (Kurzeme Business Incubator 2015);

4) CleanTech Latvia (31 partner) is a non-profit organisation established to promote development and recognisability of the Latvian clean technology enterprises, organisations, research and/or educational institutions (CleanTech Latvia 2015);

5) The aim of the Latvian Electronics and Electrical Engineering Industry Cluster (38 partners) is to facilitate cooperation between companies in electronics and electrical engineering industry and research and educational institutions, to raise competitiveness of businesses and the industry as a whole, to increase exports, to promote innovation and new product development in the industry (Latvian Electronics and Electrical engineering cluster 2015);
6) Nanostructured materials and high-energy radiation cluster NanoTechEnergy (6 partners) consolidates and updates the existing infrastructure of research institutions to develop a platform for modern material technology development, materials research and education in the Baltic Region to design innovative multifunctional materials that will be used in competitive research-intensive products. Multifunctional materials are envisaged for radiation energy conservation, data recording, storage, transfer and transformation, as well as their efficient application in high-tech devices (NanoTechEnergy 2015).

Partners of NanoTechEnergy cluster work in many areas: 1) research on thin-film and coating technologies and their applications; 2) research on thin film boundaries; 3) research on plasma synthesis of nanoparticles and their applications; 4) nanowire production and research; 5) nanocomposite material production and research; 6) research into applications of hybrid materials and systems; 7) synthesis and research of photonic materials; 8) theoretical modelling of multifunctional materials; 9) theoretical and applied magnetohydrodynamics; 10) geomatic measurements; 11) radiochemistry and research into materials used in thermonuclear reactions (NanoTechEnergy 2015). It should be noted though that all cluster participants are research institutions and real enterprises operating in the market are mentioned as stakeholders rather than participants. Moreover, research centre of state significance LATNANO-C dealing with nanostructured and multifunctional materials, constructions and technologies is only at the initial stage of its development. There is an opinion (Motoyama et al. 2011) that the development of nanotechnology is not possible without state support, at the expense of private business only, as research results reach the market after some 10-20 years, but entrepreneurs make investments if returns are expected in 3-5 years at the latest. It means that the main aim of cluster activities is to reconcile the interests of the state, research and business communities.

The web page CORDIS (European Commission Community Research and Development Information Service) provides an opportunity to select projects connected to nanoscience, where Latvia is represented as a participant (in the period from 2002 to 2013). In total € 3.5 billion were allocated to the field of nanomaterials and nanotechnologies within the European Union’s Research and Innovation funding programme FP7. Information summarised in Table 1 demonstrates that the largest fraction of project funding came from the EU Structural Funds and the parties involved in the implementation of the projects or project participants from Latvia were mainly universities and associated research centres. Nanomaterials and nanotechnologies are a new field for Latvia, and this is attested by the number of projects implemented in the last ten years. There is a clear indication that there are problems related to the funding allocated to date, as the existing structure is not viable in the long-term perspective (TECHNOPOLIS Group 2013).

Table 1. Investment summary on the Latvian scientist participation in the projects in nanotechnology, YY 2002-2013
(Source: retrieved by authors from http://cordis.europa.eu/fp7/)

<table>
<thead>
<tr>
<th>Institution</th>
<th>Number of projects</th>
<th>Total cost, EUR</th>
<th>EU contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Latvia</td>
<td>9</td>
<td>17,699,509</td>
<td>13,089,207</td>
</tr>
<tr>
<td>Riga Technical University</td>
<td>4</td>
<td>8,340,086</td>
<td>5,815,428</td>
</tr>
<tr>
<td>Latvian Academy of Sciences</td>
<td>1</td>
<td>1,529,032</td>
<td>1,332,494</td>
</tr>
<tr>
<td>Commercial companies</td>
<td>2</td>
<td>2,308,819</td>
<td>1,439,576</td>
</tr>
<tr>
<td>Other (public organisation)</td>
<td>2</td>
<td>765,913</td>
<td>718,413</td>
</tr>
</tbody>
</table>

Despite the fact that Latvia is in the group of so-called «modest innovators» and R&D intensity index (GERD to GDP, %) in 2012 was 0.66 (EUROPE 2020), it has been recognised that the country has a good specialisation level in materials both in terms of research and technology (except nanotechnology) (European Commission 2014). Small number of R&D employees in the private sector is a sign of insufficient knowledge absorption capacity of the industry, which in its turn does not facilitate cooperation between science and industry. Insufficient number of employed in science, research, technology advancement and innovation and low staff renewal rate in these areas are the main drawbacks of Latvia’s innovation system, as a result Latvia is ranked second-to-last among the EU member states in the field of innovation, leaving behind only Bulgaria (European Union Research and Innovation 2014).
The majority of indicators describing research capacity of a country in a particular field is based on the number of internationally recognised publications and granted patents. If publications appear as a result of cooperation between business and research community, they have a much higher impact, but in Latvia cooperation of this kind is still relatively rare. If support instruments are in place, it is possible to facilitate joint action at the international level and to promote collaboration between researchers and entrepreneurs. There is ample evidence that smart strategy activities prove to be successful, the development of regional smart specialisation network, which is realised as collaboration in new patent applications and joint publications, can be mentioned as an example (David et al. 2009).

Cooperation can be interregional, and it is possible that joint projects with, for example, Lithuanian or Estonian academia can promote development of a definite sector in Latvia. The Baltic Region is not just an ideal concept; it is the region with common territory and common business culture.

Summarising information about publications in nanotechnology in three Baltic States from 2005 until 2015 it can be seen that Lithuanian researchers published more articles in the field than researchers from the other Baltic States. As of 1 September 2015 Latvia was ranked 64th in the world with 59 publications. According to EPO (European Patent Office) data, as of 1 June 2015 Latvia was in the 62nd place with 0 granted patents and its h-index showed tendency to decrease – in 2010 it was 12, but in 2014 – just 3.

Nanotechnology research indicators are summarised in Table 2.

Table 2. Nano-related research indicators in Latvia
(Source: compiled by authors using http://statnano.com/)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average citation per nano-related article</td>
<td>8.32</td>
<td>5.56</td>
<td>3.6</td>
<td>2.33</td>
<td>0.7</td>
</tr>
<tr>
<td>H-index of nano-related articles</td>
<td>12</td>
<td>11</td>
<td>8</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Nano-related articles</td>
<td>44</td>
<td>61</td>
<td>72</td>
<td>64</td>
<td>65</td>
</tr>
<tr>
<td>Local share in nanoscience generation (Percent)</td>
<td>11</td>
<td>10.63</td>
<td>12.77</td>
<td>10.27</td>
<td>10.06</td>
</tr>
<tr>
<td>Nano-related articles per million people</td>
<td>19.65</td>
<td>29.64</td>
<td>35.55</td>
<td>31.79</td>
<td>32.16</td>
</tr>
<tr>
<td>Published patent applications in nanofield (EPO)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
In Latvia, public and private research cooperation is very weak, and that leads to reduction of outward foreign investment channelled to support research-intensive and innovation-based industry specialisation. Fig. 2 shows the total number of publications in Latvia and the number of articles in nanotechnology included in the ISI databases in the last 10 years.

![Total ISI publications and Nano ISI](image)

**Fig.2. Publications in ISI databases in 2005 – 2015**

*(Source: compiled by authors using http://statnano.com/)*

The number of publications in the established databases is an important quantitative and qualitative indicator used in the Latvian science. At present, a new university financing model «Money Follows Quality» has gained prominence, and the issue of long-term development opportunities of the field in question has become topical. Publications and conference materials on physics and astronomy published in 2014 have been recognised as having fundamental significance on the world scale, however, publications in the nanofields have low citation index (Latvian Council of Science 2015).

### 3. Aspects of commercialisation

The structure of the Latvian business is mainly formed by micro, small and medium-sized enterprises (in 2015 they constituted 98.9%). SMEs are traditionally seen as the backbone of economy, however, SME capacity to make investments in research and new product development is relatively low. SME activities in a definite field are influenced by objective factors: small market share and informal organisational structure (Bolton 1971). Although SMEs can react flexibly at external impacts, the size of their market is small, specialisation with regard to factors of production is limited and qualification of workforce is not always sufficient (McAdam, Keogh 2004).

The issue of intellectual investment absorption capacity also remains topical, because to ensure the private sector is able to use research innovations, it is necessary to establish the culture for innovation, as according to Morone and Testa (2005) the attitude of an enterprise to innovation determines its competitiveness in 61.7 % cases. Innovation behaviour is an important aspect determining competitiveness of a business; it provides the basis that allows the enterprise to work in the global markets, develop niche specialisation, and participate in a knowledge network (cluster) (Morone, Testa 2005). These related processes depend on the availability and quality of human resources. Izsak et al. (2013) mention the problems with human capital after the crisis of 2008, as many talented people left Latvia seeking better-paid jobs and career opportunities abroad. Freel (2000) concludes that creative innovation potential and opportunities to introduce innovations in SMEs are limited, and they mainly focus on product improvement.

It is recognised that small enterprises establish important links between market and research in the field of nanotechnology. For example, Genet et al. (2012) note that patent application intensity in SMEs that work in
nano-related fields is more than 50%, whereas in large enterprises it is below 10%; small enterprises perform technology-bringing role, but it may be stated that they are not always capable to transfer knowledge from state research sector to industry. Small enterprises can use breakthrough technologies more efficiently and see new market opportunities, at the same time, large enterprises can face significant challenges in the introduction of revolutionary technologies, as they may be driven by organisational inertia and short-term goals (Christensen, 2013; Kostof et al. 2004). Small commercial nanotechnology companies operate in a dynamic and volatile nanotechnology business environment. Studies attest that tech savvy entrepreneurs do not always strive for development and profit maximisation, but, for instance, for independence (Oakey 2003). Berry and Taggart (1998) and Oakey (2003) point out that a multi-skilled management team where technological excellence is supplemented with managerial skills is seen as an important factor to gain success in technology-based business. According to Maclurcan (2005) nanotechnology promotes cross-disciplinary research collaboration. Nanotechnology unites numerous research fields and technologies: information technology, biotechnology and materials technology (Invernizzi, Foladori 2005).

Critical lack of cooperation between entrepreneurs and representatives of science and research institutions is a different strategic trend. In the period from 2008 until 2012, RTU researchers applied for 11 patents in nano-related fields: synthesis of nanoparticles for nanocomposites, nanocoatings, solid body nano-acceleration measurement, and nanostructured materials in the micron and/or nanometre size range. Researchers study fundamental scientific problems they are interested in, whereas entrepreneurs try to produce and sell what their clients want, as special equipment at the disposal of the enterprises can be utilised only in the particular niche they operate. Research activity in the production sector is also very low; in some nanotechnology sectors it is virtually non-existent. To obtain information from the enterprises that deal with nanotechnology, researchers mainly use surveys and questionnaires, as structured publicly available statistical data is not available. Surveys have been used: 1) to acknowledge the significance of nanotechnology in the USA manufacturing industry (NSF 2005), 2) to assess health and safety practices in the nanomaterial industry (Conti et al. 2008), 3) to determine the level of commercialisation in nanotechnology (Fiedler, Welpe (2010). In order to find out which Latvian companies work in the field of nanotechnology, the enterprises were analysed considering their core activities according to NACE Rev. 2 codes and the relevant business entities were selected using the database of the Central Statistical Bureau and information available in Lursoft database, as well as company home pages. Table 3 presents summarised information on performance indicators in the manufacturing industry in Latvia with regard to technological intensity in 2013; the number of selected enterprises using nanotechnology in each technological intensity group and the industry, in which they operate, are shown opposite.

<table>
<thead>
<tr>
<th>Technological intensity group</th>
<th>NACE Rev. 2 code</th>
<th>Annual sales per employee, thsd euro</th>
<th>Monthly labour costs per employee, euro</th>
<th>Number of selected enterprises in nano-related fields (NACE Rev. 2 code)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High technology (HT)</td>
<td>21, 26, 30.3</td>
<td>96.8</td>
<td>1,144</td>
<td>3 (26)</td>
</tr>
<tr>
<td>Medium-high technology (MHT)</td>
<td>20, 25.4, 27, 28, 29, 30, (except 30.1 and 30.3), 32.5</td>
<td>62.4</td>
<td>872</td>
<td>2 (20); 1 (32.5)</td>
</tr>
<tr>
<td>Medium-low technology (MLT)</td>
<td>18.2, 19.22, 23, 24, 25, (except 25.4), 30.1, 33</td>
<td>70.4</td>
<td>808</td>
<td>1 (23); 1 (25)</td>
</tr>
</tbody>
</table>

Table 3 presents mean values – sales and labour costs per employee in the Latvian manufacturing companies by technological intensity in 2013. The selected 8 enterprises (highlighted in bold), which deal with multifunctional material production including materials for nanocoatings, operate within several industries in Latvia: NACE 20 Manufacture of chemicals and chemical products – medium-high technology (MHT); NACE 23 Manufacture of other non-metallic mineral products – medium-low technology (MLT); NACE 25 Manufacture of fabricated metal products, except machinery and equipment (MLT); NACE 26 Manufacture of computer, electronic and optical products – high technology (HT); NACE 32.5 Manufacture of medical and dental instruments and supplies (MHT). In Latvia, nanotechnology is used within all three technological intensity groups. It means that nanotechnology as an important form of innovation can promote establishment of new enterprises...
and even create completely new fields within the existing industries (Bozeman et al. 2007).

Characterising the field of nanotechnology in Latvia it should be recognised that it is heterogeneous, enterprises have narrow specialisation and work in different market niches. The number of such enterprises is relatively small considering the manufacturing industry overall. Only a small fraction of produce manufactured by these companies reaches domestic market, as their export volumes range from 75% to 100% of the total output. Export flows are managed by each enterprise individually, each of them being involved in a separate international supply chain. Table 4 provides summarised data on 7 enterprises that export their products indicating export volumes and export industries, which utilise their output. Only one company working in the field of manufacturing of medical and dental instruments and supplies (MHT/32.5) sells all its products in the domestic market.

Table 4. Latvian nanotechnology enterprise exports according to NACE Rev. 2 codes by technological intensity in 2014

<table>
<thead>
<tr>
<th>Manufacturing industry according to technological intensity/NACE Rev. 2 code</th>
<th>Export industry</th>
<th>Export volume, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT/26A</td>
<td>Aviation and aerospace industry</td>
<td></td>
</tr>
<tr>
<td>HT/26B</td>
<td>Manufacture of computer, electronic and optical products</td>
<td></td>
</tr>
<tr>
<td>MHT/20A</td>
<td>Manufacture of chemicals and chemical products</td>
<td></td>
</tr>
<tr>
<td>MHT/20B</td>
<td>Aviation and aerospace industry; Manufacture of fabricated metal products, except machinery and equipment; Manufacture of non-metallic mineral products; Scientific research and development</td>
<td>90-100%</td>
</tr>
<tr>
<td>MLT/23A</td>
<td>Manufacture of motor vehicles; Manufacture of medical and dental instruments and supplies; Manufacture of pharmaceutical products; Biomedicine; Biotechnology; Manufacture of computer, electronic and optical products</td>
<td></td>
</tr>
<tr>
<td>HT/26C</td>
<td>Aviation and aerospace industry; Manufacture of motor vehicles; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment</td>
<td>Up to 85%</td>
</tr>
<tr>
<td>MLT/25A</td>
<td>Manufacture of motor vehicles; Manufacture of fabricated metal products, except machinery and equipment; Scientific research and development</td>
<td>Up to 75%</td>
</tr>
</tbody>
</table>

(Source: compiled by the authors)

All Latvian enterprises working in high-tech fields deal with manufacturing of computer, electronic and optical products, but only two of them cooperate with aviation and aerospace industry, one enterprise delivers products to foreign partners within its core industry. Enterprise HT/26C exports its products to more than one industry and that in a way attests that the products are unique and widely applicable. Two enterprises in the MHT niche manufacture chemical substances and chemical products, and one of the enterprises exports its produce to a high-tech industry.

Figures 3.1, 3.2 and 3.3 illustrate sales per employee in 2013 by technological intensity group. Although all enterprises work in nanotechnology, it can be clearly seen that they demonstrate significant differences in the annual sales per employee. Comparing the annual sales per employee by technological intensity group, three high-tech sector enterprises, namely, HT/26A, HT/26B, HT26C fall considerably behind the mean annual indicator for the group, which is 96.9 thousand EUR. In turn, from three enterprises in the MHT group only MHT/20B shows annual sales per employee amounting to 77.7 thousand EUR and that exceeds the mean indicator of the group – 62.4 thousand EUR. At the same time, enterprise MLT/23A in the MLT group managed to reach annual sales of 98 thousand EUR per employee, and that is the highest indicator among the companies in the sample. All enterprises selected can be classified as SME. It has been confirmed that differences in nanotechnology commercialisation depend on the size of the enterprise, and that small enterprises are in a better position to use the opportunities provided by nanotechnology than large ones (Avenel et al. 2007).
The authors consider that performance results of the selected enterprises are influenced by macroeconomic and demand factors, as well as the structure of the industry. It should be noted that it is rather the field that can be discussed than the industry as a whole, because to make an informed decision on the industry, it is necessary to have structured data and summarised statistics. At present these data are not available. Therefore, market orientation of the purposefully developed field depends on the economic policy of the country and the implemented support instruments to promote enterprise and product development in the industry. In such a way both intermediate seller and end consumer market or national demand are formed. Technologically consolidating the attracted resources an enterprise develops the total of supply factors, which characterises, e.g. a definite product range and potential manufacturing capacity. That is the reason why each enterprise with its factual production volume can be considered an inherent element of the industry and it has a certain impact on its further development. The enterprise depends on the change and development of the industry and in this connection can face both stimuli and limitations in further work of the business. Commercialisation of nanotechnology is implemented by enterprises in many industries and Wiek et al. (2008) use the notion “development potential”, which covers development opportunities of the research field, qualification and competences of the available workforce, patents and cooperation among management, different industries and academic institutions. Practical implementation of 3S concept is not possible without sustainable development. Sustainability is formed by the sum of partial equilibrium states of separate elements in the system. The more system elements demonstrate the features of equilibrium state, the higher sustainability of the system is Sustainable development factors of the enterprises focused on innovative technologies include: 1) income from the buyers of the produce manufactured by the enterprise; 2) financial stability and positive profitability dynamics; 3) workforce competences and skills; 4) consideration of ecological issues within the general enterprise management process; 5) positive public attitude towards enterprise activities. Analysing the situation in the USA (Sargent 2013) notes that there is a lack of available official data that can be used to identify how research and commercialisation of nanotechnology influence creation and retention of jobs. However, the authors consider that the following aspects can be used setting the boundaries of some industry and comparing the contribution of an enterprise to economy: firstly, the number of employed and its dynamics, secondly, workforce efficiency, which can be characterised by the added value, or production volume per employee, and thirdly, labour tax and contributions. That is why considering annual performance results of the selected enterprises in 2014 presented in Table 5, tax contributions made by the enterprises were also analysed – personal income tax (PIT) and mandatory state social insurance contributions (MSSIC) per employee. ROA indicator was used to compare profitability of the selected enterprises; the highest value of ROA was demonstrated by the enterprises in the HT group (19.8 and 13.5).
Table 5. Performance results of the enterprises in the field of nanotechnology in 2014 (compiled by authors using Lursoft database)

<table>
<thead>
<tr>
<th>Enterprise code</th>
<th>Age of the enterprise, years</th>
<th>Number of employees</th>
<th>Sales per employee, thsd euro</th>
<th>PIT+MSSIC per employee annually, thsd euro</th>
<th>ROA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLT/23A</td>
<td>11</td>
<td>111</td>
<td>108.9</td>
<td>8.3</td>
<td>8.5</td>
</tr>
<tr>
<td>HT/26A</td>
<td>12</td>
<td>67</td>
<td>19.2</td>
<td>3.6</td>
<td>19.8</td>
</tr>
<tr>
<td>HT/26C</td>
<td>18</td>
<td>46</td>
<td>57.5</td>
<td>6.0</td>
<td>13.5</td>
</tr>
<tr>
<td>HT/26B</td>
<td>3</td>
<td>25</td>
<td>50.4</td>
<td>2.2</td>
<td>-3.6</td>
</tr>
<tr>
<td>MHT/20B</td>
<td>11</td>
<td>7</td>
<td>5.7</td>
<td>2.5</td>
<td>-3.6</td>
</tr>
<tr>
<td>MHT/32.5</td>
<td>18</td>
<td>5</td>
<td>48.8</td>
<td>2.0</td>
<td>6.4</td>
</tr>
<tr>
<td>MLT/25A</td>
<td>4</td>
<td>6</td>
<td>5.9</td>
<td>7.3</td>
<td>-63.3</td>
</tr>
<tr>
<td>MHT/20A</td>
<td>2</td>
<td>6</td>
<td>0.4</td>
<td>2.9</td>
<td>-22.2</td>
</tr>
</tbody>
</table>

In addition, Table 5 provides information on the age of the selected companies in accordance with the date of registration in the Register of Enterprises, as age is one of the parameters within business life cycle concept used to determine the stage of development of a particular company at a particular time. It can be concluded that the enterprises compete for workforce, and remuneration is one of the parameters, because the specifics of the field call for human resources with a definite level of qualification. Assessing development opportunities of the enterprises in the field of nanotechnology, it seems that companies MLT/25A and MHT/20A face considerable problems – their average annual sales per employee are in numerical terms lower than tax contributions per employee. However, it can be explained by the age of the enterprises. Three enterprises that operate for a short period of time are incurring losses, which is characteristic of the companies in the growth phase. If within this phase a business can be considered new, empirical research (Robinson, McDougall 2001) on the development of new enterprises attests that business performance results are greatly influenced by the structure of the industry and the strategy adopted by companies. It is in line with the findings on uncertainty and efficiency problems faced by enterprises in an emerging industry at the early stage of their development (Bozeman et al. 2007).

Conclusions

According to Innovation Union Scoreboard 2014, Latvia is included in the group of «modest innovators», as Latvia’s achievements in the field of innovation are 50% below the average EU level. These are modest results to be used as a foundation for introduction of S3 concept and establishment of a cooperation platform between research and private sector to implement one of the aims of the National Development Plan of Latvia for 2014-2020 – to develop the field of nanostructured materials. It may be problematic to promote knowledge-based entrepreneurship and make it sufficiently attractive to all stakeholders, as each of them pursues different goals.

Very few enterprises work in the field of nanotechnology in Latvia, half of them have incurred losses in the last two years of operation, therefore the issue of sustainable development of these enterprises and the way how it can be ensured by company management remains topical. These companies deal with innovative technologies, which are included as a priority to be supported within the National Development Plan of Latvia for 2014-2020. However, the enterprises face certain difficulties in using the EU financial instruments directly and receiving state funding, as well as providing private co-financing. Even if a company works in the supported industry, it is not practical to allocate funds for development of a concrete enterprise, as the main goal is to support and develop the entire field providing that it unites research and commercialisation.

The authors consider that cluster development is an important prerequisite to strengthen weak cooperation between academic and business structures in the field of nanotechnology. It is an unresolved task, as the analysis of current activities (projects, publications, patents) shows that the academic structures dominate. Testable criteria should be included into state support instruments to measure the success of cooperation between academic institutions and businesses in the priority sector development. If concrete enterprises participate in the work of nanotechnology industry clusters, it is necessary to conduct further monitoring of their activities to be able to make conclusions whether these enterprises make progress and what problems they face.
Acknowledgements

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SCENARIOS FOR REDUCING YOUTH UNEMPLOYMENT AND PROMOTING SUSTAINABILITY IN THE REGIONS OF LATVIA

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Abstract. In foreign studies Latvia is positioned as a “depressive” region in the year 2030, which will have an insufficient population of young people. Thus, Latvia as a country with a business-friendly environment will not be able to be competitive in relation to other European countries and the flow of investment will be at risk, as well as passed on other, more competitive and better developed regions in demographic terms. Therefore, it is pertinent to analyse the trends in youth employment in Latvia and to work on Latvia’s economic development. There is necessity to promote human involvement in the labour market and to reduce their departure to foreign countries. It is important to draw attention to these challenges and to find answers to the questions: Which of the youth employment-promoting scenarios can be realised in Latvia’s regions in the near future? Which of the scenarios is the most appropriate for the development of Latvia’s regions? Which of the scenarios are more focused on the interests of all parties involved? Which scenario will ensure the country’s economic development? Four possible scenarios for promoting youth employment in Latvia were evaluated by experts. The experts were asked to assess the criteria for each scenario by hierarchy analysis. The most optimal scenario for promoting youth employment in Latvia in the experts’ opinion is the scenario with EU participation. The main idea of the scenario is the effective use of European Union (EU) funding for youth mobility in the labour market organised by the State Employment Agency.

Keywords: youth unemployment, sustainability, the Analytic Hierarchy Process (AHP).

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JEL Classifications: J64, D7

1. Introduction

Youth unemployment is one of the most pressing economic and social problems confronting those countries whose labour markets have weakened substantially since 2008, following the near-collapse of worldwide financial markets. There is an element of “deja vu” around this development: youth unemployment first became a serious problem for industrialized countries during the 1980s. While labour markets were booming in the early part of this century, youth unemployment was still a concern (Bell, Blanchflower, 2010). The weakening of global recovery in the years 2012 and 2013 has aggravated the youth employment crisis when there were no free jobs with adequate requirements for people without education and professional skills (Grinevica, 2014; Išoraitė et al., 2014; Starineca; Voronchuk, 2015).

In the 3rd quarter of 2013, in Latvia there were 27.1 thousand unemployed young people – 22.4% of the total number of unemployed persons aged 15-74. Labour Force Survey results compiled by the Central Statistical Bureau of Latvia indicate the most (86.9%) of them were aged 20-24 (Unemployment of Young..., 2013).
In October 2015, the seasonally adjusted youth unemployment rate in Latvia was at 17.1%, in EU – 20%, but more than EU average, in Greece – 47.9%, Spain – 47.7%, Croatia – 43.1%. A lower seasonally adjusted youth unemployment rate than in Latvia and the EU is in Lithuania – 15.6% and Estonia – 15.1% (Youth Unemployment Rate..., 2015). Youth unemployment in Latvia in the year 2015 was lower than in 2013, but it is still a major challenge addressed to the government of Latvia. A series of studies starting with Sum (2000) in the U.S. and O’Higgins (2003) for the World Bank suggest that young people who have difficulty in their early integration into the world of work suffer lifelong “scarring” effects that diminish their resiliency and ability to thrive in a dynamic and demanding labour market (Youth Unemployment Challenge..., 2012).

According to the International Labour Organisation (2012), there is an extensive body of literature which demonstrates the central importance of qualifications on labour market outcomes. Young people with an education level below tertiary are more likely to be passed over by employers in favour of their more highly educated peers (Global Employment Trends..., 2012). Geography can also play a part in the decisions young people make. The areas in which people live can be damaging to their prospects of finding a job, especially if they are residing in neighbourhoods with many other unemployed people. The consequences of this pertain to the lack of information about jobs as a result of social networks (Green, White, 2007). The difficulty in finding employment as a means for securing a livelihood experienced by young people is an ongoing issue, along with the sense of frustration arising from failing to meet their work expectations. Indeed, youth unemployment has always been one of the major concerns of governments, and this is exhibited - among other things- by the rate of migration reported in different regions (Barbagelata, 2012).

Youth unemployment is of particular concern as people who become unemployed during their early working years may become demoralised, and people who fail to find a job after leaving full-time education may see a deterioration in their human capital and employment prospects, which could lead to social exclusion. At the same time, youth unemployment is problematic not only for those affected, but also for the economy as a whole. First, unemployment among young persons’ implies unutilised labour potential and thus has a negative impact on potential growth. Given that populations in euro area countries will age in the years to come and that the labour force is expected to decline, it will become increasingly important to make full use of the potential of young people. Second, youth unemployment means that there is less labour input from those who, despite having less work experience than older workers, are supposed to improve production processes with their more up-to date and innovative expertise. Finding solutions to the youth unemployment problem requires both a rigorous analysis of its main causes, as well as a comprehensive assessment of policies that would improve the employability of young persons (Gomez-Salvador, Leiner-Killinger, 2008). The youth integration into the labour market is very important for young people’s future options; also, it has a significant role in the country’s revenues, competitiveness and development (Tvaronavičienė, 2014; Grinevica, Rivza, 2015; Shatrevich, Strautmane, 2015). In order to identify the most appropriate development scenario to involve young people into the labour market in Latvia, the Analytic Hierarchy Process (AHP) method established by American scientist Thomas L. Saaty was used.

The aim of the research is to identify the causes of youth unemployment and to establish the best scenario to reduce youth unemployment and to promote the sustainability of the regions of Latvia.

To achieve the aim, there are set the following tasks:
1) To evaluate the theoretical aspects from different authors to identify the main viewpoints and the practical approach to the methodology of the Analytic Hierarchy process (AHP);
2) To manage the evaluation with the experts from different sectors to find out the best scenario for reducing youth unemployment in the regions of Latvia.

The following materials and methods are used to achieve the aim and fulfil the tasks:
1) Theoretical framework of the research: the monographic and descriptive methods are used; the research is also based on scientific discussion regarding different author conclusions on the Analytic Hierarchy Process (AHP);
2) Research methodology: the methods of expert interviews, evaluations, discussion of the results and findings
are used to achieve the aim.

The authors made the expert interviews to gather information on their opinion of the best scenario for youth unemployment reduction opportunities. There were made interviews with an employer, young people who work in the private banking sphere, a business analyst, an expert from the Investment and Development Agency of Latvia and a representative from a local government.

2. Theoretical framework of the Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a general theory of measurement (Saaty, 1987).

The AHP, introduced by Thomas Saaty (1980), is an effective tool for dealing with complex decision making, and may aid the decision maker to set priorities and make the best decision. By reducing complex decisions to a series of pairwise comparisons, and then synthesizing the results, the AHP helps to capture both subjective and objective aspects of a decision. In addition, the AHP incorporates a useful technique for checking the consistency of the decision maker’s evaluations, thus reducing the bias in the decision making process (Kasperczyk, Knickel, s.a.).

The AHP is a decision support tool which can be used to solve complex decision problems. It uses a multi-level hierarchical structure of objectives, criteria, subcriteria, and alternatives. The pertinent data are derived by using a set of pairwise comparisons. These comparisons are used to obtain the weights of importance of the decision criteria, and the relative performance measures of the alternatives in terms of each individual decision criterion (Triantaphyllou, Mann, 1995).

The AHP considers a set of evaluation criteria, and a set of alternative options among which the best decision is to be made. It is important to note that, since some of the criteria could be contrasting, it is not true in general that the best option is the one which optimizes each single criterion, rather the one which achieves the most suitable trade-off among the different criteria (Kasperczyk, Knickel, s.a.). Decision making, for which we gather most of our information, has become a mathematical science today (figuera et al., 2005). It formalises the thinking we use so that, what we have to do to make better decisions is transparent in all its aspects. We need to have some fundamental understanding of this most valuable process that nature endowed us with, to make it possible for us to make choices that help us survive. Decision making involves many criteria and subcriteria used to rank the alternatives of a decision. Not only does one need to create priorities for the alternatives with respect to the criteria or subcriteria in terms of which they need to be evaluated, but also for the criteria in terms of a higher goal, or if they depend on the alternatives, then in terms of the alternatives themselves (Saaty, 2008).

Basically the AHP helps in structuring the complexity, measurement and synthesis of rankings. These features make it suitable for a wide variety of applications. The AHP has proved a theoretically sound and market tested and accepted methodology. Its almost universal adoption as a new paradigm for decision-making coupled with its ease of implementation and understanding constitute its success. More than that, it has proved to be a methodology capable of producing results that agree with perceptions and expectations. T. Saaty describes the seven pillars of the AHP as follows:

- Ratio scales, proportionality and normalised ratio scales;
- Reciprocal paired comparisons;
- The sensitivity of the principal right eigenvector;
- Clustering and using pivots to extend the scale;
- Synthesis to create a one-dimensional ratio scale for representing the overall outcome;
- Rank preservation and reversal;
- Integrating group judgements (Saaty, 2001).

The strengths of the AHP have been a subject of substantial debate among specialists. The main strengths are mentioned as follows:
The advantages of AHP over other multi criteria methods are its flexibility, intuitive appeal to the decision makers and its ability to check inconsistencies (Ramanathan, 2001). Generally, users find the pairwise comparison form of data input straightforward and convenient.

Additionally, the AHP method has the distinct advantage that it decomposes a decision problem into its constituent parts and builds hierarchies of criteria. Here, the importance of each element (criterion) becomes clear (Macharis et al., 2004).

The AHP method supports group decision-making through consensus by calculating the geometric mean of the individual pairwise comparisons (Zahir, 1999).

The AHP is uniquely positioned to help model situations of uncertainty and risk since it is capable of deriving scales where measures ordinarily do not exist (Millet, Wedley, 2002).

3. Research results of the Analytic Hierarchy Process

Based on the expert interview results, there were made scenarios and criteria were selected. The experts chose the most important criteria groups for reducing youth unemployment.

According to the expert interview results, there were defined the following criteria groups with 5 criteria for each interest group:

- **Individual interests:**
  - Job opportunities;
  - Growth opportunities of individual;
  - Competitiveness of individual’s income in a given sector;
  - Welfare provision for individuals’ family;
  - Needs of individual.

- **Educational institution interests:**
  - Development of knowledge, innovation and skills;
  - Investments in knowledge;
  - Ensuring the transfer of knowledge to younger generations;
  - Maintaining the number of students;
  - Relations between educational institutions and employers.

- **Entrepreneurs’ interests:**
  - Qualification of workforce;
  - Potential of investment and fundraising;
  - Profit-making;
  - Promotion of output/ service sales;
  - Expansion of business.

- **Local government interests:**
  - Promotion of employment;
  - Improvement of the demographic situation;
  - Attraction of funding for regional development;
  - Promoting the development of enterprises (small and medium enterprises, self-employment, etc.);
  - Cultural and social development.

- **National interests:**
  - Sustainable regional development;
  - Efficient use of resources;
  - Increasing the gross domestic product by promoting agriculture, forestry, manufacturing and the development of other industries;
  - Legislative alignment in the field of labour market regulation;
  - Creation and maintenance of cooperation with other EU countries.

- **European Union (EU) interests:**
  - Growth and competitiveness of the EU;
  - Raising the level of public welfare;
  - Social inclusion;
Successful implementation of EU policies;
Successful expenditure and absorption of EU structural funding.

The criteria hierarchy for reducing youth unemployment in the regions of Latvia was made after discussions with the experts. The methodology of the Analytic Hierarchy Process with the scenarios that were made for Latvia are also possible to use in other European region countries.

Four possible scenarios for reducing youth unemployment in the regions of Latvia were offered for the expert evaluation:

**Scenario 1: The scenario for contributing to youth business development. The attraction of European Union funds for youth self-employment and business financing and the establishment of a special financial and administrative support programme at the institution “Altum”**.

Characteristics: it is important to create the interest of young people in entrepreneurship development and entrepreneurial promotion. At national level, the focus should be on raising funds and their volumes for start-up and self-employment to encourage young people to become entrepreneurs in Latvian rural areas and ensure the efficient use of national resources. It is also important to attract mentors and business angels and increase their interest in the promotion of these business support activities, providing feedback and benefiting all concerned parties. For example, in collaboration with the state joint-stock company “Latvian Development Financial Institution “Altum”” at the level of the regions in the country, fundraising opportunities for financing youth entrepreneurship should be ensured to increase efficiency gains from business support programmes. With these processes interacting, successful mutual cooperation among existing entrepreneurs, young entrepreneurs and regional government institutions will be built over several years.

**Scenario 2: The scenario of cooperation between educational institutions and entrepreneurs. The interest of entrepreneurs to prepare competitive labour market specialists.**

Characteristics: the collaboration of entrepreneurs with the institutions of professional and higher education is important to encourage young people into the labour market. The educational authorities in cooperation with entrepreneurs should make training programmes that are competitive in the labour market, within which the young people should be allowed to get practical training in a company. Close interaction between the educational and the private sectors will ensure specialists are prepared for performing specific operations and supply professionals in the industries where they are not enough.

Close cooperation between educational institutions and entrepreneurs will encourage individuals who have acquired higher education in Latvia to stay in the country. It is important to employ young people who were funded from the state’s budget and prevent their departure. In the current situation, the state-allocated funding is used inefficiently, because after graduation many young specialists from different fields go to study and work to foreign countries. The legislative framework has to be amended, and students who have graduated in such study fields as medicine, internet technologies, engineering, etc. and in state-funded study programmes should continue their studies and work in the country after graduation for at least next 3 years. By paying taxes, the student will pay back the state’s expenditures. Specialists who are prepared with that kind of principle, who have graduated with the state’s financial support or personal support, completed practical training with an employer and got the possibility to work together with the employer with whom they were practicing, will significantly increase the country’s tax revenues. Tax relief for entrepreneurs will promote the employment of youth.

**Scenario 3: The scenario of collaboration between national institutions and entrepreneurs who employ young people.**

Characteristics: only by ensuring successful interaction among the state, state-administered institutions, funding and human capital, it is possible to improve the economic situation in the areas of employment and demog-
raphy. The demographic scope of the result of current economic situation in Latvia is moving to the downside; until 2014 the birth rate was lower than the mortality rate. Young people at working age are forced to travel abroad in search of a job or for studies in order to be able to provide a valuable life.

In Latvia the population of immigrants is not surprising, therefore there is no hope for the economy’s recovery due to immigrants. There need to be a strong position how to “hold” the young people who have not departed to another country. One of the ways how to build a more positive environment for these young people is to review the legislative framework in relation to employment issues by promoting the willingness of employers to employ young people and encourage the change of attitude by employers towards the knowledge and professional skills by young people. Equivollent emphasis should be placed on close cooperation between national and regional authorities and entrepreneurs, with promoting knowledge-based economic development and efficient use of resources, especially in agriculture, industry and forestry, which is positioned as one of the ways to promote economic growth and preserve the human capital. A no less essential prerequisite is a decent wage level for young people, which is based on assessing their work quality.

![Diagram](image-url)

**Fig. 1.** The criteria hierarchy for reducing youth unemployment in the regions of Latvia

**Scenario 1:** The scenario for contributing to youth business development.

**Scenario 2:** The scenario of cooperation between educational institutions and entrepreneurs.

**Scenario 3:** The scenario of collaboration between national institutions and entrepreneurs who employ young.

**Scenario 4:** The EU participation scenario. The EU interest in growth by contributing to the efficient use of EU funds in youth mobility activities organised by the State Employment Agency. Characteristics: since Latvia is an EU Member State, an important role in economic development is played by financial support amounts from the EU Structural Funds. The EU is interested in the EU Member States to be able to increase their revenue as a percentage of GDP and to improve the country’s economic growth. It is important to promote the effective use of the allocated EU structural funds in the State Employment Agency by organising youth mobility events – the Latvian state can not afford inefficient and informal use of the resources, there is need to move to successful use of the potential of young people and promote their successful deployment. It is important in these events organised by the State Employment Agency, as well as in universities, to draw the attention of young people to the business opportunities and to inform them of business support programmes, their opportunities and financing possibilities. Also for future integration into the labour market, the contribution of organised youth
mobility arrangements, learning the subject matter courses such as the Russian, Latvian languages, project management, etc., which promotes the young people’s competitiveness in the labour market, is important.

The developed criteria hierarchy for evaluation is shown in Figure 1. At the first level, an acute problem - youth unemployment reduction in Latvia - is defined. The second level is the criterion groups representing a variety of process-related interests; each group has defined five criteria. At the third level the possible scenarios for reducing youth unemployment in the regions of Latvia are presented.

With regard to the above-mentioned scenarios, the experts were asked to give an opinion by rating statements.

**Table 1.** Information on experts who participated in hierarchy analysis

<table>
<thead>
<tr>
<th>Code</th>
<th>Expert’s Position</th>
<th>Spatial level of activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Analyst</td>
<td>National interests</td>
</tr>
<tr>
<td>B</td>
<td>Senior Officer of the Enterprise Development Project Financing</td>
<td>EU interests</td>
</tr>
<tr>
<td>C</td>
<td>Entrepreneur</td>
<td>Entrepreneurs’ interests</td>
</tr>
<tr>
<td>D</td>
<td>The deputy of local government</td>
<td>Local government interests</td>
</tr>
<tr>
<td>E</td>
<td>Private Banker</td>
<td>Individuals’ (in this case, youth) interests</td>
</tr>
</tbody>
</table>

In order to assess young people’s inclusion into the labour market, the experts were asked to appreciate 4 possible scenarios by using the AHP method. For the study, five experts who were asked to express their assessment of the above scenarios were invited (Table 1). The selection of experts was directed by the condition that they were linked with the labour market and represented the labour market’s spatial levels. Information about the identity of the experts is confidential.

Each expert must firstly start with the evaluation of criteria groups, so for example, the comparison matrix of criteria groups evaluated by Expert A looks as follows:

**Table 2.** Comparison matrix of criteria groups (Expert A)

<table>
<thead>
<tr>
<th>Criteria groups</th>
<th>Individual interests</th>
<th>Educational institution interests</th>
<th>Entrepreneurs’ interests</th>
<th>Local government interests</th>
<th>National interests</th>
<th>EU interests</th>
<th>Priority vector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual interests</td>
<td>1</td>
<td>8</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>0.41</td>
</tr>
<tr>
<td>Educational institution interests</td>
<td>0.125</td>
<td>1</td>
<td>0.333</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.03</td>
</tr>
<tr>
<td>Entrepreneurs’ interests</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>0.31</td>
</tr>
<tr>
<td>Local government interests</td>
<td>0.167</td>
<td>4</td>
<td>0.25</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.09</td>
</tr>
<tr>
<td>National interests</td>
<td>0.167</td>
<td>4</td>
<td>0.2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.08</td>
</tr>
<tr>
<td>EU interests</td>
<td>0.143</td>
<td>4</td>
<td>0.167</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.08</td>
</tr>
</tbody>
</table>

C.R. = -0.08  Total = 1.00

*Source: authors’ survey results*

Priority vector coordinates is calculated by the following formula (Saaty, 2010):

$$x_i = \frac{(I^n)^{-1} w^2_{i,j}^{1/n}}{\sum_{j=1}^{n}(I^n)^{-1} w^2_{i,j}^{1/n}} = \frac{a_i}{\sum_{i=1}^{n} a_i}$$
Notations:
\( x_i \) value i of the priority vector;
\( w_i \)

\( w_i \) element of pairwise comparison matrices;

\( n \) – rank of pairwise comparison matrices;

Consistency Ratio (C.R.) is calculated by the following formula:

\[
C.R. = \frac{C.I.}{R.I.},
\]

where

\[
C.I. = \frac{\lambda_{max} - n}{n-1},
\]

R.I. – Random Index

A scheme for determining the priority vector (Saaty, 1980):

<table>
<thead>
<tr>
<th>Filling in a matrix for comparing pairs</th>
<th>Calculating the geometrical mean, special vector component</th>
<th>Determining the priority vector</th>
</tr>
</thead>
</table>
| \[ \begin{array}{ccc}
A_1 & A_2 & A_3 \\
\frac{W_1}{W_1} & \frac{W_1}{W_2} & \frac{W_1}{W_3} \\
\frac{W_2}{W_1} & \frac{W_2}{W_2} & \frac{W_2}{W_3} \\
\frac{W_3}{W_1} & \frac{W_3}{W_2} & \frac{W_3}{W_3} \\
\end{array} \] |

\[
3 \sqrt{\frac{W_1}{W_1} \times \frac{W_1}{W_2} \times \frac{W_1}{W_3}} = a_1 \quad \rightarrow \quad \frac{a_1}{S} = x_1
\]

\[
3 \sqrt{\frac{W_2}{W_1} \times \frac{W_2}{W_2} \times \frac{W_2}{W_3}} = a_2 \quad \rightarrow \quad \frac{a_2}{S} = x_2
\]

\[
3 \sqrt{\frac{W_3}{W_1} \times \frac{W_3}{W_2} \times \frac{W_3}{W_3}} = a_3 \quad \rightarrow \quad \frac{a_3}{S} = x_3
\]

where

\[
S = \sum_{i=1}^{3} a_i
\]

Notations:

A – comparable criteria groups of the second level;

W – evaluation of comparable elements;

a – average geometric mean for comparable elements;

x – priority vector for comparable elements.

A random read from the index table: for example, where \( n = 6 \), the R.I. = 1.25 (Table 3).
The Consistency Ratio (C.R.) must be less than 0.10, in some cases it may allow for 0.20 but not more. If the Consistency Ratio is beyond these boundaries, the experts have to once again evaluate and file a new pair wise comparison matrix. In our example, C.R. = -0.08, less than 0.10 and those Expert A job filling criteria for the group assessment matrix are correct.

The Consistency Ratio for all the experts is less than 0.20. It means that the results of the expert evaluation are correct and do not exceed the credibility limit.

In a similar way an expert filled out the rest of the individual criteria and the scenario evaluation table in relation to each of the criteria, a total of 37 tables. Priority vectors and C.R. were calculated for each table.

Then the individual expert assessments were gathered together, so for example, a group of evaluation criteria shown in the table and the calculated average priority values.

### Table 3. Random Index (R.I.)

<table>
<thead>
<tr>
<th>n</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.I.</td>
<td>0.5245</td>
<td>0.8815</td>
<td>1.1086</td>
<td>1.2479</td>
<td>1.3417</td>
<td>1.4056</td>
<td>1.4499</td>
<td>1.4858</td>
</tr>
</tbody>
</table>

*Source: Alonso, Lamata, 2006*

By summarising the expert evaluations, there was obtained a criteria group from the experts’ views (Table 4). The experts recognised the interests of individuals as the group most interested in youth employment, where the average priority vector value is 0.42. This rating is logical, because the young people themselves are the ones who are the most passionate about youth employment promotion, which significantly affects the individual’s ability to participate in society, to build a future and career, as well as to exist. The other interested parties are associated with young people and their inclusion into society, and in a sense are the beneficiaries of promoting youth employment; it affects their welfare, profit, competitiveness and so on.

The next most interested part, according to the results of expert evaluation, represents the interests of entrepreneurs, and the average priority vector value for this group is 0.15; the experts evaluated the interests of local government relatively lower, as the average priority vector is 0.13. The interests of educational institutions and local government were evaluated as irrelevant compared with the interests of individuals - the average priority vector value of the educational institutions– 0.12 and local government – 0.11.

The EU interests are evaluated by the experts as insignificant interests, where the priority vector value is 0.08. According to the results of Expert C, the EU interests are second important interests (average priority vector value 0.22). According to the results of Expert A, they consider that the entrepreneur’s interests are second important than the interests of the nation, local government, EU and educational institutions, where the global priority vector value is 0.31. In general by evaluating the opinions by the experts, Expert A evaluated the inter-
ests of entrepreneurs with conclusive predominance (average priority vector value 0.31), while the interests of entrepreneurs were evaluated by Expert C as the least important (average priority vector value 0.06).

Expert E evaluated the local government interests as the second most essential interests (average priority vector value 0.22), while the other experts evaluated those interests as insignificant relative to the other interest groups. The next step in the hierarchy analysis is evaluation of the priority vector value calculation. The priority vector allows considering the optimal solution to various problems. It shows the priority vector values in relation to the overall objective (Pelse, 2007).

**Scenario 1:** The scenario for contributing to youth business development.

**Scenario 2:** The scenario of cooperation between educational institutions and entrepreneurs.

**Scenario 3:** The scenario of collaboration between national institutions and entrepreneurs who employ young people.

**Scenario 4:** The EU participation scenario.

![Diagram](image.png)

**Fig. 2.** Selection of the most appropriate scenario for promoting youth employment in Latvia by expert views

*Source: authors’ survey results*

According to Figure 2, Expert A, who holds the analyst position and represents the interests of the state evaluated Scenario 4 – the EU’s participation as the most optimal scenario, with the priority vector value of 0.39; also Expert C, who is a long-time entrepreneur and represent the interests of entrepreneurs, acknowledged Scenario 4 of these scenarios as the most optimal, with the priority vector value of 0.37. Expert B, who is operating the business development projects in the area of financing and represents the interests of the European Union, assessed Scenario 3 – the scenario of collaboration between national institutions and entrepreneurs – as an optimal scenario; the priority vector value is 0.31. Expert E, who holds a private banker’s position and represents the interests of young people (individuals interests), recognized Scenario 2 as optimal; the priority vector value is 0.29. However, Expert D who holds a local government deputy position and represents the local government interests rated Scenario 1 – the scenario for contributing to youth business development – as the most optimal variant.
According to the research results, an optimal scenario is Scenario 3 - the scenario of collaboration between national institutions and entrepreneurs who employ young people, which includes and highlights the importance of successful interaction among the state, state-administered institutions, funding and human capital, for improving the economic situation in the areas of employment and demography. It means that the majority of the experts thought that the best way how to promote youth employment in the regions of Latvia was to develop interaction between state and individuals. For Scenario 3, the average value of priority vector value is 0.27, with the minimum priority vector value of 0.21 and the maximum priority vector value of 0.31. The second best scenario for promoting youth employment in the regions of Latvia is Scenario 2 - the scenario of cooperation between educational institutions and entrepreneurs, with the interest of entrepreneurs to prepare competitive labour market specialists. For Scenario 2, the average value of priority vector value of 0.24, the minimum priority vector value of 0.16 and the maximum global priority of 0.32. Scenario 1 and Scenario 4 are rated similarly. Scenario 1 is rated as one of the worst scenarios - the scenario for contributing to youth business development. The main conception of the scenario: the attraction of European Union funds for youth self-employment and business financing and the establishment of a special financial and administrative support programme at the institution "Altum". The minimum priority vector value is 0.16 and the maximum priority vector value is 0.33. Scenario 4 is rated as second of the worst scenarios- the scenario with EU participation, which highlights the importance of the efficient use of EU funds in youth mobility activities organised by the State Employment Agency. The experts did not rate it as the most optimal scenario. The main idea of the scenario was directed to the financial funding for youth business development by creating a new support programme which is responsible for funding and administrative support. The minimum priority vector value is 0.13 and the maximum priority vector value of 0.39 (Figure 3). In general, by evaluating the results of the scenarios, the authors conclude that there is no marked difference in the significance of the scenarios; they vary in terms of priority vector value from 0.23 to 0.27.

**Conclusions**

The Analytic Hierarchy Process helps to analyse the subjective and objective evaluation measures. The AHP provides a useful mechanism for choosing the alternatives by evaluating several groups of criteria. That methodology helps to summarize and choose one of the scenarios and helps in decision making, when several scenarios are possible to establish. The Analytic Hierarchy Process helps to crystallize the most optimal scenario for dealing with the proposed problem. The youth unemployment problem is one of the central focus for the
European Union to deal with, because in some European region’s countries there is very high youth unemployment, especially in Greece, Spain, Croatia. According to the survey results, presently the most effective scenario for reducing youth unemployment in the regions of Latvia would be Scenario 3 with the collaboration between national institutions and entrepreneurs who employ young people; the average value of priority vector value is 0.27. The main idea for the scenario is the successful interaction among the state, state-administered institutions, funding and human capital, it is possible to improve the economic situation in the areas of employment and demography. The scenarios mentioned in the paper are also adjustable to other European region countries such as Greece, Spain, Croatia, where youth unemployment are higher than in Latvia and the EU average.

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