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INTRODUCTION

Department of Management and Technical faculty "Mihajlo Pupin" from Zrenjanin have started the organization of International Symposium Engineering Management and Competitiveness (EMC) in 2011. Since 2013 the organization of the EMC symposium has been supported by the following foreign partners: Szent István University, Faculty of Economics and Social Sciences, Gödöllő, Hungary, Voronezh State University, Faculty of Economics, Voronezh, Russia and University of Montenegro, Maritime Faculty, Kotor, Montenegro.

The objectives of the Symposium EMC are: presentation of current knowledge and the exchange of experiences from the field of Engineering management, consideration of development tendencies and trends in Serbia and the world as well, gathering researchers from this field with the aim of expanding regional and international cooperation, raising the level of professional and scientific work at Technical faculty "Mihajlo Pupin" from Zrenjanin, expanding cooperation with economic and educational institutions and encouraging young researchers within this field. Taking into account that this Symposium is international, the importance of this event is obvious for the town of Zrenjanin, Banat region, Vojvodina and Serbia. Organization of EMC by the Technical faculty "Mihajlo Pupin" from Zrenjanin represents this scientific-educational institution as one of the major representatives of economic and social development in Banat.

Within this Proceedings all accepted papers received for X International Symposium Engineering Management and Competitiveness (EMC 2020) are presented. This year at the symposium we have 34 papers and 3 abstracts. The authors come from 12 countries: Bosnia and Herzegovina, Croatia, Greece, Hungary, Iran, Montenegro, Russia, Slovenia, Slovakia, Turkey, USA and Serbia. The papers are divided into eight sessions: Plenary session, Session A: Management and operation management, Session B: Human resource management, Session C: Marketing management, Session D: Economy, Session E: IT management, Session F: Abstracts.

We wish to thank the Technical faculty "Mihajlo Pupin" from Zrenjanin and the dean Prof. Ph.D Dragica Radosav for their active role concerning the organization of the Symposium. We are also expressing our gratitude to all authors who have contributed with their papers to the organization of our tenth Symposium EMC.

The EMC Symposiums become a traditional meeting of researchers in June, every year. We are open and thankful for all useful suggestions which could contribute that the next International Symposium Engineering Management and Competitiveness become better in an organizational and program sense.

President of the Programming Committee
Professor Dragan Ćoćkalo, Ph.D.

Zrenjanin, June 2020.

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X International Symposium Engineering Management and Competitiveness 2020 (EMC 2020)
19-20th June, Zrenjanin, Serbia

Plenary session

Papers (pp. 3-46):

APPLICATION OF MULTI CRITERIA DECISION MAKING IN HEALTH CARE

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ABSTRACT

The use of Multi-Criteria Decision Making (MCDM) in health care has become common. This paper has been written in the field of health care decision-making. This paper provides a survey of the literature on MCDM applications to health care problems. This research contributes to the existing literature on the health care and MCDM. This provides a unified source of references that could be useful for students, researchers and practitioners. The paper ends with an assessment of the presented literature, aiming to reach some conclusions, as well as to indicate future trends in this line of research. The review shows that MCDM has been applied to a broad range of areas in healthcare, with the use of a variety of methodological approaches. Further research is needed to develop practice guidelines for the appropriate application and reporting of MCDM methods.

Key words: Decision-making, Multi Criteria Decision Making (MCDM), Health care.

INTRODUCTION

Decision making in the healthcare sector is difficult due to its complexity and critical effects on the life quality of individuals (Clemen & Reilly, 2013). The significance of decision making in healthcare cannot be stressed enough as many of these decisions are complex, involve uncertainties, and the elicitation of stakeholders' preferences and values. Several methods have been proposed to aid and support the decision-making process in healthcare. Recently, there have been many research efforts to analyze the applicability and practicability of MCDM methods. Because of the diversity of approaches and applications, MCDM is rapidly gaining popularity in healthcare (Mühlbacher & Kaczynski, 2016). Healthcare decision making does not conceptually differ from decision making in other fields. The main difference in health care is that health is an irreplaceable and priceless good. This unique feature makes it more difficult for health care decision makers to make the right choices. Interest in MCDM has grown in healthcare over the last decades (Diaby, Campbell, & Goeree, 2013). MCDM is increasingly becoming a popular framework for aiding and supporting healthcare decision-making. The literature includes some reviews of the application of MCDM in healthcare (Adunlin, Diaby, & Xiao, 2015). For example, Liberatore and Nydick (2008) provided a review for application of a specific decision making technique of Analytical Hierarchical Process (AHP) for evaluation of healthcare and medical decision making problems.

MCDM is an extension of decision theory that supports decision makers who have multiple objectives by decomposing the decision objectives into criteria. These criteria are given a numeric importance weights and decision alternatives such as drugs or treatments are scored on each of the criteria. The criteria weights and performances scores are then aggregated into an overall score, which is used to rank the alternative treatments (Broekhuizen, Groothuis-Oudshoorn, van Til, Hummel, & IJzerman, 2015).

In the 1960s, the first MCDM techniques emerged to alleviate difficulties in accommodating diverse opinions and handling large amounts of complex information in the decision-making process. These capabilities have encouraged planners to combine MCDM with other planning tools. The methods of MCDM evolved as a response to the observed inability of people to effectively analyze multiple streams of dissimilar information. There are many different MCDM methods, and a detailed analysis of the theoretical foundations of these methods and their comparative strengths and weaknesses is presented in Belton and Steward (2002). The common purpose of MCDM methods is to evaluate and choose among alternatives based on multiple criteria using systematic analysis that overcomes the limitations of unstructured individual or group decision making. Within MCDM, elementary methods can be used to reduce complex problems to a singular basis for selection of a preferred alternative. Competing decision criteria may be present, but inter-criteria weightings are not required. For example, an elementary goal aspiration approach may rank the dredging alternatives in relation to the total number of performance thresholds met or exceeded. Multi-criteria decision making involves a multi-stage process of (i) defining objectives, (ii) choosing the criteria to measure the objectives, (iii) specifying alternatives, (iv) assigning weights to the criteria, and (v) applying the appropriate mathematical algorithm for ranking alternatives. MCDM allows to accommodate the need for unbiased integration of modern planning objectives for independent identification and ranking of the most suitable planning solutions (Mosadeghi, Tomlinson, Mirfenderesk, & Warnken, 2009).

Healthcare decision-making was an initial and ongoing operational field for MCDM methods and techniques, in which different methods of decision-making have been used in various fields of medical and healthcare. Various areas of healthcare and medical problems have been systematically reviewed using different MCDMs. The use of MCDM in healthcare is the focus of this paper. The first aim of this paper is to review the decision making approaches for assessment in the context of Health management, The second aim is to identify shortcomings associated with the use of MCDM for assessing Healthcare problems. In this paper, we attempted to show the important role of MCDM techniques in four areas of application in Healthcare: (1) Health care service quality, (2) Health care waste management, (3) Health care technology management, and (4) Health care services management.

HEALTH CARE SERVICE QUALITY

Health care service quality and its outcomes are one of the rare topics in services marketing literature that have received widespread academic research. The demand for improved and better healthcare service quality has enlarged which leads to built-up pressure towards supply side and have become a difficult assignment for researchers, hospital administrators, government policymakers and therapeutic specialists to fulfil the needs of patients which helps to build satisfaction and loyalty. However, it calls for more expenditures to get the consideration of new patients rather than to retain existing patients. Loyalty is one of the important factors for business success that can only be built and sustained through provision of better service quality leading to improved satisfaction (Fatima, Malik, Shabbir, & Management, 2018). In the literature of service quality, there are various approaches such as quantitative and qualitative methods.

There are various decision-making approaches for assessing service quality in the healthcare and medical industry. For example, Hsu and Pan (2009) used AHP and Monte Carlo approaches to investigate the quality structure of dental services and precisely identify the ranking of the leading attributes. Shieh, Wu, and Huang (2010) used DEMATEL method to identify and assess criteria of hospital service quality to identify the critical success factors for evaluation of service quality in hospitals. Büyüközkan, Çifçi, and Güleryüz (2011) used fuzzy AHP approach to assess the presented service quality model. The consequences signified that hospitals must concentrate more on sympathy, competence and reliability to do sustaining and competent provision. Altuntas, Dereli, and Yilmaz (2012) integrated AHP and ANP methods to rank service quality factors. Based on this study, the key service quality dimensions include factors such as employees' knowledge; empathy, having reassuring and sympathetic employees, services provided on time, and making the patients feel safe while

interacting with hospital employees. S.-F. Lee and Lee (2013) used ANP and DEMATEL methods to examine critical index weights of service quality in a hospital to establish an objective and quality index of physical therapies in order to have a systematic analysis and introduce an innovation strategy applicable in services given by the hospital. Chang (2014) employed fuzzy VIKOR approach to identify the significant weights of assessment criteria for service quality performance - to evaluate the quality of services delivered in private hospitals. Moslehi, Manesh, and Asiabar (2015) used AHP and Delphi method to calculate weights of quality management indicators - to explore the most important indicators that can be used for quality measurement of the Iranian health centers. Shafii et al. (2016) integrated the fuzzy AHP and TOPSIS methods for evaluating the service quality of a teaching hospital in Yazd-Iran. La Fata, Lupo, and Piazza (2019) proposed a novel method based on fuzzy ELECTRE III and Importance-Performance Analysis (IPA) to assess the service quality in the healthcare context.

HEALTH CARE WASTE MANAGEMENT

Health care waste management is a major concern for governments across the world. Reports have been released regularly by various international and local bodies for creating awareness about the hazardous impact of health care waste on humans and animals (Chauhan, 2020). In recent decades, we have witnessed a surge in medical and health care waste, due to an increase in population, an increase in both size and number of healthcare facilities, and an increase of disposable medical products utilization. How to choose an appropriate method for disposing Health care Waste (HCW) can be considered an intricate MCDM problem that needs an extensive process evaluation on potential disposal practices. When procedure of an HCW treatment alternative is chosen, several potential evaluation criteria, e.g., technical, social, economic, and environmental criteria in addition to their corresponding sub-criteria need to be well taken into account. Thus, the conventional MCDM techniques have been used in many case studies to evaluate the technologies applied to waste management in hospitals. We provided details of reviewed MCDM techniques and their applications in waste management in the healthcare industry.

Dursun, Karsak, and Karadayi (2011) proposed fuzzy TOPSIS for analysis and evaluation of HCW treatment alternatives, for evaluating waste treatment in health care. Results of this paper indicated that steam sterilization and microwave are the best approaches as treatment technologies in Turkey. Liu, Wu, and Li (2013) utilized fuzzy VIKOR to evaluate health care waste disposal methods, by evaluating HCW disposal methods along with the MCDM technique. Based on the final ranking, steam sterilization, was the most appropriate HCW treatment technology in Shanghai, China. Liu, You, Lu, and Shan (2014) utilized MULTIMOORA method for assessing and selecting health care waste treatment technology. Ciplak (2015) used MCDM approach to identify, assess and ranking of the best possible health care waste management option, to classify the finest likely health care waste management choice by considering the financial, communal, ecological and technical features. Xiao (2018) proposed multi-granular fuzzy linguistic information to evaluate the HWT technologies. The findings of this paper found that steam sterilization was the best technology for HTW.

HEALTHCARE TECHNOLOGY MANAGEMENT

Healthcare Technology Management, sometimes referred to as clinical engineering, clinical engineering management, clinical technology management, healthcare technology management, medical equipment management, biomedical maintenance, biomedical equipment management, and biomedical engineering, is a term for the professionals who manage operations, analyze and improve utilization and safety, and support servicing healthcare technology. These healthcare technology managers are, much like other healthcare professionals referred to by various specialty or organizational hierarchy names. Healthcare technology management is the name of the field responsible for managing the selection, maintenance, and safe and effective use of medical equipment

and systems. We present the information regarding MCDM techniques and their applications in healthcare technology management.

Taghipour, Banjevic, and Jardine (2011) applied AHP approach to create a hierarchal model to rank medical devices, to rank medical devices by employing a decision-making approach. Bahraminasab and Jahan (2011) used VIKOR approach for selecting the best material for femoral component of total knee replacement. S. Lee, Yang, and Han (2012) used Fuzzy Cognitive Map (FCP) method for selecting of dental implant abutments, where they used the MCDM technique for dental implant abutments selection. Lu, Lin, and Tzeng (2013) integrated ANP, DEMATEL and VIKOR approaches to evaluate the criteria for adoption of Radio-Frequency Identification (RFID), to assess the factors affecting the adoption of RFID in healthcare industry. Ivlev, Kneppo, Bartak, and Economy (2014) utilized AHP and MAUT to analyze medical equipment with management application, and to select and evaluate medical equipment's by using decision-making methods. Angelis and Kanavos (2016) proposed the MAVT approach for evaluating the healthcare technologies, to apply the decision-making method to evaluate new medical technologies. The findings of this study found that, the proposed index could be important for measuring the dimensions of medical technologies. Improta et al. (2018) used the AHP method to assessment of health technology, for health technology assessments for hernia diseases.

HEALTHCARE SERVICES MANAGEMENT

Hospital services is a term that refers to medical and surgical services and the supporting laboratories, equipment and personnel that make up the medical and surgical mission of a hospital or hospital system. Healthcare services in hospitals are the one of the most comprehensive environmental services programs in the healthcare industry today such as hospital specific systems and procedures to extensive training performance, hospital information systems, and emergency department initiatives to the use of the latest technologies and products (Mosadeghrad, 2014). We presented some information regarding the decision-making approaches to assessment of hospital healthcare services.

Vahidnia, Alesheikh, and Alimohammadi (2009) utilized fuzzy AHP approach to evaluate decision factors and their influences on alternative sites. The aim of this study was to choose a proper site to establish a hospital using the fuzzy MCDM technique. Wu, Lin, Peng, and Sciences (2011) used ANP structure to evaluate, rank, and find the best strategy in a hospital, to describe the continuing development of an evaluation model with Balance Score Card (BSC) criteria to help hospital managers select an appropriate strategy. The three hospitals included in this study showed a balance among customer perspectives, internal business processes, learning and growth, and financial measures, as supported by BSC. Tsai, Lin, and Negotiation (2012) employed the fuzzy AHP method to tackle the imprecision and uncertainty of location selection for joint-venture hospitals or clinics, to assess the model of optimal region selection for joint-venture hospitals or clinics in China. The factors such as government policies, investment strategy, and demand conditions are relatively very significant criteria. Leaven and Engineering (2014) used ANP to evaluate and rank the laboratory processes, to optimize performance of a clinical laboratory inside a local hospital system. The results obtained from the ANP model showed that the pre-analytical stage was the most critical one amongst the three stages in the laboratory process. Ahmadi, Nilashi, and Ibrahim (2015) integrated ANP and DEMATEL to facilitate the adoption decision of a hospital information system. The aim of this study was to integrate the mature TOE framework and the HOT fit model, which have been developed recently, for identifying the factors affecting the hospital managers' decision-making process in adopting HIS. The results of this study indicate that perceived technical competence, relative advantage and hospital size" are of a higher significance compared to others. Carnero, Gómez, and making (2016) used the Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH) method for enhancing the maintenance policies in the healthcare organizations. The aim of this study was to identify and rank the best maintenance policies for improving healthcare organizations. The results of this paper found that, quality of healthcare was ranked as the highest policy. Ajmera (2017) integrated

the TOPSIS method with SWOT analysis to rank the best strategy for medical tourism sectors. The outcomes of this study found that, the SO strategy was the best strategy for the medical tourism sectors. Hsieh et al. (2018) integrated AHP and fuzzy TOPSIS to evaluate the significant factors of human errors in the emergency departments. The main objective of this paper was to finding the significant human error factors in the emergency departments. The results of this studies found that, resource management, drew resource management, decision errors and inadequate supervision were the significant error factors in the emergency departments.

CONCLUSION

Multi criteria decision-making approaches were used for solving healthcare decision problems. From the science decision point of view, to handle this decision-making problem, they combined techniques from operational research with artificial intelligence fields. Expert systems, fuzzy linguistic variables, neural networks and multi criteria decision making techniques were used as the methodology. This study aimed to review papers that used the MCDM techniques and approaches for healthcare management in four different areas of application that were published before 2020. This study attempted to categorize these papers into four application areas and scopes: (1) Health care service quality, (2) Health care waste management, (3) Healthcare technology management, and (4) Healthcare services management.

The results obtained from this review show that MCDM approaches and techniques are appropriate for the health care management problems. Each approach and technique may have some drawbacks and advantages, and it cannot be claimed that a particular approach or technique is more appropriate than the others. Various DMs generally disagree on the approach and technique, which is the most valid and suitable. The selection of an approach and technique is mostly dependent on the preferences of DM and the analyst. The methods must be taken into consideration in terms of validity, suitability, and user-friendliness. In addition, it should be realized that employing different approaches and techniques will most likely lead to different recommendations, and it is noteworthy that there may be errors in any approach or technique.

This particular paper has some limitations and recommendations for future studies. First, this study categorized four application areas and scopes. It is recommended for future studies to review papers in different sub-areas of health care management categories. Another limitation is that the data was collected from journals, and the documents do not include textbooks, doctoral and master's dissertations and theses, and unpublished papers on MCDM issues. As a result, in a future study, data can be collected from these sources, and the obtained results can be compared to the results obtained and reported in this study.

The next limitation is that all of the papers were extracted from journals in English; then, the scholarly journals published in other languages were not included in this review. However, the researchers believed that this paper comprehensively reviewed and included most of the papers, which were published in international journals. This paper carefully selected and summarized the available papers of several publishers in Web of Science, Scopus, and Google Scholar. However, a number of relevant outlets might have remained beyond the scope of the current study. Therefore, future studies could review the papers that were not used in the current review.

As another limitation, the paper presents the review of numerous publications, which describe the use of MCDM recently developed methods in journals. However, this review does not cover recent methods that have been published in books. Group decision making (GDM) is a very important factor for comprehensive problem solving, but it was not considered in the group environment, in the majority of the reviewed studies. The approach that considers one single DM is not complete regarding the use of multi-criteria decision making techniques. One of the critical tasks for an organization is personnel selection; therefore, more rational decisions are made by a group of people rather than by a single person. Situations, in which a group of decision makers (each one of different

importance) are involved in the decision making process, should be studied. Hybrid methodology should be developed based on fuzzy linguistic, solving dependency and hierarchical structure for criteria.

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KNOWLEDGE AS THE MOST IMPORTANT RESOURCE FOR CONDUCTING BUSINESS IN THE FUTURE

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ABSTRACT

This study developed and tested a theory-based measure of authentic leadership using separate samples obtained from Republic Serbia, and the United States as well as Republic of Croatia. Confirmatory factor analyses supported a higher order, multidimensional model of the authentic leadership construct (the Authentic Leadership Questionnaire [ALQ]) comprising leader self-awareness, relational transparency, internalized moral perspective, and balanced processing. Structural equation modeling (SEM) demonstrated the predictive validity for the ALQ measure for important work-related attitudes and behaviors, beyond what ethical leadership offered. Finally, results revealed a positive relationship between authentic leadership and a follower performance. Implications for research and practice are discussed. Having established the invariance of the higher-order factor structure across the three samples, we then compared the fit of the three-factor structures (e.g., a one-factor model, a first-order factor model, a second-order factor model) to further assess if the results obtained using U.S. sample would hold in a Serbian and Croatian sample. We concluded that the second-order factor model is preferable. The estimated internal consistency alphas (Cronbach's alpha) for each of the measures were also at acceptable levels: self-awareness, .78; relational transparency, .71; internalized moral perspective, .72; and balanced processing, .75.

Key words: authentic leadership, construct validation, leadership development, ethical leadership.

INTRODUCTION

Authentic (Greek αυθεντικότητα - beginner, causative) legal, legal, true, true, certain, original, credible; which originates really from the one to which it is attributed originally, legally, as it is displayed without premise, the characteristic of personality emerged from itself. Kruse, K. (2013) Authenticity has been explored throughout history, from Greek philosophers to the work of Shakespeare ("To thy own self be true." – Polonius, Hamlet). In Avolio, B. and Wernsing's, T. Essay Practicing Authentic Leadership, They outline there ways authentic leaders should practice self-awareness:

- Seek feedback from the environment
- Use self-reflection to better understand your behavior
- Practice regular self-observation to stay aware of your feelings at all times.

Robbins, S. and Judge, T. (2009) state that for the authentic leadership of ethics as the essence of leadership. Some authors claim Robbins, S. and Judge,T. (2009) that ethics is crucial to complement the image of authentic leadership. According to George. B. (2003) due to ongoing corporate scandals, there were few leaders who advanced as models to "do things right". In an authentic leadership,

George, B. (2003) believes that we need new leaders, not just new laws to get us out of the corporate crisis.

George, B. (2003) convincingly shows that the authentic leaders of companies focused on the creation mission will have far more value in stocks with financially-oriented companies. George B. (2003) is openly talking about the many difficult challenges he has been facing - from ethical dilemmas and fighting with the FDA to his own development as a leader. He says that Authentic Leadership offers inspirational lessons to anyone who wants to be heart-warming and compassionate to those they serve.

George, B. (2003) thinks that the best leaders are independent in their work, advising people to be what they are. George, B. (2003) compares three CEOs of General Electric: the wise Regional Jones, Dynamic Jack Welch and Jeff Immelt who used the delegation. It can be seen that all three are very successful leaders who have been used with three completely different leadership styles. Company GE gathered around their features, adapted to their different styles and flourished with each individual. With the leader, authenticity is important, not a style.

Martin. B. (2018). A year after Authentic Leadership was published, the conversation got buster and the Gallup Leadership Institute of the University of Nebraska-Lincoln held its inaugural summit on Authentic Leadership Development. In 2007, George's True North went further to explain who's an authentic leader and what leaders can do to be more authentic, creating a concept that could be further tested.

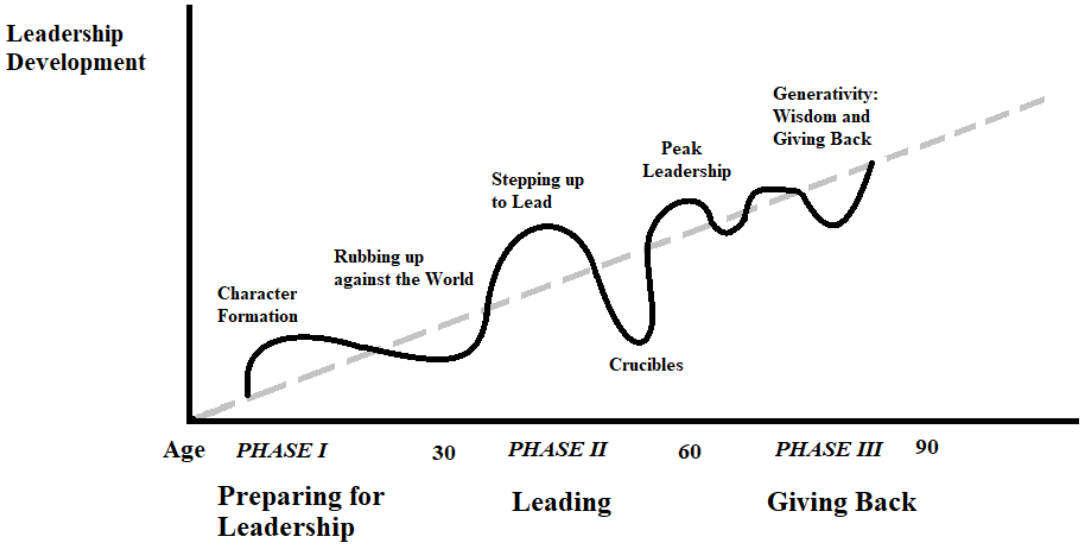

Figure 1.
Source: Bill George's website

The book restated the idea that leadership is not something you are born with, but that authentic leadership, especially, requires constant development and growth. Georg, B. (2003) developed an idea of leadership as o journey, with three distinct phases:

- Phase 1: In the first part of your journey, you prepare yourself for the leadership.
- Phase 2: In the second phase, you start leading by taking on new challenges until you reach the „peak" of leadership.
- Phase 3: In the final part of the leadership journey, you start seeking opportunities to spread your leadership wisdom to others and give back to the community, even though the leadership process continues.

You can see what the journey looks like in the below chart:

Penger, S. & Černe, M. (2014). The purpose of this study is to develop and test empirically a multilevel model of cross-level interactions between authentic leadership at the team level and job satisfaction and work engagement at the individual level. Using data from 23 team supervisors and 289 team members, the study also investigates the mediating role of perceived supervisor support in the proposed cross-level relationships.

To find and understand your role, you must first understand yourself (At the entrance to Delphi on the lion's door it says "Meet yourself"), your passion and motivation that drives you. Then look for an environment that can match your personal purpose with the purpose of the organization. By publishing the essay "Serving as a Leader" in 1970, followed by Greenleaf, "Leadership in Service" (1977), a different paradigm of leadership entered the hearts and minds of people, organizations and societies. Greenleaf, R. (1977) suggested that service should be a recognizable characteristic of leadership. Not only will they create a better, stronger society, but people themselves will "find greater joy in their lives if they have raised the aspect of serving their leadership and built more institutions of service." Greenleaf, R. (1977/2002) is known publicly for the development of the concept of "service management". He clarifies the importance of service and places the ministry as the primary purpose of leadership. Greenleaf, R. (1977/2002) states that if people feel that you are honest in engaging in the service of others, they will follow you fully committed to the common goal.

According to Sajfert, D. (2017), the practice of successful shows that all aspects of leadership – can help an organization increase its competitiveness ability and value. Sajfert, D., & Todorović, J. (2018) state in their monograph that the very inspirational etymological origin of the word itself is a leader. In Serbian, the word "leader", which has roots in Old Persian language, is as old as civilization itself, and its original meaning is to go/travel. According to Sajfert, D., & Todorović, J. (2018) Leadership is a process that involves a two-way flow, that is, a feedback of the influence of the leader and followers on each other. Some people become leaders in the development or transmission of certain successes and shortcomings, charisma and passion, or because of their wealth, military power of name of family name. According to Sajfert, D., & Todorović, J. (2018) Other leaders are because they have great minds and ideas or tell compelling stories. No matter how people become leaders, no one is a leader without willing followers.

An authentic transformational leader helps people change for the better and allows them to improve their lives and the lives of others. Sajfert, D., & Todorović, J. (2018) cite Dostoyevsky: Not the most important wit, but what guides her – character, heart, virtues, generosity and advanced ideas. According to Northouse, P. (2008), this is a small number of working materials of a small group of leadership scholars, established by the W. K. Kellog Fondation Institutions. That small hole of scholars questioned how theory and practice can be used to build a more caring and just society. The ideas and research of this group were published in the editorial board of Joana Ciulla (1998).

According to Max De Pree (1989), the leader works on firm values and states that leadership is a skill that has become a must-read for reading not only within the business community, but also in the professions from the academic community to the political arena. The first edition was published in 1989, the book has sold more than 800,000 copies in printed paper form. According to Max De Pree (2011) this revised edition brings timeless words and practical philosophy Maxa De Pree to the new generation of readers.

The leader must lead the heart. Walton Walter and Earl Bakkenen, founder of Medtronic, had the ability to "burn the soul" of their employees to achieve unimaginable excellence. Nelson, M. (2004) executive director of Carlson Company, is known as the leader in the heart. By coming to a leading position, Carlson Companies inherited a "solid" growth-led organization that was not very empathetic to its employees. Nelson's "moment of enlightenment" took place. She organized a meeting with a group of MBA students who were just studying the culture of the company. When she asked her to make her observations, she came across the silence wall. A young student raised her hand and said the following: We heard from employees that Carlson is a company that "chases" its employees and at the same time does not care about them. Marilyn encouraged this event to look at things better. She designed a program called "Carsol Worries". Immediately began to change the environment using personal passion, motivation skills and genuine interest for employees and clients. She turned to clients and daily socializing with employees in production. With its positive energy, it changed the company's culture, built new relationships with its clients, accelerated growth and improved overall efficiency.

Mother Theresa is a special example of authentic leadership. Many consider her a nun who is concerned about the poor. By 1990, it created an organization of 4,000 missionaries deployed around the world. The organization she founded in Calcutta, the Missionaries of Mercy, has expanded its operations in 450 centers around the world united under the same mission: "Heartbreaking the poorest." Mother Theresa had the clear purpose of her actions, clearly defined values and a heart filled with compassion. She created close relationships with other people and practiced self-discipline - all these are values of authentic leadership.

George, B. et. al. (2007) interviewed several CEOs asking them how they saw their own potential, or how they became what they were. Their work focuses on the personality traits and personality characteristics. They noted that the lack of trust among leaders in the last five years has grown because of a high profile scandal and it has

become necessary to look for a new type of leader. The article focuses on authentic leadership, consisting of people who find their own voice, instead of competing with those who are considered good leaders.

Colins, J. (2001) and his associates did a five-year research. It was sampled (Companies from the "GOD TO GREAT" survey (1965-1995) 1,435 companies from Fortune 500 in the period 1965-1995. The process of selection of the starting number was reduced to companies that had a growth index at least threefold higher than the average of the New York Stock Exchange and maintained it at least 15. They had to be existing, not newly established, and their success was not the result of the success of the industry. The final number of such companies was 11, with an average increase of 6.9 percent than the average of the US economy. is that all 11 excellent companies have CEO leaders who are "of the same variety." Time Collins, J. (2001) proves that leadership of the fifth level is not ideology but an empirical finding. Leaders leading excellent companies are leaders 5. Level 5 contains all of this from the previous levels with one "extra dimension": the paradoxical mix of personal modesty and professional will. The leader of the 5 levels is channeling his ego away from him and as a higher objective sets the creation of an excellent This does not mean that they are not ambitious, they are very ambitious, but their ambition is focused on the institution, not on their own. There is an interesting duality of personality, but full will; humble, and without fear. As a rule, they do not talk about themselves but about the organization. The research clearly showed that they typically come from home, unlike the companies that are compared and missing. Comparable companies have made six times more CEO outsiders than what the OVP did. Also, unlike them, the leaders of the 5th level of their successor determine early and train him for the successor. They will stoically and without compromise do everything necessary for the survival of the organization. Fanatically they were initiated by producing results. When they talk about success they say they were lucky.

Gentry, WA, & Chappelow, C. (2009) have conducted a research on the development of leadership that has traditionally focused on exploring the reasons for success in leadership or executive roles and finding different ways to develop talents of leadership. The research is dedicated to why leaders are failing. Nevertheless, Gentry, WA, & Chappelow, C. (2009) Estimates showed that the average failure rate of leaders in more than one study is 50.5%. This suggests a holistic perspective for understanding the leadership that should be needed, and one thread of research that has brought great interest in recent years is the one that refers to the leader slip.

Avolio, B. et. al. (2004) state that conceptual and empirical links between authentic leadership and attitudes of followers, behaviors and results and their outcomes have not been developed. Although we have a series of articles that develop the theory of authentic leadership and suggestions that appeared in a special edition of The Leadership Quarterly (Vol 16, Issue 3, 2005). The authors presented the obtained results and suggestions based on the created theoretical model and the implications for future construction of theory and practice.

May, D. R. et. al. (2003). They propose a method for fostering sustainable, authentic moral behavior by the leaders. Characteristics of authentic leadership: commitment to transparent evaluation of alternatives, so that decisions are functionally sound and morally justified, it is necessary to show commitment to personal growth and others.

Avolio, B. & Gardner, W. (2005) have made a special theme that is the result of the inauguration summit conducted by the Gallup Leadership Institute at the University of Nebraska-Lincoln in 2004 on the authentic leadership development (ALD). In this introduction, in a special edition, we describe the current thinking in this new field of research, as well as issues and concerns.

Gardner, W. et. al. (2005). In order to address current and future management needs, a model of an authentic leader and the development of followers has been proposed, considering his relation to the real, sustainable performance of the followers. Development processes of self-awareness and self-regulation of the leader and followers are emphasized. Ilies, R. et. al. (2005) tried to examine the concept of authentic leadership and discuss the impacts of authenticity and authentic leadership on the leader and the eudemal wellbeing of the followers, and explore the processes through which these influences are realized.

Cooper, C. et. al. (2005). Recently, researchers have introduced a new leadership structure, called authentic leadership. There is a considerable interest in this new field of study. Scientists working on authentic leadership believe that a recent slowdown in corporate scandals and abuse by management has shown that a new leadership perspective is needed. In order to address these negative social trends, proponents of authentic leadership take a very normative approach, putting emphasis on creating interventions that facilitate the development of authenticity.

Kreiner, J., & Putcha, C. (2005) state that members of the technical profession are guilty of various events that have undesirable effects on society, the environment and the safety of people and ecosystems. While technological innovation improves the standard of living of people, and are, the circumstances that create unanticipated consequences that could be undesirable. In order to meet the challenges of time, engineers must be moral and accountable and aware of the legal implications for decisions made during their practice. In addition, it is of utmost importance that engineers can inform the public of alternatives that must be considered when considering engineering approaches.

Kreiner, J. & Flores, A. K. (2004) everything that engineers do affects the society and its development and, occasionally, the consequences of these actions are not fully thought out, not anticipated, or not fully understood, but the results are undesirable just the same. In order to meet the challenges of the time engineers must be properly prepared to face the moral, legal and ethical ramifications of their actions. Kreiner, J. & Flores, A. K. (2004) thus, to meet their responsibilities to society at large and the global community, engineers must be equipped with the knowledge and ability to fully and cogently explain their actions as well as the methods to be used to implement their decisions. This is particularly important in presenting the engineering alternatives that are considered so that informed conclusions can be drawn and appropriate decisions drawn involving different segments of the society. Educating young engineers about to enter the practice of their chosen profession how to help arrive to the compromises to be implemented becomes one of the paramount items of contemporary engineering education.
Petrović, N. et. al., (2017). states that there are 5 types of behavior of an effective leader, (Petrović et al., 2017):

- Planning, coordinating and organizing activities,
- Supervision of subordinate associates,
- Establishing and maintaining good relationships with subordinate associates,
- Establishing and maintaining good relationship with superiors, associates who are at the same level and external associates,
- Taking responsibility for achieved results, performing the specified obligations and making necessary decisions.

In Brown, M.E. et al. al. (2005). state that the ethical scale of leadership (ELS), for measuring the construct, and assessing its psychometric properties, and in the research, provide evidence of its constructive validity.

Sajfert, D. et. al. (2016). The research conducted was intended to determine the quality of relationships and exchanges between leaders and followers, as well as the importance of ethical leadership in the Serbian metal industry. The research identified several significant recommendations for leaders and high level managers, about what should they in particular focus on in their work. First of all, leaders need to pay more attention to their employees. This means that they need:

- to understand the problems that employees face in their work,
- to recognize the potentials and abilities of employees,
- as well as to demonstrate to employees the extent,
- to which they are satisfied with their work,
- in addition, leaders need to be and have personal integrity.

Only in this way, they can gain and maintain authority over employees.

In Brown, M.E. et al. al. (2005). state that the ethical scale of leadership (ELS), for measuring the construct, and assessing its psychometric properties, and in the research, provide evidence of its constructive validity.

Crawford, J., et.al. (2019). Increasingly poor and unethical decision-making on the part of leaders across the globe, such as the recent Australian Cricket Ball Tampering Scandal, pose a significant challenge for society and for organizations. Authentic leadership development is one strategy that has been positioned as an antidote to unethical leadership behaviors.

Agote, L. et. al. (2015). It is proposed here that authentic leadership (AL) perception can influence followers' trust and emotions during change. To test these hypotheses, we gathered and analyzed the experience of 102 Spanish human resource managers using structural equation modeling based on partial least squares. Findings show that AL is directly and positively related to followers' trust in the leader and the experience of positive emotions.

DIMENSIONAL STRUCTURE OF A HIGHER ORDER AUTHENTIC LEADERSHIP CONSTRUCT

Avolio, B. J. & Gardner, W. (2005). We begin by considering some of the environmental and organizational forces that may have triggered interest in describing and studying authentic leadership and its development. We then provide an overview of its contents, including the diverse theoretical and methodological perspectives presented, followed by a discussion of alternative conceptual foundations and definitions for the constructs of authenticity, authentic leaders, authentic leadership, and authentic leadership development.

Avolio, B. J. & Gardner, W. (2005). a detailed description of the components of authentic leadership theory is provided next. The similarities and defining features of authentic leadership theory in comparison to transformational, charismatic, servant and spiritual leadership perspectives are subsequently examined. Avolio, B. J. et.al. (2004). we conclude by discussing the status of authentic leadership theory with respect to its purpose, construct definitions, historical foundations, consideration of context, relational/processual focus, attention to levels of analysis and temporality, along with a discussion of promising directions for future research.

According to May et. al (2003). exists six characteristics concerning the moral intensity of an issue influence whether or not a leader recognizes an issue as being a moral one, so that the authentic decision-making process can be engaged:

1. Issues vary in the degree to which they have consequences for others.
2. Issues differ in the probability of whether those consequences will occur.
3. Consequences may happen in the near or distant future.
4. Individuals who are affected vary in their degree of social, cultural, psychological, or physical closeness to the leader.
5. The consequences of a decision may be concentrated on a few individuals or spread out among many stakeholders.
6. Issues vary in the degree of consensus others have regarding what the leader should do.

Kouzes, J. M., Posner, B. Z. (2006) building on the knowledge base, of The Leadership Challenge is grounded in extensive research and based on interviews with all kinds of leaders at all levels in public and private organizations from around the world. The authors Kouzes, J. M., Posner, B. Z. (2006) emphasize that the fundamentals of leadership are the same today as they were in the 1980 s, and as they've probably been for centuries. In that sense, nothing's new. While the content of leadership has not changed, the context has-and in some cases, changed dramatically.

As part of a larger theory of optimal self-esteem, Kernis (2003) identifies four core elements of authenticity: self-awareness, unbiased processing, relational authenticity, and authentic behavior/action. Kernis (2003) relational transparency refers to presenting one's authentic leadership (as opposed to a fake or distorted self). Such behavior promotes trust through disclosures that involve openly sharing information and expressions of one's true thoughts and feelings while trying to minimize displays of inappropriate emotions.

To address present and future leadership needs, a model of authentic leader and follower development is proposed and examined with respect to its relationship to veritable, sustainable follower performance Gardner, W. L. et. al. (2005). The developmental processes of leader and follower self-awareness and self-regulation are emphasized. The influence of the leader's and followers' personal histories and trigger events are considered as antecedents of authentic leadership and followership, as well as the reciprocal effects with an inclusive, ethical, caring and strength-based organizational climate Gardner, W. L. et. al. (2005). Positive modeling is viewed as a primary means whereby leaders develop authentic followers. Posited outcomes of authentic leader–follower relationships include heightened levels of follower trust in the leader, engagement, workplace well-being and veritable, sustainable performance Gardner, W.L. et. al. (2005).

George has become the unofficial spokesperson for responsible leadership—in business, the media, and academia. In Authentic Leadership Bill George (2003) makes the case that we do need new leaders, not just new laws, to bring us out of the current corporate crisis. Bill George (2003) persuasively demonstrates that authentic leaders of mission-driven companies will create far greater shareholder value than financially oriented companies. During George's twelve-year leadership at Medtronic, the company's market capitalization soared from $1.1 billion to $460 billion, averaging 35% per year.

ITEM DEVELOPMENT AND VALIDATION

Hinkin, (1995) this article reviews scale developmentprocedures for 277 measures used in 75 articles published in leading academic journals from 1989 to 1994. It points out some of the problems encountered and provides examples of what could be considered "best practices"in scale development and reporting. Based on the review, recommendations are made to improve the scale development process.

Deci, E. L. & Ryan, R. M. (2000) research guided by self-determination theo~has focused on the social-contextual conditions that facilitate versus forestall the natural processes of self-motivation and healthy psychological development. Specifically, factors have been examined that enhance versus undermine intrinsic motivation, self-regulation, and well-being. The findings have led to the postulate of three innate psychological needs- competence, autonomy, and relatedness-which when satisfied yield enhanced self-motivation and mental health and when thwarted lead to diminished motivation and well-being. Also considered is the significance of these psychological needs and processes within domainssuch as health care,education, work, sport, religion, and psychotherapy.

Podsakoff P. M. et. al. (2003) little empirical research has tested the fundamental assumption that these forms of behavior improve the effectiveness of work groups or organizations in which they are exhibited. In the present study, the effects of OCBs on the quantity and quality of the performance of 218 people working in 40 machine crews in a paper mill located in the Northeastern United States were examined. The results indicate that helping behavior and sportsmanship had significant effects on performance quantity and that helping behavior had a significant impact on performance quality. However, civic virtue had no effect on either performance measure.

CONFIRMATORY FACTOR ANALYSIS

We performed a confirmatory factor analysis (CFA) using three independent samples from the United States and the Republic of Serbia and Republic Croatia. The U.S. sample consisted of 220 full-time employees from a large high-tech manufacturer based in the Silicon Valley, San Jose California part of the country who rated their immediate supervisors on authentic leadership behaviors. The average age of respondents was 43.5 years (SD = 8.35), with mean work experience of 13.5 years (SD = 8.22). All respondents had a university degree, and 81% were men. All surveys were distributed by the human resources department and collected on site. Respondents were guaranteed confidentiality in a cover letter from the researchers and endorsed by senior management.

The Serbian sample consisted of 230 full-time employees from two a large state owned company located in Zrenjanin and Belgrade. The average age of the respondents was 25.3 years (SD = 2.78), with mean work experience of 2.83 years (SD = 1.65). Seventy-two percent of the Serbian respondents were women, 20,9% had a senior school education, 45% had a technical secondary education, 15% had a junior college degree, and 17% had a college or university degree. Participants were assured confidentiality in a cover letter from the researchers and endorsed by senior management. All surveys were distributed and collected on site.

The Croatian sample consisted of 210 full-time employees from two a large state owned company located in Zagreb and Osijek. The average age of the respondents was 29.8 years (SD = 2.89), with mean work experience of 4.83 years (SD = 1.65). 53% percent of the Croatian respondents were women, 20,9% had a senior school education, 43% had a technical secondary education, 30% had a junior college degree, and 27% had a college or university degree. Participants were assured confidentiality in a cover letter from the researchers and endorsed by senior management. All surveys were distributed and collected on site.

RESULTS

As we have detailed throughout this article, authentic leaders can have positive effects on a variety of follower and organizations outcomes. Given this, it is important to outline exactly how an organization, through its various human resource management systems, can enhance the authentic leadership of its existing leaders as well as increase the overall level of authentic leadership displayed across all leaders. Table 1 indicates that organizations can improve authentic leadership in two ways.

First, when choosing leaders, there are certain individual differences that have been suggested to underlie each of the components of authentic leadership. Ilies, R., (2005) selecting or promoting individuals who possess these characteristics should yield higher levels of authentic leadership. Second, there are a number of different

developmental initiatives that can be used to foster each of the components of authentic leadership. We briefly discuss how each of the components can be addressed through these two means.

Table 1. Strategies for increasing authentic leadership

Authentic leadership component	**Selection criteria**	**Developmental interventions**
Self-awareness	Positive self-concept Emotional inteligence	Multisource feedback
Unbiased processing	Integrity Learning goal orijentation	Assessment centers
Authentic behavior/acting	Self-monitoring (low other-directedness) Self-esteem	Coaching/mentoring Behavioral role modeling
Relational authenticity	Pastositive relation astositive relationship	Upward feedback Leader-member exchange training

Self-awareness reflects an awareness and trust in one's own personal characteristics, values, motives, feelings, and cognitions. It reflects the extent to which a leader knows his or her strengths and weaknesses and is fundamental to any adaption or development.

Two key personality characteristics that are likely to lead to authentic behavior (and thus should be used to select leaders) is the extent to which a leader is low in other-directedness (a component of self-monitoring)and has light levels of self-esteem. These two characteristics suggest that leaders will not attempt to behave in ways that are inconsistent with their personal values (low other-directedness) and will be secure in their own identity. In terms of developing such authentic for positive behavioral role

Validation of the higher order authentic leadership model: U.S. (California) sample Serbian sample and Croatian sample. We conducted a CFA to examine whether a second-order authentic leadership factor existed and whether it explained the relationships among the four lower order factors, with AMOS maximum likelihood procedure. To assess our results fit, we used several fit indexes, chi-square ($\chi 2$), and the ratio of the differences in chi-square to the differences in degrees of freedom. Given that there is no one acceptable cutoff value of what constitutes adequate fit, we elected to use an CFA value of .94 and an RMSEA value of .066 or less as indicative of adequate fit. For $\chi 2$/df, we interpreted a ratio of less than 3.05 as a good fit.

Using 220 employees from the United States, we compared the fit of two different factor structures. The first was a one factor model, in which all 16 items were indicative of one larger authentic leadership factor. The second was a first-order factor model in which items were allowed to load onto their respective factors (i.e., self-awareness, relational transparency, internalized moral perspective, and balanced processing) and the factors allowed to correlate with each other. However, if tenable, the second-order factor model is preferable because it allows for the covariation among first-order factors by accounting for corrected errors that are very common in first-order CFA.

The fit statistics for are shown in the upper section in Table 2. The results illustrate that the best-fitting model is the second-order factor model. The fit statistics represent a considerable improvement in the chi-square, CFIs, and RMSEAs over the one-factor and first-order factor models and thus suggest that the second-order factor model is preferable. The estimated internal consistency alphas (Cronbach's alpha) for each of the measures were also at acceptable levels: self awareness, .91; relational transparency, .86; internalized moral perspective, .75; and balanced processing, .80. The standardized factor loadings of the second-order factor authentic leadership model are presented in Table 2, with factor loadings ranging from .65 to .92.

Having established the invariance of the higher-order factor structure across the three samples, we then compared the fit of the three-factor structures (e.g., a one-factor model, a first-order factor model, a second-order factor model) to further assess if the results obtained using U.S. follower would hold in a Serbian and Croatian follower. The results are shown in the lower part of Table 2.

The worst-fitting model is the one-factor model in which items were loaded directly on a single-factor authentic leadership, as demonstrated by the relatively poor fit indexes. Assessing whether the second-order factor model is significantly better than the first-order factor model was done using a chi-square test. The difference in chi-square between the first-order factor and second-order factor models, which is distributed as chi-square with

degrees of freedom. The fact that this value is statistically significant would suggest that the second higher order factor model is significantly better than the first-order factor model. The relatively poor fit of the first-order factor model compared to the second-order factor model may be a result of significant relationships among the four measures.

Table 2. Comparison of A Priori Authentic Leadership Questionnaire Factor Structure

Structure	x^2	df	x^2 df	Δx^2	CFI	RMSEA
U.S. follower [a]						
One-factor model (all 16 items)	355.70	101	3.48		.90	.10
First-order factor model	271.63	95	2.83	84.13**	.93	.08
Second-order factor model	233.68	97	2.38	122.07**	.96	.05
Serbian follower [b]						
One-factor model (all 16 items)	248,76	101	2.44		.90	.089
Firs-order factor model	207.70	95	2.16	40.07**	.92	.079
Second-order factor model	175.02	97	1.82	72.75**	.94	.058
Croatian follower [c]						
One-factor model (all 16 items)	246,45	99	2.33		.89	.91
Firs-order factor model	205.65	94	2.05	41.03**	.90	.074
Second-order factor model	189.54	97	2.01	80.62**	.92	.048

Note: All chi-square values are significant at p<001; the $\triangle x^2$ is in relation to one-factor model CFI= comparative fit index; RMSEA = root mean square error of approximation.

a. n= 220
b. n= 230
c. n=210

** p<01 (two-tailed).

Although the results from the U.S. sample are supportive of the higher-order factor model of authentic leadership. This research stressed the importance of testing the reliability and factor analytic structure of a newly developed instrument on new samples to further assess the construct validity. To deal with this issue, we used another field sample consisting of 230 full-time employees from Serbia and 210 full-time employees from Croatia.

Table 3. Authentic Leadership Questionnaire Factor Loadings (Part 1)

Items	Self- Awareness	Relational Transparency	Internalized MoralPerspective	Balanced Processing
AL1	.84 (.70)			
AL2	.92 (.69)			
AL3	.83 (.68)			
AL4	.91(.66)			
AL5		.81(.62)		
AL6		.78(.65)		
AL7		.85 (.63)		
AL8		.84 (.77)		
AL9		.68(.70)		
AL10			.81(.63)	
AL11			.65 (.61)	
AL12			.68 (.67)	
AL13			.76(.73)	
AL14				.73 (.67)
AL15				.86(.73)
AL16				.84 (.68)

Note: The factor loadings in parentheses are for the U. S. data. All the factor loadings are significant at p<001.

Validation of the higher order authentic leadership model: Serbian follower. Prior to conducting our primary CFA analysis, we assessed the extent to which the higher-order authentic leadership construct was invariant across the three countries following guidelines. We first tested two separate baseline models for each sample. Table 1 suggests that the higher-order factor model had an adequate fit across the two samples. Results also suggest that the model performed slightly better for the U.S. follower as the lower RMSEA and higher CFI

indicate. The standardized factor loadings of the second-order factor authentic leadership model are presented in Table 3 (in parentheses), with factor loadings ranging from .62 to .78.

Table 3. Authentic Leadership Questionnaire Factor Loadings (Part 2)

Items	Self- Awareness	Relational Transparency	Internalized Moral Perspective	Balanced Processing
AL1	.83 (.69)			
AL2	.91 (.68)			
AL3	.83 (.67)			
AL4	.90(.65)			
AL5		.80(.61)		
AL6		.77(.64)		
AL7		.86 (.64)		
AL8		.83 (.75)		
AL9		.66(.68)		
AL10			.80(.60)	
AL11			.64 (.59)	
AL12			.67 (.66)	
AL13			.73(.70)	
AL14				.72 (.66)
AL15				.85(.72)
AL16				.81 (.65)

Note: The factor loadings in parentheses are for the Serbia data. All the factor loadings are significant at p<001.

Next, two nested models were evaluated as part of each multi-group analysis: a) an unrestricted model that imposed equality constraints between the three countries (Model 1) and b) a restricted model that specified that all factor loadings, factor variance, and the error covariance were equal (invariant) between the three samples (Model 2). The key indices are the chi-square statistic, CFI, and RMSEA values. A non-significant chi-square difference would provide support for generalizability across the two countries.

Table 3. Authentic Leadership Questionnaire Factor Loadings (Part 3)

Items	Self- Awareness	Relational Transparency	Internalized Moral Perspective	Balanced Processing
AL1	.82 (.68)			
AL2	.90 (.66)			
AL3	.82(.65)			
AL4	.89(.66)			
AL5		.79(.61)		
AL6		.78(.64)		
AL7		.83(.64)		
AL8		.81 (.72)		
AL9		.65(.67)		
AL10			.79(.59)	
AL11			.63 (.58)	
AL12			.69 (.68)	
AL13			.74(.71)	
AL14				.70 (.65)
AL15				.84(.73)
AL16				.82 (.67)

Note: The factor loadings in parentheses are for the Croatia data. All the factor loadings are significant at p<001.

Fit statistics of the unrestricted model were as follows: $\chi 2 = 233.68$, CFI = .96, and RMSEA = .05. In the restricted model the fit statistics were as follows: $\chi 2 = 175.02$, CFI = .94, and RMSEA = .06. In the restricted model the fit statistics were as follows: $\chi 2 = 189.54$, CFI = .92, and RMSEA = .042.This comparison of models was not statistically significant. Given this finding, we concluded that all factor loadings, variances, error covariance, and the covariance, are invariant across the U.S., Serbian and Croatian samples.

The results suggest that the best-fitting model is the second-order factor model as the lower chi-square and the RMSEA as well as the higher CFI indicate. We concluded that the second-order factor model is preferable. The estimated internal consistency alphas (Cronbach's alpha) for each of the measures were also at acceptable levels: self-awareness, .78; relational transparency, .71; internalized moral perspective, .72; and balanced processing, .75.

As with the U.S. sample, the worst-fitting model is the one-factor model in which items were loaded directly on a single factor authentic leadership, as demonstrated by the relatively poor fit indexes. Once again, the relatively poor fit of the first-order factor model compared to the second order factor model may be a result of significant relationships among the four measures. Taken together, these results suggest that there is substantial convergent validity among the four measures and that self-awareness, relational transparency, internalized moral perspective, and balanced processing converge to form a higher-order factor that is indicated by and explains the relationships among the lower-level measures in both the U.S. Serbian and Croatian samples.

Authentic, Ethical and Follower Work Outcomes

The purpose of this study was to examine the psychometric properties and provide further evidence of construct validity and nomological validity for the newly developed authentic leadership measure as a necessary part of construct validation (Hinkin, 1995).

The construct validation process adopted involved a) demonstrating dimensionality and internal consistency, b) demonstrating further convergent validity by showing positive correlations with alternative measures of similar constructs (ethical leadership), and c) demonstrating discriminative and predictive validity. We begin by providing overviews of the ethical leadership theories, with a focus conceptual overlap and distinctions between these theories and authentic leadership theory.

Table 4. Comparisons of Authentic Leadership Development Theory, and Ethical Leadership Theory

Theoretical Components	Authentic Leadership	Ethical Leadership
Authentic leadership		
Leader self-awareness	+	
Relational transparency	+	
Internalized moral perspective	+	+
Balanced processing	+	
Ethical leadership		
Moral person	+	+
Moral manager	+	+

For comparative purposes, the core components of each theory are summarized in Table 4, as wel as the extent to which these components are reflected by other theories. Next, we advance specific hypothesis about the relationships between authentic leadership and ethical leadership, and 2 work outcomes. Finally, we use two independent samples from a large university located in the south-western United States to assess the validity of the authentic leadership.

As Table 4 indicates, there are two core components of ethical leadership: the moral person the moral manager. According to Sajfert, D. i Todorović, J. (2018). In ancient, Romans translated ethics into virtues, ethical values, and moral values. Sajfert, D. i Todorović, J. (2018). They state: "Talent, connections, and money can help you get where you want, but these things don't mean much by themselves. You also have to work hard to be truly successful. Despite their obvious endowments, successful people would not ne where they are if they did not have a somewhat insane work ethic".

Authentic leadership theory likewise distinctive components that are not considered by ethical leadership theory, as Table 4 indicates. Specifically, the focus on self-awareness, relational transparency, and balanced processing all represent features of authentic leadership not captured in operational definitions of ethical leadership. Self-awareness, for example, is particularly important because demonstrating that one is aware of one's strengths and weaknesses helps one to be true to oneself and is critical to being authentic. In addition, developing self-awareness alludes to a deeper process of discovering who one is, that is, learning one's self-concept and self-views, how past events shape current perceptions and behaviors, and how one trends to make meaning of personal experience.

Hypothesis 1: Authentic leadership is positively related to ethical leadership, respectively.

Hypothesis 2: Authentic leadership is positively related to organizational citizenship behavior, organizational commitment, and follower satisfaction with supervisor when controlling for ethical leadership

Table 5 includes the means, standard deviations, correlations, and internal reliabilities for all Study measures. The zero-order correlations among the four measures and outcome variables provide initial evidence that the core authentic leadership construct possesses a good degree of productive validity.

All of the internal consistency estimates are above the commonly accepted .70 level (Nunnally & Berntein, 1994). We first examined a measurement model with all the variables included in each study to assess the relationship between latent variables and the manifest item that serve as their indications. The results of this model produced a good fit to our data: U.S. Sample 1=.052, Serbian Sample 1=.50, and Croatia Sample 1=.049.

Discriminant validity. We expected the authentic leadership measure would be significantly related to ethical leadership. As shown in Table 5, the four dimensions of the authentic leadership are positive and significantly correlated with ethical leadership, providing initial support for Hypothesis 1.

Discriminant validity can be established if the average variance extracted value of the factor in question (e.g. authentic leadership measure) is greater than the squared correlation betveen that factor and another factor. The average variance extracted when all variables are included in the same equation were .52 (U.S. Sample 1).

Table 5. Means, Reliabilities, Standard Deviations, and Correlations (Part 1)

U. S. Sample1 Variables	M	SD	1	2	3	4	5	6
Self-awareness	2,43	.94	.80					
Relational transparency	2.80	.70	.62	.71				
Internalized moral perspective	2.80	.83	.63	.64	.80			
Balanced processing	2.41	.81	.65	.63	.63	.71		
Ethical leadership	3.55	.78	.68	.52	.51	.50	.90	
Organizational citizenship behavior	3.46	.52	.25	.23	.16	.13	.12	.70
Organizational commitment	3.23	.78	.44	.22	.30	.20	.30	.25
Satisfaction with supervisor	1.67	.80	.48	.40	.31	.40	.40	.22

Discriminant validity can be established if the average variance extracted value of the factor in question (e.g. authentic leadership measure) is greater than the squared correlation between that factor and another factor. The average variance extracted when all variables are included in the same equation were .50 (Serbia Sample 1).

Table 5. Means, Reliabilities, Standard Deviations, and Correlations (Part 2)

Serbian Sample1 Variabiles		M	SD	1	2	3	4	5	6
1.	Self-awareness	2,34	.91	.78					
2.	Relational transparency	2.77	.66	.60	.69				
3.	Internalized moral perspective	2.75	.81	.58	.63	.81			
4.	Balanced processing	2.36	.79	.63	.61	.66	.69		
5.	Ethical leadership	3.52	.78	.55	.50	.52	.50	.98	
6.	Organizational citizenship behavior	3.32	.55	.20	.22	.13	.14	.11	.65
7.	Organizational commitment	3.13	.82	.46	.25	.28	.19	.35	.22
8.	Satisfaction with supervisor	1.62	.82	.45	.34	.23	.36	.35	.19

Discriminant validity can be established if the average variance extracted value of the factor in question (e.g. authentic leadership measure) is greater than the squared correlation between that factor and another factor. The average variance extracted when all variables are included in the same equation were .49 (Croatia Sample 1).

Discriminant validity can be established if the average variance extracted value of the factor in question (e.g. authentic leadership measure) is greater than the squared correlation between that factor and another factor. The average variance extracted when all variables are included in the same equation were .60 (U.S. Sample 2).

Discriminant validity can be established if the average variance extracted value of the factor in question (e.g. authentic leadership measure) is greater than the squared correlation between that factor and another factor. The average variance extracted when all variables are included in the same equation were .58 (Serbia Sample 2).

Discriminant validity can be established if the average variance extracted value of the factor in question (e.g. authentic leadership measure) is greater than the squared correlation between that factor and another factor. The average variance extracted when all variables are included in the same equation were .57 (Croatia Sample 2)

Table 5. Means, Reliabilities, Standard Deviations, and Correlations (Part 3)

Croatia Sample1 Variables	M	SD	1	2	3	4	5	6
1. Self-awareness	2,33	.92	.84					
2. Relational transparency	2.76	.68	.55**	.76				
3. Internalized moral perspective	2.71	.82	.54**	.62**	.78			
4. Balanced processing	2.32	.76	.61**	.60**	.62	.68		
5. Ethical leadership	3.58	.76	.53**	.51**	.53	.48	.88	
6. Organizational citizenship behavior	3.22	.59	.21**	.19	.12	.12	.10	.66
7. Organizational commitment	3.23	.68	.41**	.19	.26	.15	.30	.20
8. Satisfaction with supervisor	1.60	.76	.44**	.36	.21	.32	.33	.15

Table 5. Means, Reliabilities, Standard Deviations, and Correlations (Part 4)

U. S. Sample 2 Variables	M	SD	1	2	3	4	5	6
1. Self-awareness	2,50	.927	.82					
2. Relational transparency	2.80	.70	.60	.72				
3. Internalized moral perspective	2.77	.80	.66	.64	.80			
4. Balanced processing	2.40	.83	.65	.64	.66	.72		
5. Idealized consideration	3.48	.79	.55	.56	.50	.48	.90	
6. Individualized consideration	2.30	.90	.53	.50	.54	.50	.76	.80
7. Inspirational motivation	2.58	.90	.53	.40	.58	.40	.78	.60
8. Intellectual stimulation	2.38	.89	.58	.40	.53	.50	.67	.70
9. Organizational citizenship behavior	3.86	.56	.20	.24	.16	.15	.11	.74
10. Organizational commitment	3.23	.85	.40	.24	.30	.29	.30	.22
11. Satisfaction with supervisor	1.51	.80	.44	.40	.39	.49	.48	.26

Table 5. Means, Reliabilities, Standard Deviations, and Correlations (Part 5)

Serbia Sample 2 Variables	M	SD	1	2	3	4	5	6
1. Self-awareness	2,44	.87	.78					
2. Relational transparency	2.74	.72	.63	.71				
3. Internalized moral perspective	2.75	.81	.64	.69	.78			
4. Balanced processing	2.42	.82	.64	.62	.65	.74		
5. Idealized consideration	3.43	.78	.53	.52	.48	.44	.88	
6. Individualized consideration	2.33	.92	.51	.52	.52	.49	.74	.79
7. Inspirational motivation	2.56	.93	.49	.38	.55	.44	.73	.63
8. Intellectual stimulation	2.34	.82	.52	.42	.52	.48	.65	.72
9. Organizational citizenship behavior	3.82	.54	.24	.22	.13	.18	.12	.78
10. Organizational commitment	3.25	.83	.38	.22	.35	.26	.32	.27
11. Satisfaction with supervisor	1.61	.82	.42	.48	.36	.44	.43	.24

Table 5. Means, Reliabilities, Standard Deviations, and Correlations (Part 6)

Croatia Sample 2 Variables	M	SD	1	2	3	4	5	6
1. Self-awareness	2,72	.90	.79					
2. Relational transparency	2.72	.77	.66	.78				
3. Internalized moral perspective	2.72	.77	.62	.60	.76			
4. Balanced processing	2.38	.80	.62	.60	.62	.70		
5. Idealized consideration	3.44	.76	.52	.50	.48	.41	.86	
6. Individualized consideration	2.35	.88	.50	.54	.50	.47	.72	.77
7. Inspirational motivation	2.50	.91	.50	.36	.50	.42	.70	.64
8. Intellectual stimulation	2.23	.81	.51	.41	.50	.46	.63	.73
9. Organizational citizenship behavior	3.76	.52	.25	.22	.11	.19	.13	.77
10. Organizational commitment	3.20	.80	.36	.20	.38	.20	.35	.25
11. Satisfaction with supervisor	1.70	.88	.40	.46	.30	.44	.40	.28

We conducted additional test to establish discriminant validity following (Venkatraman, 1989). To do this, the correlation of authentic leadership with ethical leadership was freely estimated in the first model, whereas it was set to 1.00 in the second model. According to Venkatraman, discriminative validity is evidenced if the unconstrained measurement model fits the data better than the constrained model. That is, "a significantly lower x^2 value for the model with the unconstrained correlation, when compared with the constrained model, provides support for discriminant validity" (Venkatraman, 1989). The results were as follows: ALQ and ethical leadership (unconstrained correlation, x^2 (275) = 578.66; constrained correlation, x^2 (288) = 654.32; $\triangle x^2 = 52.64$, $p < .01$), and authentic leadership (unconstrained correlation, x^2 (432) = 1006.12; constrained correlation, x^2 (431) = 1002.11; $\triangle x^2 = 23$, $p < .01$). These results, together with the CFA result, provide evidence that the authentic leadership is positively related to ethical leadership while also significantly distinguishable from these two leadership behaviors, lending support for hypothesis 1.

Predictive validity. Hypothesis 2 predicted that higher order authentic leadership measure would be positive related to OCB, organizational commitment, and follower satisfaction with supervisor when controlling for ethical leadership (H2a) and authentic leadership (H2b). To test these hypotheses, we used SEM to account for the measurement error, once again using items as indicators of each construct. We used Sample 1 to test Hypothesis 2a and group Follower 2 to test Hypothesis 2b. The results revealed that the higher order authentic leadership measure predicted (ß = .26, $p < .01$), OCB (ß = .28, $p < .01$), organizational commitment (ß = .26, $p < .01$), and follower satisfaction with supervisor (ß = .25, $p < .01$), controlling for ethical leadership. Hypothesis 2a was thus supported. Similarly, we found that authentic leadership measure predicted OCB (ß = .27, $p < .01$), organizational commitment (ß = .31, $p < .01$), and follower satisfaction with supervisor (ß = .32, $p < .01$), controlling for ethical leadership. Therefore, Hypothesis 2b was supported.

In our first sub-model, using group Sample 1 (n = 220), dropping the path from ethical leadership to the criterion variables did not significantly degrade model fit ($\triangle x^2 = 2.78$, ns; $\triangle df = 3$). In contrast, dropping the path from authentic leadership to the criterion variables resulted in substantially worse fit to our data ($\triangle x^2 = 10.12$; $\triangle df = 3$, $p < .04$). Similarly, using group Sample 2 (n = 230), dropping the path from ethical leadership to the criterion variable did not significantly degrade model fit ($\triangle x^2 = 1.45$; $\triangle df = 3$). Similarly, using group Sample 3 (n = 210), dropping the path from leadership to the criterion variable did not significantly degrade model fit ($\triangle x^2 = 1.38$; $\triangle df = 3$). Taken together, the results support the incremental validity of authentic leadership in our data.

DISCUSSION

Our confidence in the plausibility of the higher order factor model of authentic leadership is further strengthened by the observation that no significant differences were found between three diverse samples. For example, the Serbian sample differed from the U.S. sample in that participants were considerably younger, with less work experience, less education. Finally, we should point out here that these results do not address the possible distinctiveness among the measures. It is possible that the scales indicate a higher order factor yet at the same time.

The results indicate positive relationship between the four underlying dimensions of authentic leadership and measures of ethical leadership (Browm, et. al, 2005). In addition, the CFA confirmed that the authentic leadership construct as operationalized ins distinct from these related leadership variables. Thus, provided further evidence of construct validity to the support for the content and convergent validity of the higher order. More important, a closer look at the correlations presented in Table 5 suggests that the four dimensions of authentic leadership correlated positively with ethical leadership and the dimensions leadership but not so highly as to indicate construct redundancy.

We also found that the higher order authentic leadership measure accounted for variance in a diverse set of frequently researched work outcomes beyond that explained by ethical and leadership dimensions. Specifically, the authentic leadership was shown to account for additional unique variance in OCB, organizational commitment, satisfaction with supervisor. Thus, evidence was obtained of the value added by considering the effects of authentic leadership on commonly researched organizational variables beyond existing measures of related leadership constructs.

We suggest that the incremental validity displayed by using authentic leadership measure does not necessarily indicate that it will be a better predictor of performance across all organizational domains. The extent to which these findings are generalizable should await further confirmation. We would also suggest that there may be some performance domains for each of these measures where one may predict the other. For example leadership

may be more predictive thin authentic leadership when predicting performance excellence that far exceeds normal or conventional standards of performance (Lim & Ployhart, 2004). It would certainly be interesting to explore how each of these unique leadership measures predicts a range of unique performance criteria across organizational contexts and culture.

THEORETICAL CONTRIBUTIONS, FUTURE RESEARCH DIRECTIONS, AND LIMITATIONS

The development of the ALQ has implications for future research on authentic leadership in the workplace. Although there has been considerable attention focused on the topic in recent years, empirical research on authentic leadership has been limited. One possible explanation of this shortage of research is the inherent difficulty involved in measuring authentic leadership behavior. On the basis of our preliminary findings, we offer a theory-driven higher order authentic leadership measure (the ALQ) that has initial evidence to support its reliability and validity, consequently providing future researchers with one method for assessing authentic leadership.

Our results suggest that it is possible to discriminate the authentic leadership measure from other related leadership orientations (e.g., ethical leadership Sajfert, D. 2017). At this early stage in the development of the ALQ, we considered differentiating the authentic leadership construct from ethical leadership to be the more important priority. Nevertheless, it is encouraging to note that the basic factor structure of the ALQ held up across the Serbian, Croatian and American settings, suggesting that the core components of authentic leadership may generalize across cultural contexts.

The study has, notable strengths. First, the conceptualization and operational definition of the new authentic leadership were theoretically driven. Thus, although results from CFAs suggested that the measure could be further improved, it is unlikely that the basic conceptualization will expand to include additional major sub-dimensions. Other strengths include the use of multiple samples of followers and leaders from a broad spectrum of organizations and cultures and relatively large sample sizes for the testing and cross-validation of the instrument.

PRACTICAL IMPLICATIONS

This research has practical implications for organizations interested in authentic leadership development. Given sweeping concerns regarding ethics and leadership, the scales offer organizational human resource professionals one reliable and valid instrument for examining the level of authentic leadership exhibited by its managers.

The notion that authentic leaders may possess the ability to enhance follower commitment and citizenship behaviors is very promising, especially given the positive relationship between these constructs and performance. Indeed, by combining authentic, and ethical, leadership, we may be able to provide some of the strongest positive impacts on long-term motivation and sustaining high levels of performance.

Overall, given recent attention being paid to the role that leaders play in follower engagement at work, and suggestions that engagement at work is best enhanced when employees feel they are supported, recognized, and developed by their managers, our findings may be especially timely and relevant to practitioners. Moreover, given the spate of high-profile unethical cases of leadership, the authentic leadership may prove to be a useful means of providing early evidence to identify those leaders who may not always adhere to the highest ethical and moral principles in terms of their decisions, actions, and behaviors. Such data could be used as the basis for recommending further leadership development or for more closely monitoring of the leader to avoid ethical meltdowns in organizations.

CONCLUSION

In this article we have outlined a four-component model of authentic leadership and then described the antecedents and outcomes of these components for leaders and followers. In addition, we discussed the mechanisms through which authentic leaders can positively effect followers and provided implications for research and practice. Given the relative newness of the construct of authentic leadership, we hope

that our model will (see Table, 1.) a) stimulate further conceptual development in the areas of psychological authenticity and authentic leadership, b) lead to a programmatic effort to develop a multicomponent measurement framework for authentic leadership, c) inspire empirical investigations of antecedents and outcomes of authentic leadership such as those specified herein, and d) aid researchers and practitioners working on the design of interventional programs aimed at developing the authentic leaders of tomorrow.

Discriminant validity. We expected the authentic leadership measure would be significantly related to ethical leadership. As shown in Table 5, the four dimensions of the authentic leadership are positive and significantly correlated with ethical leadership and the four dimensions leadership, providing initial support for Hypothesis 1.

As stated at the outset, this research was driven by three main objectives: (a) to develop and test a higher order authentic leadership measure, (b) to demonstrate the utility of authentic leadership as a construct by documenting its ability to explain additional variance in key organizational outcomes beyond ethical leadership, and (c) to provide insight into the relationship between authentic leadership and follower job satisfaction and performance. To accomplish these objectives, four independent samples were employed—two from a university setting and two from field settings. Of the field studies, one was conducted in the West (United States - California) and the others in developing economies (Serbia and Croatia) using a sample of state-owned and multinational firms, respectively. The use of such diverse samples enhances the potential generalizability of the findings while bringing into focus the context in which leadership is embedded (Kreiner, J. 1996 , Kreiner, J., & Putcha, C. (2005), Sajfert, D. 2018, Sajfert, D. et. al. 2017).

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OPPORTUNITIES FOR THE DEVELOPMENT OF INNOVATIVE ECONOMY IN RUSSIAN REGIONS: EXPERT ASSESSMENTS

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ABSTRACT

The purpose of the paper is to identify the opportunities for the development of innovative economy in Russian regions by using expert assessments. Opportunities for the development are assessed on a five-point scale based on the influence strength and the implementation opportunity. To process the survey, we use a fuzzy logic device that allows presenting the results as an optimistic and pessimistic forecast. Expert assessments of the opportunities for the development of innovative processes have shown a variety of expert opinions and high level of consistency on a number of fundamental issues. Experts highly appreciated the importance of developing innovative infrastructure. However, the probability of creating such infrastructure is estimated at a low level. Experts highly appreciate the impact of government programs on the development of innovative processes. The probability of their implementation is estimated at the middle level in an optimistic forecast, and at the low level in a pessimistic. As for the power of the state's influence on the functioning of market economy entities, the conclusion is made about its high level in the optimistic forecast and middle in the pessimistic; the probability of its implementation is middle according to the optimistic version and low in the pessimistic.

Key words: innovative economy, Russian regions, expert assessment

INTRODUCTION

Innovative development of the economy is declared one of the most important directions of state policy at the Federal level in Russia. A natural consequence of this attitude is the formation of directions for the development of an innovative economy with the participation of Federal and regional authorities (Getmantsev et al., 2018); Treshchevsky et al., 2018). The scientific literature explores various opportunities for the development of innovative processes. Attention is paid to the formation of "smart cities", especially within urban agglomerations (Treshchevsky et al., 2018; Mkrttchian et al., 2018; Plotnikov et al., 2019; Getmantsev et al., 2019), improving education systems (Treshchevsky et al., 2019). To clarify the opportunities for the development of innovative processes in Russian regions, we conducted a survey of experts from four cities in Central Russia: Voronezh, Bryansk, Kursk, and Orel. The experts were professors from the universities of these cities involved in the development of strategic planning documents at the regional and municipal levels.

MATERIALS AND METHODS

Questions for the expert survey were formulated by the expert community of the Voronezh region, which included teachers of the Voronezh State University, employees of the Department of Economic development of the government of the Voronezh region, heads of enterprises and banks in the region.

In total, experts formulated 18 opportunities. In the future, the authors of this paper divided the issues into three blocks: the impact of state programs; the creation of innovative infrastructure; and the actions of the state in the sphere of activity of market economy entities. Experts assessed the impact of each of the opportunities and the probability of its implementation. The probability was estimated not in the classical version - from 0 to 1.0, but in points from 1 to 5. At the same time, the authors of the paper proceeded from the need to ensure comparability of the results of the assessment of the power of influence and the probability of its implementation. The five-point scale is used because it is well known in Russia and has been tested in assessing the level of students' knowledge. All experts have a clear idea of what each score means. Points were assigned to each opportunity as follows: the power of influence of the opportunity / the probability of implementing of the opportunity is the most significant 5 points; significant 4 points, insignificant 3 points, extremely insignificant 2 points. There are no absolutely insignificant opportunities among the formulated ones, since they were proposed by the expert community as relevant. To obtain a general assessment of the power of influence and the probability of the realization of opportunities, the arithmetic averages were calculated. The average values were adjusted to identify an optimistic and pessimistic variant, using fuzzy indices for each opportunity. The calculation of fuzzy indices is made according to the method of Konysheva et al (2011), Nazarov (2016). The general meaning of using the fuzzy index for this purpose is as follows: the larger the fuzzy index, the less consistent the expert opinions are. Therefore, including it in the correction by reducing the values of the arithmetic mean, we tend to be pessimistic, because we are guided by the opinions of experts who evaluated the opportunities at a low level. Adjusting the average by increasing it, we focus on the optimal option, that is, on the opinions of experts who rated the opportunity highly.

The calculations were carried out using the Excel program according to the following formulas:
Adjusted average (pessimistic version) – formula 1:

$$Xicn = \frac{\bar{x}i}{1 + \bar{x}i \times Ki} \quad (1)$$

Where:
$Xicn$ – adjusted average value of the power of influence or the probability (pessimistic variant)
$\bar{x}i$ – average value of the i-th parameter (opportunities)
Ki – fuzzy indices of the i-th parameter (opportunities)

Adjusted average (optimistic version) – formula 2:

$$Xico = \bar{x}i + \bar{x}i \times Ki \quad (2)$$

Where:
$Xico$ – adjusted average value of the power of influence or the probability (optimistic variant)
$\bar{x}i$ – average value of the i-th parameter (opportunities)
Ki – fuzzy indices of the i-th parameter (opportunities)

The calculation results were rounded to hundredths of a unit.
The interpretation of the results was carried out as follows: above 4 points – a high power of influence or probability of realization of the opportunity, from 3 points to 3.99-an average influence, from 2 points to 2.99 points-a weak influence.

RESULTS

The results of calculations of the average values of the impact of programs for the development of the innovative economy are presented in Table 1.

Table 1: Power of influence of programs for the development of innovative economy in the region

Opportunities for developing an innovative economy	Assessing the impact of opportunities			
	Average value	Fuzzy indices	Adjusted average (pessimistic version)	Adjusted average (optimistic version)
1. Development and implementation of federal state programs that ensure innovative development of the economy	4,60	0,06	3,66	4,86
2. Development and implementation of regional state programs that ensure innovative development of the economy	4,20	0,07	3,30	4,47
3. Expanding the region's participation in the implementation of the National technology initiative	4,44	0,08	3,30	4,79
4. Implementation of PPP projects with the participation of universities and research institutes	3,78	0,09	2,82	4,12
5. Implementation of information policy aimed at increasing the prestige of innovative and scientific activities; promotion of innovative culture through the media and the Internet	4,00	0,06	3,27	4,22

As can be seen from the data presented in Table 1, all programs for the development of the innovative economy received a high rating for the optimistic version. The highest possible ratings do not exceed the average value for the pessimistic version. The lowest rating was given to the impact of public-private partnership (PPP) projects with the participation of universities and research institutes (opportunity 4). The highest points were awarded to programs for the development of the innovative economy at the Federal level, including those involving the region (opportunities 1, 3). The calculation of the impact of infrastructure projects is presented in Table 2.

Table 2: Power of influence of infrastructure projects for the development of innovative economy in the region

Opportunities for developing an innovative economy	Assessing the impact of opportunities			
	Average value	Fuzzy indices	Adjusted average (pessimistic version)	Adjusted average (optimistic version)
6. Development of innovative infrastructure (engineering centers, technology transfer centers, centers for the collective use of scientific equipment, technology parks) with the participation of the state	4,56	0,06	3,53	4,84
7. Creation and development of innovative clusters	3,89	0,04	3,40	4,03
8. Opening and development of technology parks with an acceleration program and production centers for collective use of equipment	3,78	0,10	2,78	4,14
9. Creation of scientific and educational centers based on integration of universities, scientific organizations and their cooperation with enterprises	4,11	0,08	3,13	4,42
10. Formation of inter-university research centers for the creation and commercialization of innovative developments	3,67	0,05	3,13	3,84

As can be seen from Table 2, the most optimistic option was the development of innovative infrastructure that includes engineering centers, technology transfer centers and other high-tech structures with the participation of the state (opportunity 6). The lowest rating is a pessimistic variant of innovative development based on the centers of collective use of technoparks (opportunity 8). The average level of influence was assigned by experts to innovative objects with the participation of research institutes and universities (opportunities 9, 10). Table 3 presents the results of calculations of the power of influence of opportunities for the development of the innovation economy based on the state's actions in its market sector.

Table 3: Power of influence of state actions in the sphere of activity of market economy subjects

Opportunities for developing an innovative economy	Assessing the impact of opportunities			
	Average value	Fuzzy indices	Adjusted average (pessimistic version)	Adjusted average (optimistic version)
11. Formation of cooperation with foreign companies to introduce technological and product innovations; integration of regional producers into international value chains	4,33	0,08	3,18	4,69
12. Creating an environment for online communications between innovation developers, businesses and government agencies	4,11	0,08	3,12	4,43
13. Central Bank's reduction of the key rate	3,67	0,11	2,61	4,07
14. The influx of venture capital	4,00	0,06	3,23	4,24
15. Formation of the intellectual property market	3,67	0,09	2,74	4,01
16. Expansion of training and retraining of specialists with competencies that meet the requirements of the innovation economy	4,00	0,10	2,88	4,39
17. State support for talented scientists and specialists in the field of scientific, technological and innovative activities	4,22	0,07	3,22	4,53
18. State support for small innovative enterprise	4,33	0,05	3,54	4,56

An analysis of the data presented in Table 3 allows us to state that the greatest potential for innovative development is in cooperation with foreign companies in introducing technological and product innovations (opportunity 11). Low values of the power of influence on innovation processes were assigned by experts to reduce the Central Bank's key rate (opportunity 13) and to train specialists with competencies that are adequate to the requirements of the innovation economy (opportunity 16). This assessment seems rather strange, since in this case the experts were well-known representatives of university science in Central Russia. Table 4 presents data characterizing the probability of implementing programs to develop an innovative economy in the region.

Table 4: Probability of implementing of programs for the development of the region's innovative economy

Opportunities for developing an innovative economy	Assessing the probability of implementing opportunities			
	Average value	Fuzzy indices	Adjusted average (pessimistic version)	Adjusted average (optimistic version)
1. Development and implementation of federal state programs that ensure innovative development of the economy	4,20	0,08	3,18	4,52
2. Development and implementation of regional state programs that ensure innovative development of the economy	3,67	0,10	2,72	4,02
3. Expanding the region's participation in the implementation of the National technology initiative	3,67	0,03	3,28	3,78
4. Implementation of PPP projects with the participation of universities and research institutes	2,89	0,06	2,46	3,06
5. Implementation of information policy aimed at increasing the prestige of innovative and scientific activities; promotion of innovative culture through the media and the Internet	3,33	0,04	2,90	3,48

It is noteworthy that experts lower than the power of influence estimate the probability of implementing programs for the development of the innovative economy of the region. Thus, only two

opportunities (1 and 2) received a high rating even for an optimistic variant. According to the pessimistic version, three opportunities are rated at a low level (2, 4, 5). In terms of influence, only one opportunity was evaluated for the pessimistic option at a low level (table 1). PPP projects with the participation of universities and research institutes received the lowest values for the power of influence and the probability of realizing opportunities. Table 5 presents data that characterize the probability of implementing infrastructure projects for innovative development of the region's innovative economy.

Table 5: Probability of implementing of infrastructure projects for the development of the region's innovative economy

Opportunities for developing an innovative economy	Assessing the probability of implementing opportunities			
	Average value	Fuzzy indices	Adjusted average (pessimistic version)	Adjusted average (optimistic version)
6. Development of innovative infrastructure (engineering centers, technology transfer centers, centers for the collective use of scientific equipment, technology parks) with the participation of the state	3,63	0,09	2,75	3,94
7. Creation and development of innovative clusters	3,56	0,07	2,89	3,79
8. Opening and development of technology parks with an acceleration program and production centers for collective use of equipment	3,33	0,05	2,84	3,51
9. Creation of scientific and educational centers based on integration of universities, scientific organizations and their cooperation with enterprises	3,33	0,09	2,57	3,63
10. Formation of inter-university research centers for the creation and commercialization of innovative developments	3,00	0,08	2,44	3,23

The data presented in Table 5 demonstrate a high level of pessimism among experts regarding the probability of realizing opportunities for developing innovative economies based on infrastructure projects. Even in the optimistic case, there is no rating that reaches a high level (according to the power of influence four opportunities were assigned the highest value). According to the pessimistic version, all opportunities were assessed as weak (only one opportunity received the "weak influence" rating for the strength of the influence). In other words, experts believe that the probability of implementing infrastructure projects that are of high importance for the development of innovative processes in the economy of the regions is low. Similar calculations were made with regard to the actions of the state in the sphere of functioning of market economy entities. According to the optimistic version of the assessment, three opportunities received a high level of probability (12, 16, 18). The probabilities of implementing other features are estimated at the average level. In a pessimistic survey, only the opportunity «State support for small innovative enterprise» received an average rating, while the rest received a low rating. The probability of cooperation with foreign companies in the innovation sector (2.23 points) received the lowest ratings for the pessimistic variant, while the optimistic one received the inflow of venture capital (3.22 points).

CONCLUSIONS

Thus, expert assessments of the opportunities for developing innovative processes in the regional economy demonstrate both a variety of expert opinions and a fairly high level of consistency on a number of fundamental issues. Among the agreed positions, a high assessment of the significance of the development of innovation infrastructure with a low probability of these events is essential. In

addition, experts highly appreciate the power of influence of state programs and projects for the development of innovation processes. The probability of their implementation with an optimistic forecast is estimated mainly at the average level, with a pessimistic one, mainly at a low level. With regard to the power of the state's influence in the functioning of market economy entities, an optimistic conclusion is made about its high level. In the pessimistic version, the power of influence is estimated mainly as average. The probability of implementing various forms of such participation is generally average according to the optimistic version, and low according to the pessimistic one.

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PROCESSES FOR IMPROVING BUSINESS QUALITY WITHIN THE FRAMEWORK OF INDUSTRY 4.0

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ABSTRACT

Quality of products and services are an imperative metric for achieving competitiveness on the international market. Therefore enterprises should focus on satisfying the needs of customers through adequate quality management systems. The necessity for high quality products and services comes not only from the expectations of customers, but also from the requirements put on by the fourth industrial revolution - Industry 4.0. SMEs have to conduct business within the frameworks of Industry 4.0. In this paper the focus is on product and service quality, but also on overall business quality. A theoretical model for business quality improvement is proposed and suggestions for improving business quality are discussed. The paper acts as a basis for future research in this domain and provides useful insight into the domain of business quality within the framework of Industry 4.0.

Key words: Business quality, Industry 4.0, Product quality, Competitiveness.

INTRODUCTION

Small and medium-sized enterprises (SMEs) amidst the changes which are brought by the globalization of markets face challenges when it comes to achieving a competitive position on the international market. Besides the challenges which are brought on by globalization, SMEs have to conduct business within the framework of the fourth industrial revolution - Industry 4.0, in order to obtain adequate competitive ability (Ungerman, Dedkova, & Gurinova, 2018). The Industry 4.0 concept is characterized by the application of advanced information-communication technologies (ICT) such as cloud computing, Internet of Things (IoT), Internet of Value (IoV), social product development, advanced robotics, wireless sensors, cyber-security, machine learning, blockchain technology, 3D printing, Big Data Analytics and other (Lu, 2017). These high-end technological solutions have the potential to increase productivity and overall business performance. However, it is necessary to address cost-benefit ratios when it comes to implementing a modern Industry 4.0 technological solution, as this will decrease the potential risk of implementation failure. Besides the importance of modern technology application in various business processes, product quality, and overall business quality also have a key role in achieving competitiveness. Effective quality management has be shown to improve innovation processes and competitiveness (Kafetzopoulos, Gotzamani, & Gkana, 2015). This further implies that high quality products have a bigger chance to increase the competitive ability of an enterprise. Now, domestic enterprises lack adequate quality products, productivity, and the average age of manufacturing equipment is between 20 and 30 years (Ćoćkalo, Đorđević, Bogetić, Bakator, & Bešić, 2019). Therefore, domestic enterprises are far from

being competitive on the global market. This further results in with low competitiveness on a national level. Certainly, there are issues which have to be addressed.

In this paper the importance of business quality and conducting business within the frameworks of Industry 4.0 are analyzed. The goal of the paper is to present a model for improving business quality as an important metric of competitive ability. The paper consists of four main sections (excluding the *"Introduction"* and *"Conclusion"* sections). First, conducting business within the framework of the fourth industrial revolution is discussed. Next, the importance of quality management and business quality is addressed. In the third section, the model for improving business quality is presented and discussed. In the fourth section, suggestions and guidelines for improving business performance and business quality are proposed. Afterwards, conclusions are drawn and guidelines for future research are proposed.

CONDUCTING BUSINESS IN THE FOURTH INDUSTRIAL REVOLUTION - INDUSTRY 4.0

SMEs have to adapt to the changes which are partly brought by the globalization of markets, and partly by Industry 4.0. Conducting business within the frameworks of Industry 4.0 involves three main aspects of a SME business model which are value creation (tasks and processes which operate in a business ecosystem with a goal to provide value for the customer), value offer (specific, individual products and services of a company, which are offered to the customer) and value capture (monetization of value which is given to the customer - means of compensation by the customer), (Müller, Buliga, & Voigt, 2018). In the same study it was noted that Industry 4.0 is not only changing manufacturing systems, but also overall working and living environments. It is evident that modern technologies which are the core of the Industry 4.0 concept have the ability to create value for customers more easily through higher innovation potential. Therefore, Industry 4.0 principles and the whole concept is rather appealing to SMEs as it provides technologies which may improve flexibility, customer proximity and reactivity (Moeuf, Pellerin, Lamouri, Tamayo-Giraldo, & Barbaray, 2017). Some of the Industry 4.0 principles include real time data management, virtualization, interoperability, agility, decentralization, integrated business processes and orientation towards services (Mittal, Khan, Romero, & Wuest, 2018). Through modern ICT technologies SMEs have the ability to mere effectively develop innovations which add value to their customers, hence increasing their competitive ability on the global market. Certainly, without innovation-rich and high-quality products SMEs can hardly achieve a sustainable competitive position of globalized markets. Industry 4.0 technologies have made it possible for enterprises to develop newer, leaner business models which can give them a better chance on the market.

Implementing modern technologies requires adequate management and employee expertise, adequate financial resources and infrastructure as well as a well-defined long-term strategy for the implemented technology. This a higher rate of success is ensured, as implementing a modern technology can impose certain risks to the enterprise. Risks of implementing Industry 4.0 technologies within SMEs are the lack of expertise in SMEs, short-term strategies without long-term strategic goals, speed of technological advancement which could make a newly implemented technology obsolete, and employee resistance as they can perceive Industry 4.0 technologies as a tool of surveillance (Moeuf et al., 2019). In the same study the main success factors of implementing Industry 4.0 technologies in SMEs are pointed out which are employee training, conducting a thorough analysis before starting a project, adequate communication between employees and managers, hierarchical alignment within the company, managers participating with other managers in exchanging support, continuous improvement strategy, good IT infrastructure, and simplification of Industry 4.0 tools.

It is evident that conducting business within the framework of Industry 4.0 requires SMEs to implement and apply technologies which allow the increase of innovation, productivity and quality of products in order to achieve and maintain a competitive position on the market. However, as noted before, there are risk involved in the implementation and application of these modern ICT, and it is an

imperative for enterprises to carefully calculate the benefit-risk ratio in order to avoid critical failure especially in severely dynamic markets such as high-tech markets. In the next section, the importance of product quality, quality management and business quality overall in the process of achieving competitiveness is addressed.

QUALITY AS AN IMPERATIVE FOR ACHIEVING COMPETITIVENESS

Quality management and its main practices: strategic quality planning, supplier quality, supplier quality, process monitoring and control and strategic quality management, represent critical quality management practices and they affect business quality and financial performance (Parvadavardini, Vivek, & Devadasan, 2015). Therefore, it is necessary for an enterprise to practice quality management principles. There is a certain link between quality performance (number of final products without the need of rework, and perceived quality market outcomes) and competitive advantage of an enterprise on a market (Kafetzopoulos, & Gotzamani, 2015). If taken into consideration the constant fragmentation and segmentation of markets, it is evident that SMEs have to adapt in order to maintain a competitive position on these markets. Now, product and service quality also have to adapt, meaning that quality has to be improved over time in order to satisfy the needs and expectations of customers. As SMEs are an important part of economic growth, it is necessary for them to achieve adequate business and market performance. Delivering consistent and high quality products and services can positively affect competitiveness on the market (Kr Singh, 2011). When it comes to implementing quality management systems, it was found that it has the potential to increase business performance and improve competitive advantage. Now, enterprises have to address the cost-benefit ratio when considering the potential benefits of an effective quality management system. Surely, such system can improve product quality, but research has shown that product quality doesn't necessarily come from implementing quality management systems nor does a quality management systems secure constant quality (Bakator, & Ćoćkalo, 2018). This is due to the fact that enterprises tend to increase quality short term in order to acquire a quality management system certificate, and afterwards the increase in quality decreases to previous levels. Hence, organic quality, and organic increase in quality is far more important compared to certification. This further indicates that SMEs don't necessarily need a quality control system which is based on a certified quality management system, but rather focus on the needs of the customers, and organically increase quality where needed.

Increasing product quality can reduce manufacturing costs, which further allow SMEs to sell their products for a competitive price. This way a more favorable position on the market can be achieved. Based on the noted function of quality in SMEs, it is safe to assume that quality plays a crucial role in achieving and maintain a competitive position on the market.

A MODEL FOR IMPROVING BUSINESS QUALITY

After analyzing the characteristics of conducting business within the framework of Industry 4.0, and considering the importance of product quality and overall business quality for achieving competitiveness on the international market, a model for improving business quality is developed. The model is presented on Figure 1. It integrates several crucial quality management tools and concepts with the goal to broadly address quality issues and challenges within an enterprise. The main goal of the model is to depict the main mechanics in the business quality improvement process.

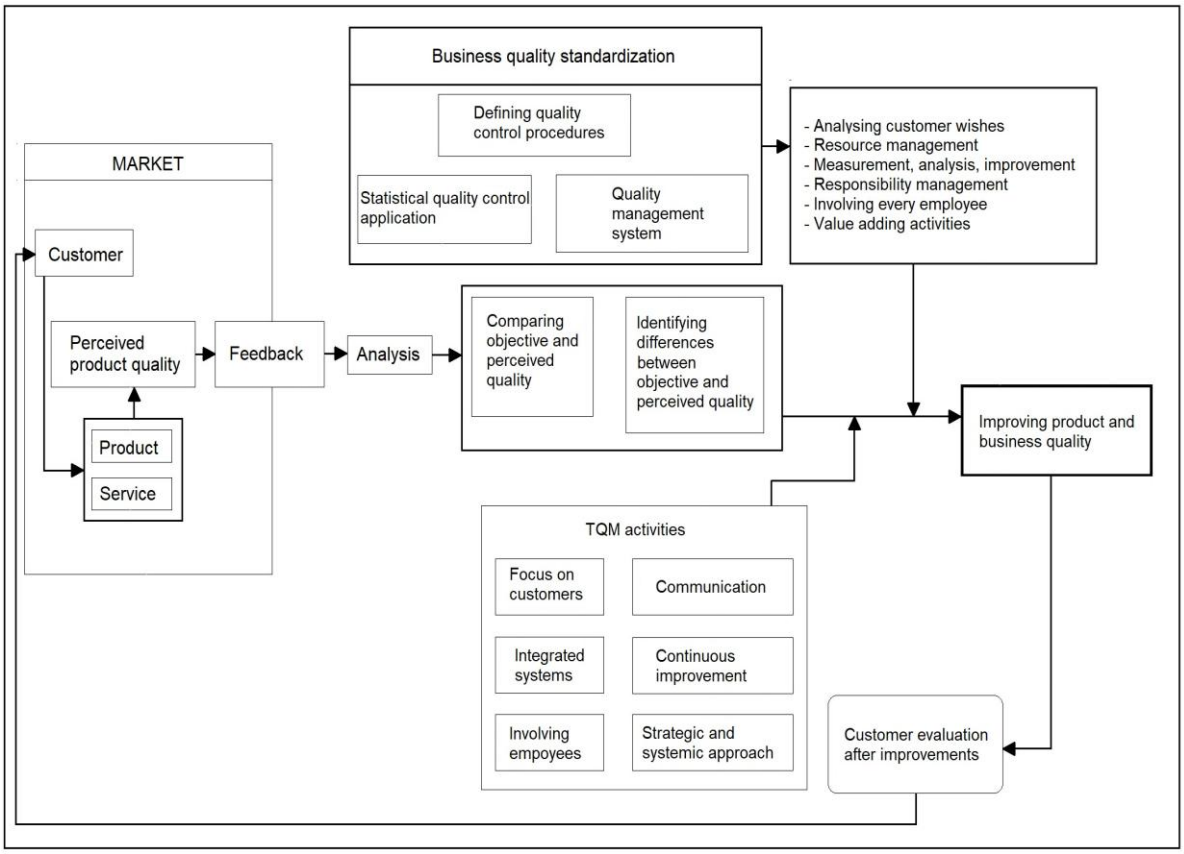

Figure 1: A model for improving product quality and overall business quality

Based on Figure 1. it is evident that at the core of the model is the analysis of customer feedback, and according to this feedback data, improvements are made. Additionally, details on the model's elements and sub-elements are noted:

- Market - includes the customers, products, services, and how customers perceive the quality of these products and services.
- Feedback - the main element of the model and the core of the improvement process. Through the feedback information from the customers, the enterprise analyses customer satisfaction and arranges adequate changes and improvements.
- Analysis - objective quality and perceived quality is compared and differences are identified. This way gaps between objective and perceived quality can be reduced in order to increase product quality.
- Business quality standardization - includes defining crucial quality control procedures and processes which should be controlled, statistical quality control, and the implementation of quality management systems. This module of the model is connected and interlaced with other activities such as: analyzing customer wishes; resource management and effective resource allocation; measurements of the current state in the enterprises, analyzing and conducting improvements; defining and managing responsibility; involving every employee in the improvement process; and conducting value adding activities.
- TQM activities - includes several concepts such as focus on customers' wishes, needs and expectations; implementing and developing integrated systems within the enterprise; involving employees in the quality improvement process; effective communication between employees regardless of the hierarchical structure in the enterprise; aiming at continuous improvement of business processes and improving procedures in order to increase business quality; and strategic long-term planning with a systemic approach to improving business activities.
- Customer evaluation after improvements - in order to increase product quality and business quality overall, it is necessary to conduct periodic re-evaluations of customer satisfaction and the level of their fulfillment.

The presented model graphically presents the potentially effective activities which may increase business quality. This increase in business quality (including product and service quality) may further positively affect business and market performance. This assumption is based on the notions discussed in the literature review section of this paper. Namely, increasing product quality can increase the competitive ability of an enterprise, as higher quality and lower number of defect products allows enterprises to sell their products for a more competitive price on the market. The improvement measures in this particular model are mainly generalized and specific improvement actions depend on the type and size of the enterprise, market size, industry, and other business and market metrics.

SUGGESTIONS AND GUIDELIES FOR IMPROVING BUSINESS QUALITY

Taking into consideration the domestic economy, the business performance of domestic enterprises on globalized markets and the models of conducting business within the framework of Industry 4.0, suggestions and guidelines for improving business quality are proposed. As note earlier in this paper, quality management, and high quality products and services are an imperative for achieving and maintaining a competitive position on the market. The suggestions and guidelines are as follows:

- SMEs should analyze perceived and objective quality and optimize product quality accordingly;
- Standardizing quality through procedures, statistical quality control applications, and quality management systems;
- Analyzing customer wishes is a crucial part of developing products and services which will bring success on the market;
- every employee should be involved in creating value;
- SMEs should focus on customers and on continuously improving product, service and process quality;
- Establishing a cost-effective infrastructure for improving product, service and process quality, as this would reduce improvement costs in the long-term;
- SMEs have to develop a strategic as systemic approach towards improving their products and services.

As domestic enterprises lack productivity, quality, innovation and ICT application, the main goal is to improve these metrics in order to increase the competitiveness potential on the international market. The presented model in this paper provides a concise insight into the improvement dynamics of business quality. Continuous improvements based on customer feedback is an important and necessary first step towards better competitive ability.

CONCLUSION

The lack of high and constant quality products, the lack of innovation, and the lack of modern ICT applications are the main issues that domestic enterprises face and which make it difficult, and virtually impossible for domestic SMEs to be competitive on globalized international markets. Standardizing product quality is the first crucial step towards increasing overall business quality. However, continuous improvement is needed for long-term success and strong competitive positon on the market. Besides the challenges which are brought on by the globalization of markets, and their constant fragmentation and segmentation, the concept and conducting business within the framework of Industry 4.0 also puts pressure on domestic SMEs. It can be concluded that the prolonged transitional process of the Serbia has taken its toll, as the fast-paced changes in the domain of manufacturing, marketing, quality, and innovation, are a lot for the average domestic enterprise.

The main limitation of this paper is the lack of empirical data from domestic enterprises. However, given the goal and concise nature of the paper, this limitation is acceptable. For future research it is recommended to analyze quality improvement methods and tools applied in domestic enterprises. The collected should be compared to other published data in this domain. Further, this opens doors for a structured meta-analysis. This study provides solid basis for future in this domain.

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THE IMPACT OF ADVERTISING ON OLDER CONSUMERS

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ABSTRACT

Nowadays companies are too little aware of the importance of the target group of older consumers, which today is definitely ahead of the rest of the target group, as the number of older people only increases over the years, while the number of births decreases. Therefore, it is even more strategically important for companies to not only focus on young customers, who are still the most desired consumers, but also start focusing on older generations and their needs for specific products or services. Targeting the older generation considering life stage, health, marital status, hobbies, lifestyle is presented as a more efficient approach to reconstruct positively images of ageing. This main goal of this paper is to find out how advertising in the print media affects the purchasing decisions of older customers. We investigated how factors based on print media (price, quality of a product or service, attractiveness of a print ad) affect their purchasing decisions. We will also try to identify the advantages and disadvantages of print media for older customers and what they think about advertising products or services in print media themselves. Research has shown that the print media are present in the lives of older customers and influence their purchasing decisions.

Key words: Advertising, print media, older consumers, older generation, consumer behaviour.

INTRODUCTION

Changes in population structure matter due to the extent to which organizational and social lives are often built on past notions of age rather than on present and future changes. Thus, life in industrial nations has been typically structured round age-related transitions from education to employment to retirement. The embedded economic assumption was that there were sufficient numbers in work to support those not working. Aging populations, with recent improvement in incomes, health and nutrition resulting in increasing longevity, raise marketing as well as major public policy challenges (Gratton & Scott 2016). Similarly, flexible working practices and gradual transitions between life-stages result in more heterogeneity among older individuals, making re-examining earlier views of aging necessary. In marketing, age is often conceptualized in chronological terms, whereby product ranges are targeted to those above a certain age, such as 65 (Nunan & Di Domenico 2019).

Regarding the current underrepresentation and misrepresentation of the over-50's population and the negative consequences marketing can have in self-image, attitudes and behaviours, recommendations for future campaigns based on a more informed and empathetic approach have been considered. Targeting the older generation considering life stage, health, marital status, hobbies, lifestyle is presented as a more efficient approach to reconstruct positively images of ageing through more acceptable and numerous depictions of older people, taking part in the socialisation process and putting an end to age discrimination (Gimenez 2019).

Creative media advertising is an advertising strategy where in a non-traditional medium is creatively used for advertising purposes. This novel advertising strategy is gaining marketers' interest; however, little is known about its persuasive effects on consumers' cognitive, affective and behavioural responses and the processes that underlie them (Rauwers et al. 2018).

ADVERTISING AND OLDER CONSUMERS

Major brand marketers over the years have demonstrated a distinct obsession with age. People are segmented off into age ranges like 18 to 34, 35 to 50, and over-55, as if our buying patterns, motivation, and lifestyles are homogenous and based primarily on how many years we've been alive. Life stage and age have been decoupling over the past generation, with milestones like education, marriage, kids, career, and retirement becoming unmoored from traditional age constraints (Beer 2019).

The world needs experienced, creative, older people in the advertising industry. Brands need to target not only a younger audience a greater priority in needed for older consumers. Ultimately, we need to achieve balance. Balance in the work place, balance in the audiences and, most of all, balance in our approaches to advertising and marketing. The IFA currently partner with WHO to host a series of webinars that are part of an ongoing dialogue to bring to knowledge, new ideas and innovation around age-friendly environments and to end ageism (Mokhiber 2019).

There is much that the advertising industry can do to amend their perpetuation of these negative images of ageing. Apart from the need for a change of attitude by young advertising executives who see themselves as the most important group in society, there is also the problem of limited creative imagination among the advertising industry when dealing with older consumers. It is easier to use the shorthand of stereotypical messages than it is to face the creative challenge of producing sophisticated, innovative well researched, un patronising advertising campaigns featuring and targeting older consumers. There is evidence of a small number of advertisers who have managed to create advertising, which uses older people as integral members of society, rather than as something quaint, comical or to be pitied (Carrigan &Szmigin 2000).

Older people consume like everyone else; some are less affluent and buy discount brands; others are more prosperous and buy premier brands. All wish to be treated with respect and dignity. This means that advertising which is targeted at them should be aspirational in their terms, and when portraying old age, it should use fit, active and healthy role models from their own generation. At the same time, if advertisers use older people to reach younger markets, their portrayal should avoid mockery and ridicule. Many older consumers wish to see at least some advertisements with which they can identify, and will switch to brands which recognise their existence and portray them as attractive people with plenty to offer. By behaving detrimentally towards older people, advertisers not only violate their ethical responsibilities, they also potentially violate their commercial responsibilities by failing to reach an important and affluent consumer market. It is time for the advertising community to assume their responsibility for the ethical standards of their industry towards the older generation (Conway 2019).

The presence of older models in ads associated with an adequate representation of ageing can contribute to responding to their spiritual needs. First, as they need to restore their personal dignity, older adults are very sensitive to the place given to them in advertisements. Seeing older models who give a realistic yet respectful representation of ageing gives them the feeling that they have a valuable place in society. An adequate representation can also reduce the negative stereotypes associated with ageing, and contribute to improving the image that people have of the elderly. Then, using older models in ads contributes to reducing the anxiety and the negative feelings such as not being understood and feeling lonely (Chevalier & Moal-Ulvoas 2018).

EMPIRICAL FINDINGS

First, we prepared a survey questionnaire containing open and closed questions. The survey was conducted in major cities across Slovenia. We asked random people over 65 years old.

The main purpose of the survey was to obtain how advertising in printing media is influencing purchasing decisions of older consumers.

The total number of respondents for carrying out a market survey was 100 of this, 70 were women and 30 were men. In the following, we were interested in the age group of the respondents, finding that 59 persons belong to the age group between 65 and 75 years, 35 persons belong to the age group between 76 and 85 years, at least, only 6 persons in the sample are older from 85 years.

First, we were interested in how much attention the respondents paid to the print media.

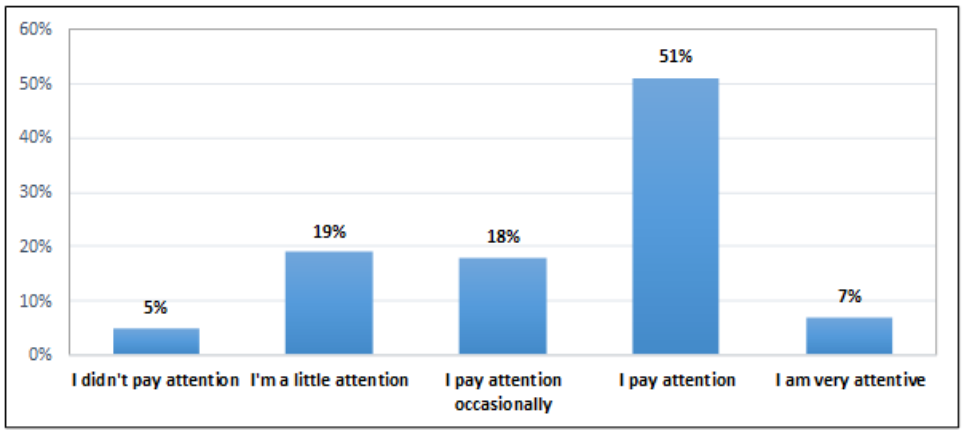

Figure 1. Attention paid to print media

Most respondents (51%) said that they pay attention to print media, while 19% of respondents said they pay a little attention to them. 18% occasionally pay attention to print media

Then we interested in which print media respondents noticed the most advertisements.

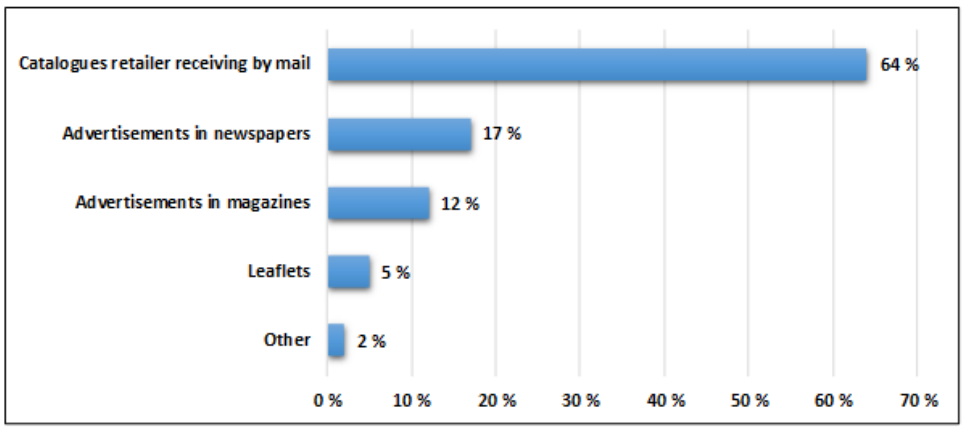

Figure 2. Advertisements in print media

Furthermore, we were interested in which retailing companies' ads attract the most respondents.

We have provided ten different retailing companies with the possibility that respondents can select the three companies whose ads are most attractive to them. However, they were able to choose an answer that did not concern any pre-proposed retailing company. The most frequently mentioned companies were Tus (42%), Lidl (41%), Mercator (38%) and Hofer (37%). Spar (31%) was mentioned less frequently, followed by E. Leclerc (19%) and Eurospin (18%). Jager mentioned 10% of respondents, Rutar 8%, and Hervis only mentioned 3% of respondents. 35% of the respondents answered that they were most attracted to the advertisements of a retailing company which was not given among the

possible answers. 4% said they were not attracted to any retailing company, and one person did not answer the question.

We were also interested in what attracted the most respondents to retailing companies' ads. Several answers were possible.

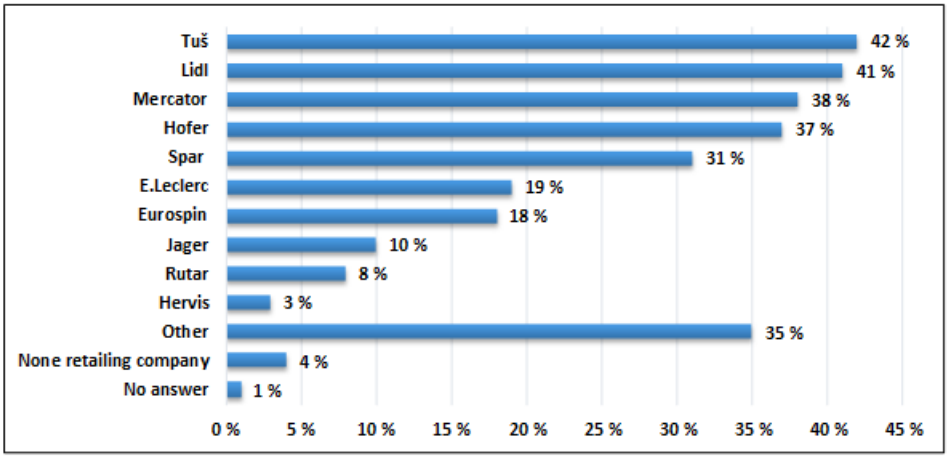

Figure 3. Advertisements in retailing companies

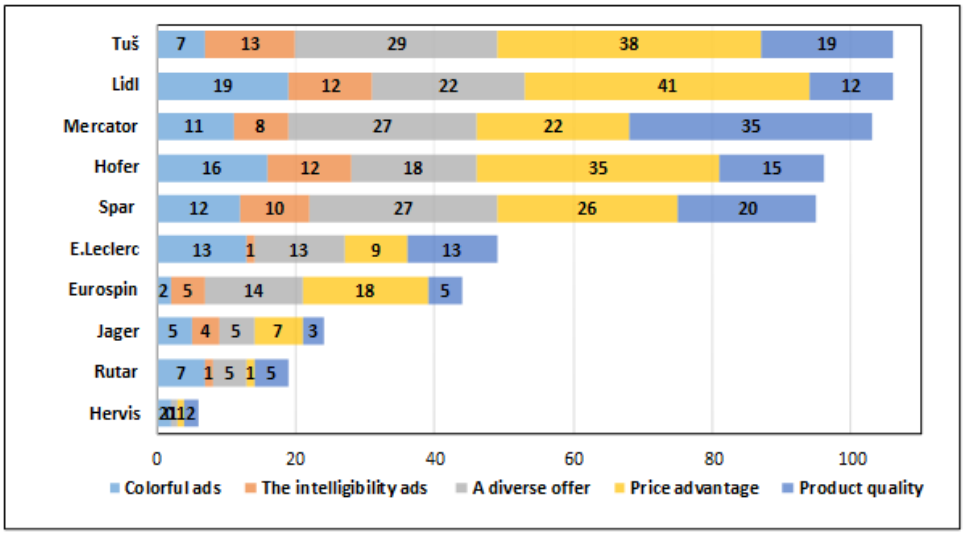

Figure 4. The most attractive ads to retailing companies

The respondents had several possible answers to this question. Thus, they were able to decide, among other things, whether the advertisements of the given retailing companies were more attracted by the colour of the advertisement, the intelligibility of the advertisement, the diverse offer, the price advantage, the quality of the products or the combination of all of the above.

Respondents were most attracted to the colour of the advertisement with Lidl (19), the intelligibility of the advertisement with Tuš (13), Lidl (12) and Hofer (12), the diverse offer at Tuš (29), Mercator (27) and Spar (27), Lidl (41) and Tuš (38), and the quality of products attracts the respondents by far the most at Mercator (35).

We were further interested in how often respondents decide to purchase a particular type of product / service based on an advertising in print media.

Table 1. : Estimate the frequency of a product / service purchase based on an advertising in print media

	Frequency estimate (%)				
Products / Services	Very rare	Rarely	Occasionally	Often	Very often
Food products	5	9	23	42	21
Medical devices	17	20	29	29	5
Home and household products	17	24	38	20	1
Cosmetics	19	22	40	15	4
Cleaning products	20	28	37	12	3
Clothing and footwear	25	24	36	13	2
Products for free time	39	17	26	17	1
Travel and vacation	48	18	21	12	1
Furniture	55	24	17	4	0
Appliances and Electronics	59	23	14	3	1
Motor vehicles	82	15	2	1	0

The table shows that respondents most often decide on an advertising in print media to buy food products. They are followed by medical devices and home and household products. But the least decide to buy motor vehicles, appliances and electronics.

We were also interested in how different factors affect a respondent's purchase of a product / service based on a visible advertising in print media.

Table 2. Impact of various factors on the purchase of a print advertising product / service

	Impact assessment (%)			
Factors	Not Influence	Less influence	Partly influence	Very influence
Price	4	2	16	78
Usefulness	4	4	27	65
Product quality	4	7	26	63
Features	6	15	37	42
Design	10	23	35	32
Brand	30	25	28	17

As many as 78% of respondents believe that the price has a great influence on their purchase of the product / service. Impact strength is followed by usability, with 65% saying it has a big impact on their purchase, and a product quality that has a big impact on purchase in 63% of respondents. Features that have a very strong influence on 42% of the respondents and a design that has a great influence on the purchase in 32% of the respondents have a slightly weaker influence on the purchase.

We were interested in whether the respondents see a print advertising intended for older customers.

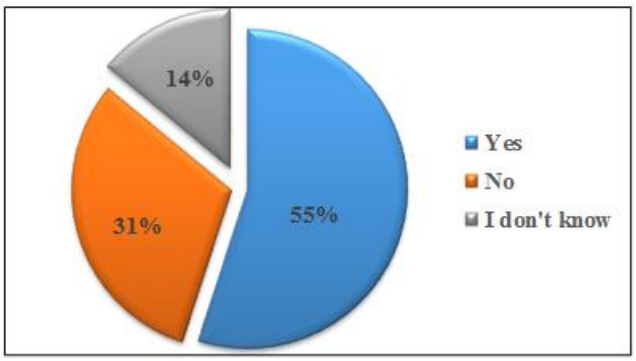

Figure 5. Advertising aimed at older consumers

In this issue, we primarily think about the advertising of certain products, which we somehow associate with older customers, and this generation is also acting in these advertising.

55% of respondents said yes, 31% said they did not notice such an ad, while 14% of respondents were not sure whether they perceived such an advertising or not.

We were interested in the questionnaire whether the respondents agreed with the statement that too few products are advertised for older customers.

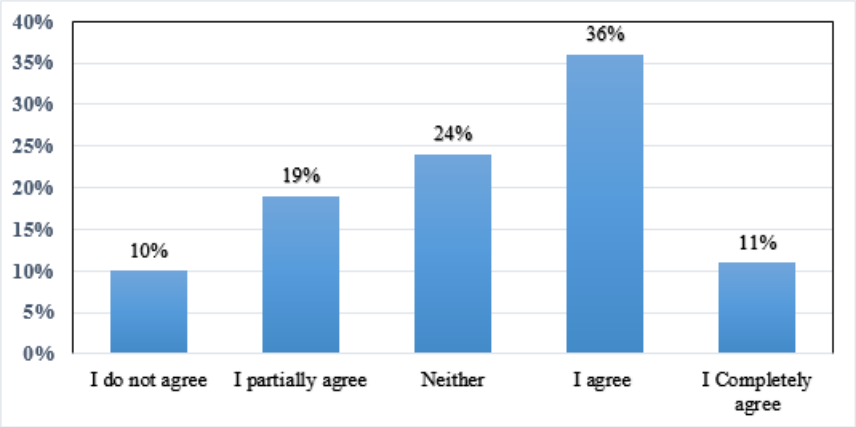

Figure 6. Do you agree with the claim that too few products are being advertising to older customers?

11% of respondents completely agree with the statement that not enough products are advertised for the elderly, and 10% of respondents disagree with this statement.

We were interested in whether the opinion of the respondents would require older people to be present in advertising aimed at older consumers.

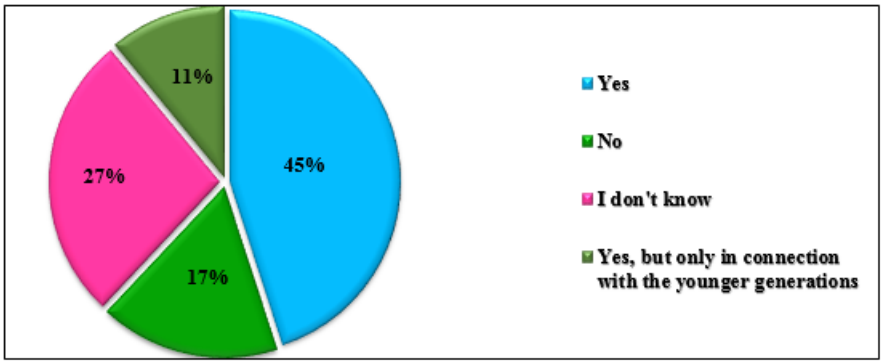

Figure 7. In your opinion, should older people be present in advertisements aimed at older consumers?

45% of respondents believe that older people should be present in advertisements aimed at older consumers, while 11% think that they are only related to the younger generations. 17% of respondents believe that older people do not need to appear in such advertisements.

We were also interested in how often respondents had difficulty reading print media.

Respondents have problems with small fonts and numbers. 27% of the respondents answered that this is often happens. A small image format of products / services is also a common problem. 41% of respondents have occasional problems with the Unintelligible display of price discounts. This is mainly about showing the prices of products at a discounted price, but the product is still paid at full price and the discount is transferred to the loyalty card.

Table 3. Estimation of the frequency of problems with print media

	Problems (%)				
Products / Services	Not at all	Rarely	Occasionally	Often	Very often
Fonts and numbers are too small	15	12	33	27	13
The product / service image format is too small	16	15	34	23	12
Unintelligible display of price discounts	22	19	41	15	3
Low quality paper (colour prints, inks)	24	21	32	20	3
Fluorescent and vivid colours of print ads	24	27	34	14	1
Shiny paper in magazines	25	30	28	16	1

CONCLUSION

Numerous products and services are emerging in the global and domestic markets today. Businesses have no easy task in how exactly their product or service should attract a potential customer. Strategic decisions and decisive approaches are needed. Namely, not every target group can be persuaded to buy in the same way. Younger generations are increasingly attracted to the so-called modern media, such as tweb, social networks, mobile telephony. This is increasingly being approached by the middle generation and gradually by the older generation. Older people still attach great importance to classic media, such as television, radio, print, mainly because of their habit and ease of use.

Given the increasing trend of aging population, older people have also become an important target group of many companies. With daily information and news on the market, they have become more determined and demanding customers. They make a thoughtful purchase decision. They attach great importance to the price and usability of the product. Print media still play an important role in their lives and purchasing decisions. Receiving commercial material from retailing companies in mailboxes still attracts their attention. They are attracted by the advertisements because they are colourful, with a brief outline of the product description and price. Advertising messages, therefore, are almost directly in hand. This allows them to read multiple times, for an unlimited period of time, to compare product features and prices, and to decide whether to buy a product or not, where to buy it, when to buy it and at what price.

Businesses, however, continue to promote products in the print media that would primarily target older customers. The needs of the elderly have changed over the years. Thus, it is necessary to visit products such as various medical devices, medicines, special nutrition, cosmetics, etc. These products are often overlooked by companies whose materials we receive almost every day at home.

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Session A: MANAGEMENT AND OPERATION MANAGEMENT

Papers (pp. 49-108):

ENVIRONMENT IMPROVEMENT ASPECTS IN THE PROCESS OF COMPETITIVENESS AND SUSTAINABLE DEVELOPMENT OF DOMESTIC ENTERPRISES

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ABSTRACT

Economic activities are related to social development as well as to the environment. Improving economic activities has an impact on social development as well as on environmental damage. Countries with similar levels of competitiveness can achieve very different results in the field of social development and environmental protection due to their different priorities and choices of policies. In this paper the complex process of achieving competitiveness and sustainability in domestic enterprises is reviewed. In addition, the environment improvement indicators in 2019 for Serbia are analyzed. The main goal of the paper is to thoroughly review the aspects of improving the environment and at same time taking into consideration the process of acquiring competitive ability and sustainable development of domestic enterprises. Namely, the importance of paper comes from the necessity for sustainable development and long-term competitiveness achievement in today's globalized markets. Domestic enterprises face challenges when it comes to competitiveness and sustainable development.. Therefore, a better understanding of the underlying indicators is needed in order to develop strategies for improvement. On this basis, the paper provides a solid basis for future research in this domain.

Key words: Environment improvement, Competitiveness, Sustainable development, Domestic enterprises.

INTRODUCTION

Economic growth does not occur independently from the environment. Each economic activity affects the social environment, the community and the individual, as well as the environment. In the time ahead, national economies should focus on economic growth together with sustainable social development, taking into account the protection and improvement of the environment and the needs of individuals. According to the World Economic Forum (WEF, 2019, p. ix;), it has become clear that the issue of environment, social and economic development all must be taken into consideration together in order to effectively develop a unique agenda for resolving these issues.

Countries with a similar level of competitiveness can achieve very different results in the field of social development and environmental protection. This is due to different priorities and policies which are defined on a governmental level. When it comes to circular economics guidelines, global supply chains should encourage greater visibility and control over resources. In this respect, it is necessary to establish ethical and sustainable supply chains in which the products are shared equally (WEF, 2019).

In this paper the road to sustainable development and achieving competitiveness of domestic enterprises is discussed. The paper has three main sections (excluding the Introduction and Conclusion sections). The first section briefly analyzes the importance of productivity, research and development (R&D), and quality for achieving competitiveness and sustainable development. Next, the indicators of environment improvement in 2019 for Serbia and the Western Balkans are analyzed. Finally, guidelines for improvement are presented.

THE IMPORTANCE OF PRODUCTIVITY, R&D AND QUALITY

It is possible to decompose economic growth into three basic elements: growth in the labor force, growth in the sector of physical resources and capital, and productivity growth (WEF, 2019, p. 26). For future development and economic growth, it can be argued that the only option is a productive economy which is based on reduced carbon-dioxide emissions. The labor force, manufacturing and other business equipment, and the exploitation of natural resources contribute to overall economic productivity and positively affects revenue. However, the by-product is pollution. Conducting business should focus on creating products and services, new investments and improving the quality of life. Creating new products and services that meet the needs and requirements of consumers is the primary goal of businesses. New investments create an opportunity to improve business processes. This improvement is primarily in the area of R&D and production capacity. Classical investments should also be accompanied by investments in education. A company operates/conducts business to generate profits and long-term goals, while constantly meeting the needs of consumers and the wider community. Inclusive growth implies a focus on job creation and reducing poverty rates.

According to some studies (Đorđević, i Ćoćkalo, 2007, p. 27), the goal of implementing the TQM concept is to improve the quality of life. The ultimate goal is to achieve business excellence in the organization and to achieve world-class products and services. In the conditions of globalization these products and services create preconditions for long-term growth and development of the enterprise. This growth and development is based on satisfaction of all segments of society. In sum, it is evident that increasing productivity, R&D activities and focusing on product quality through customer needs, are important aspects and metrics of achieving long-term competitive ability on the international market. Similarly, these metrics are important for sustainable development of domestic enterprises in Serbia.

INDICATORS OF ENVIRONMENT IMPROVEMENT IN 2019 - SERBIA AND THE WESTERN BALKANS

Institutions are one of the most significant factors pointing to the state and opportunities in the domain of environmental improvement. In the report of the World Economic Forum on Global Competitiveness, institutions are analyzed as the first pillar of competitiveness. Within this pillar there are several sub-metrics/criteria, and the possibilities of improving the environment directly arise from the criteria of the government towards the future. Within this criteria, as an integral part of the institution's competitiveness pillar, the following determining factors can be identified: long-term vision, energy efficiency legislation, renewable energy legislation, and issues which are related to the legislation of environmental hazards.

When it comes to long-term vision (mainly government), in 2019, Serbia ranked 80th in the world (out of 141 countries covered by the report). In terms of the government's ability to respond to changes in the environment, Serbia is ranked 75th in the world. Regarding energy efficiency legislation, Serbia is ranked 34th in the world. Regarding the legislation related to the issue of renewable energy sources, Serbia is ranked 65th in the world. Finally, when it comes to the issue of possible environmental threats, Serbia ranks 79th in the world. In Table 1., a comparative overview of institutional impacts and potential environmental hazards in the Western Balkans region for 2019 is presented.

Table1: Comparative overview of institutional impacts and potential environmental hazards in 2019, Western Balkans region (WEF, 2019, p. 102, 174, 398, 434, 498, 514)

Country	Global competitiveness rank	Long-term vision	Energy efficiency regulation	Sustainable energy regulation	Environment hazards
Bosnia and Herzegovina	92	138	-	-	132
Montenegro	73	79	-	-	79
Croatia	63	137	36	51	17
North Macedonia	82	119	-	-	126
Slovenia	35	97	-	-	11
Serbia	72	80	34	65	79

It can be seen from Table 1. that the above countries are ranked lower when it comes to the existence of an exact long-term vision by the state administration in relation to the global competitiveness index. Croatia and Serbia are better ranked than the aggregate Global Competitiveness Index when it comes to energy efficiency legislation. Croatia and Slovenia are significantly better ranked when it comes to the issue of potential environmental hazards than the cumulative competitiveness index, primarily due to the fact that they are required to follow and apply all EU directives in relation to environmental protection. On the other hand, Bosnia and Herzegovina, Montenegro, Northern Macedonia and Serbia are ranked lower in terms of environmental hazards in relation to the aggregate competitiveness index. The share of use of renewable energy sources in total energy consumption can be a guiding criteria in relation to the state of the environment. Further, in Table 2. share percentages of renewable energy sources consumption in 2019 are presented.

Table 2: Share of renewable energy sources consumption (WEF, 2019, p. 102, 174, 398, 434, 498, 514)

Country	Share percentage of renewable energy consumption
Bosnia and Herzegovina	40,8%
Montenegro	43%
Croatia	33,1%
North Macedonia	11,3%
Slovenia	20,9%
Serbia	21,0%

The improvement and protection of the environment are in direct contact with companies developing and implementing new technological solutions in this field. Companies developing clean technologies (solar energy, wind energy, bio-fuels and bio-materials, green buildings, water filtration, personal transport, intelligent networks, etc.) are at the very top of business organizations in terms of innovation and competitiveness. When it comes to the growth rate of innovative companies, Serbia ranked 83rd in the world (Israel is the leader in both areas) according to the 2019 World Economic Forum Report (WEF, 2019, p. 499-501). Clean technology companies are often clustered to achieve the best economic and development impact. With regard to this issue - the state of development of clusters at the level of the national economy, Serbia is ranked 104th in the world according to the aforementioned report of the World Economic Forum for 2019 (Italy is the leader in the organization of cluster organizations). Based on the presented data on the growth rate of innovative companies and the development of cluster organization, as a basic prerequisite for the development of companies engaged in the development of clean technologies, the domestic economy is relatively worse than the aggregate competitiveness index (72nd place in the world), and especially in relation to the developed world and most EU countries.

Also, improving the environment also requires larger investments. The five-year average foreign direct investment inflow to Serbia was 6.1% of GDP. This average FDI inflow is not enough to invest in clean technology companies. According to some opinions, the share of fixed investment in GDP is

currently among the smallest in the region, with no realistic chance of making any significant improvements. The main reason for this situation is the very low level of private investments (excluding foreign direct investment) (Nikolić, i Petrović, 2019, p.31). The development of clean technologies implies stronger investments in this area. There is a necessity for establishing regional centers, better incentive programs in this domain, education programs which will results in experts in the field of clean technology.

GUIDELINES FOR IMPROVEMENT

Some of the guidelines related to the promotion of environmental protection and, more broadly, the concept of sustainable development in the domestic economy are:

- Improving legislations related to environmental protection;
- Larger investments in environmental protection;
- Assisting the state and local communities in establishing clusters in the field of clean technologies;
- Improving environmental education.

When it comes to improving environmental legislation, there is a particular need to work in the segment related to stimulating action. Here, the system of tax incentives for those business organizations that regularly invest in protecting the environment, as well as stimulating actions towards new investments in environmental protection and promotion (access to funds, non-commercial loans, etc.), is particularly relevant. In the case of investments, all investors, both domestic and foreign, should be stimulated for the part of the investment which is related to the implementation and development of clean technologies. The most important instruments for the development of clean technologies are considered to be: access to capital, support for research and development, quality workforce, policy support, and vision (Pernick, i Wilder, 2008, p. 242).

The assistance of the government or local community in the formation of clusters in the field of clean technologies is important both for economic development and for enhancing innovation. The clean technology sector acts as a job multiplier. This type of production requires more jobs than existing technologies. On the other hand, innovation is the key to the success of the entire high-tech sector, including clean technologies. The key directions for action involve incentive programs and investments in this domain. In addition, regional clean technology development centers are a key point in the sustainable development agenda. Clusters are a form of networking of SMEs. Implementing long-term strategies, such as the development of clean technologies, requires regional integration, which involves overcoming barriers created by cluster-forming countries. Regional clusters represent the concentration of interdependent enterprises in one geographical area. They are restricted to geographical areas and, in their capacity, have a large number of businesses and employees within a small number of related industrial sectors. Clusters are very different in terms of competitive position and innovative activity. Thus, differences in the nature and operation of the traditional cluster and one based on science can be recognized. Innovative clusters are based on science and the advancement of knowledge, the creation of new markets and the introduction of technological generators in the area where they perform their activity. Clean technology clusters can be characterized as innovative clusters.

Each nation is considered to be as valuable as the students it educates (Pernick, i Wilder, 2008, p. 283). The clean technology sector requires professionals of different profiles - mathematicians, physicists, chemists, biologists, engineers, economists, and other professionals who can create new technologies that are forward-looking. In this sense, successful development of clean technologies can only be achieved with educational programs that are a combination of engineering, economics and environmental protection. Furthermore, this implies that adequate cooperation is needed between universities and institutes on the one hand and local and national authorities. In addition to investing in formal education for the training field, there is a need for continuous exchange of information between

all interested parties, which can be achieved through forms of non-formal education as well as other forms - scientific meetings, round tables, forums, etc.

CONCLUSION

Achieving competitiveness of domestic enterprises amidst the globalization of markets, the constant fragmentation and segmentation of markets, and changes which are brought by the fourth industrial revolution is a challenging feat as domestic enterprises lack productivity, quality, R&D, innovation and modern manufacturing equipment. If the goal of development involves sustainability or sustainable development, then the inadequacies of domestic enterprises are even more pronounced. Hence, in this paper competitiveness factors were analyzed, but also, the indicators of environment improvement in Serbia were discussed as these provide an overview of what metrics are involved in the process of sustainable development. Based on the conducted research in this paper it can be concluded that Serbia has to address the issues of renewable energy sources, possible environmental threats, and the government's ability to respond to changes in the environment. Beside this, incentive programs are necessary for domestic enterprises as well as adequate environmental protection laws and regulations. As for the enterprises, productivity, innovation, and quality are the “vessels” towards achieving competitiveness.

The main limitation of this paper is the lack of survey data from domestic enterprises. However, given the main focus of the paper (which are environment improvement factors), this limitation doesn’t reduce the significance of the paper itself. For future research it is recommended to conduct a survey research with domestic enterprises regarding environment protection systems (procedures, standards etc.), and compare the obtained data with other data within this domain. In essence, a meta-analysis could be conducted in order to develop a broader view on achieving competitiveness in parallel with sustainable development and environment improvement.

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INFORMATION SECURITY MANAGEMENT SYSTEMS AS A PREREQUISITE FOR ENTERPRISE BUSINESS EFFICIENCY

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ABSTRACT

In this paper, the authors point to the indispensability of a systemic and strategic approach to the storage and management of company information, not only as important elements in maintaining business security but also as a pathway to achieving competitive advantage. Modern business is faced with major challenges arising from technological changes and bringing about the need for the identification of information security risks, their assessment and management, all aimed at bolstering company resilience to security incidents. The implementation of the ISO 9001 and ISO 27001 international standards, utilizing integrated management systems, assists a company in attaining more efficient information security, as well as achieving a competitive edge. If businesses are to survive on the market, they will need to be more flexible and apply new technology in their business operations, entailing regular staff training in the fields of information security and business processes.

Key words: Information security, Management systems, Risk, Organizational context, Competitiveness.

INTRODUCTION

Modern technology has facilitated access to information and enabled increased storage capacity, higher processing speed and real-time global communications. These qualities lead to higher awareness and greater accessibility of information and a more extensive range of prospects for capitalizing on numerous business and private opportunities. However, at the same time, technology can also be used to disrupt or destroy information, in which case it poses a risk to the business. The changes that have been caused by the strong influence of technological advances and the process of the unification of the global market are long-lasting, and business organizations have to create behavioural models related to the observed and anticipated changes (Đorđevic et al., 2016).

Organizations must assess the risks in terms of the impact a security incident may have. They should adopt an approach to risk assessment aligned with the context of the organization as well as invest in risk management to minimize its effects on business operations. The task of the risk management process is to minimize risks by making (fact-based) decisions on how to treat risks in the most efficient way while still taking into account the need to seize and maximize business opportunities (Humphreys, T., 2016). The risk management process involves undertaking the necessary actions to ensure that risk treatment options are implemented, yet at the same time supporting business opportunities. It is important for an organization to address information security at all levels in order to ensure the availability and continuity of business resources, treat risks and avoid or reduce potential harm and impact to business operations.

When it comes to types of business activities most vulnerable in terms of information security, the information and communication activity is the one that usually crosses one's mind first; however, all business activities are susceptible to this problem, particularly banking, utilities, software, auto industry, insurance, etc. Information security enables sustainable progress of an organization as it

ensures (Andrei Ioan Hohana et al., 2015): maintaining a competitive edge, protecting reputation and ensuring compliance with applicable laws and regulations.

Today, the implementation of international standards, as well as integrated management systems, is considered a necessary tool aimed at the further adjustment of companies to new market changes. The International Organization for Standardization (ISO), in collaboration with the International Electrotechnical Commission (IEC), has upgraded existing and developed a whole new family of standards covering the area of the 4th Industrial Revolution. The implementation of the ISO 9001 and ISO 27001 international standards has a significant effect on the improvement of the quality of business operations in a company. The development of the standardized Annex S1 form has facilitated the integration of international standards in a company and the achievement of business excellence (Bogetić S., Antić Z., p. 73). Unfortunately, the number of companies certified to the ISO 9001 and ISO 27000 standards shows that business owners have not yet recognized them as models for enterprise data protection and that achieving competitive advantage via the integration of management systems is still at a very low level.

As far as data security is concerned, we also have to mention the General Data Protection Regulation (GDPR), prescribed by the European Union (EU) as of 25 May 2018, which lays down the rules relating to the manner in which personal data of EU citizens may be used. In 2018, the Government of the Republic of Serbia adopted the Law on Personal Data Protection and has thus harmonized its legislation with the EU GDPR.

THE IMPACT OF INFORMATION SECURITY MANAGEMENT ON MAINTAINING BUSINESS SAFETY

The *2019 Global Cyber Risk Perception Survey*, conducted in February-March 2019, based on a sample of 1,500 business leaders in various business positions (board members, risk managers, IT, finance, lawyers, and similar) has identified the following top five biggest business threats (2019 Global Cyber Risk Perception Survey, p. 5): cyber-attacks/cyber threats (79%), brand/reputation damage (59%), economic uncertainty (57%), loss of key personnel (55%), regulation legislation (44%).

For an enterprise to become resilient to security incidents, changes are necessary in the following four areas (Neland F., Drevin L., 2019): leadership and management, organizational culture, discussions on funding and approaches to how security is measured and monitored. For this reason, CEOs must personally engage in creating an information security environment, as well as be actively involved in protecting businesses from cyber risks. However, it is wrong to associate the CEO or the board of directors exclusively for the cyber risk management process. Other process owners in the enterprise must be equally involved in the implementation of risk management, primarily IT and risk managers, and it is through joint synergies that they should develop an information security system. In practice, the IT process owners are most often associated with risk management, which indicates a lack of understanding of this issue by executive management. Namely, information security risk management is not only a technological problem, but a business one as well, and it is, therefore, necessary for companies to focus on a strategic approach in order to manage risk more effectively. In other words, in practice, businesses express an understanding of the importance and the need to manage such risk, but unfortunately, the level of engagement in this issue is disproportionate to their role in business decision making.

According to the *2019 Global Cyber Risk Perception Survey* (p. 8), only 17% of executive leaders/board members spent more than a few days over the previous year focusing on cyber risk issues. Even among respondents from the IT sector, 30% stated they spent just a few days or less dealing with the topic. The human factor plays a major role in an enterprise's information security system. CEOs need to reflect on staff attitudes related to the issue of information security.

The issue of an enterprise's financing in the field of cyber risk prevention and data theft protection is a crucial one, as it indicates the strategic direction of the enterprise. Indirectly, through investing in an information security system, employee training and improving business processes, businesses also invest in customer satisfaction, ultimately leading to a competitive advantage.

The *Cost of Cybercrime: Ninth annual cost of cybercrime study. Unlocking the value of improved cybersecurity protection* study, conducted on a sample of 2,647 senior leaders from 355 companies, has shown that the United States is the country sustaining the greatest financial costs in terms of the impact of cybercrime on business, whereas the UK and Japan had the highest increase in cybercrime costs in the 2017-2018 period. When it comes to industries, the Banking and Utilities industries had the highest average annual cost arising from inadequate information security management leading to security incidents. The consequences of cybercrime attacks on businesses are presented in Table 1, showing a four-year trend in which loss of information and disruption in business operations appear to be the most widespread consequences of a cybercrime attack on an enterprise.

Table 1: The average annual cost of cybercrime by consequence of the attack (2018 total = US$13.0 million) (Ponemon Institute, 2019, p. 19)

	2015.	2016.	2017.	2018.
Business disruption	3	3.4	3.8	4
Information loss	2.7	3.7	5	5.9
Revenue loss	1.5	2	2.3	2.6
Equipment damages	0.3	0.3	0.5	0.5

In the 2016 to 2018 period, information loss has shown the highest upward trend, indicating the need for establishing adequate systems for protecting company information. One of the possible models of protection may be the implementation of the ISO 9001 and ISO 27001international standards which, in addition to improving the quality of business operations, offer a company effective risk management along with a smoother integration of management systems.

MANAGEMENT STANDARDS AS AN INFORMATION SECURITY STRATEGY

Although organizations today are devoting increasing resources to cybersecurity systems, the *EY Global Information Security Survey 2018-19* shows that more than three quarters (87%) of organizations do not yet have sufficient budget to achieve the desired level of cybersecurity. Protections are patchy, only a small number of organizations are prioritizing advanced capabilities, and cybersecurity too often remains a topic put aside. The same survey has revealed that a significant number (77%) of organizations continue to operate with limited cybersecurity and resilience to security incidents. Many organizations do not even have a clear picture of what their most critical information is and where it is stored, nor whether they have adequate security measures to protect these assets. Those organizations that have taken the first step and identified key data and intellectual property have also assessed the biggest threats when it comes to the data at their disposal. It is no surprise that customer information, financial information and strategic plans make up the top three most valuable sets of information that organizations would like to protect (EY Global Information Security Survey 2018-19).

The risks of cybersecurity violation have acquired the status of systemic risks due to a significant increase in the potential consequences from their implementation (L. Kaušpadienė et al., 2019). Information security risk management is a major business concern as information security incidents damage the reputation of an organization, disrupt business operations and are very costly, and, on the other hand, information assets have become more valuable and vulnerable than ever. Taking into consideration the overall contemporary context of organizations, the challenge they face implies the need for the continuous and simultaneous improvement in three areas: **the organization's protection** - identifying assets and defining protection measures, **optimizing information security** - eliminating

activities not leading to effectiveness and efficiency, investing in improving measures aimed at information security and **ensuring the growth of the organization** - focusing on a systemic approach to accomplishing business information security as a key success factor in digital transformation reflected in online sales/customer support, supply chain integration, robotics, automation, artificial intelligence, various business process innovations, and similar.

For risk management purposes, the ISO Technical Committee ISO/TC 262, Risk Management, has published the ISO 31000 Risk Management Standard - Guidelines, which delineates a framework of principles and provides a common approach for managing each type of risk. Organizations manage risk by identifying, analysing, and then evaluating whether the risk should be modified by risk treatment to meet the risk criteria. During this process, organizations consult and communicate with stakeholders, monitor and re-evaluate the risk and the risk modification management processes to ensure that no further risk treatment is required (Antić, Z., 2018, p. 25).

International standards foster a strategic approach to cyber risk, which implies that, in addition to ISO 31000, the battle against information security risks asks for the implementation of ISO/IEC 27000 (Information Technology - Security Techniques - Information Security Management Systems) as well. This international standard specifies the requirements for establishing, implementing, operating, monitoring, reviewing, maintaining, and improving documented ISMS within the context of the organization's overall business risks. Combined, these standards help the organization balance both the technological and the human factor aspect. The ISO/IEC 27000 enables the organization to assess its own technological needs, whereas the ISO 31000 helps to gauge the value of information or products located in cyberspace, as well as the scale of technological protection necessary to prevent attacks, i.e. risks. Establishing an information security management system means maintaining the security of the information which is considered an organization's assets. The safety of the information, in other words, information security, entails preserving its confidentiality (by ensuring that information is available only to those who have authorized access), integrity (self-protection of the accuracy and completeness of information and methods for processing it) and availability (ensuring that authorized users have access to information and appropriate resources when they need it). Information security is achieved through the introduction of a suitable set of controls, which are effectuated through security and protection policies, practices, procedures, organizational structures and software functions (Bogetić, S., Antić, Z., 2019, p. 139).

THE DEVELOPMENT LEVEL OF INFORMATION SECURITY IN THE REPUBLIC OF SERBIA

The Republic of Serbia, as well as other countries in the region, is striving to improve the environment for the implementation of enterprise information security systems by adopting various legal acts. One of the most important legal novelties is the establishment of the national Computer Emergency Response Team (CERT), a body responsible for rapid response to incidents, as well as for gathering and sharing information on security risks for information and communication systems. The National CERT (nCERT) is within the purview of the Regulatory Agency for Electronic Communications and Postal Services (RATEL) (Rizmal I., 2018, p. 27).

As of May 2014, the SHARE Foundation has recorded 45 cases of technical attacks against content integrity, out of which there were 29 cases of rendering content inaccessible, 5 cases of damaging and theft of data and programs, and 11 cases of unauthorized access, that is, unauthorized changes and posting of content. The most infamous incident of information security violation in the Republic of Serbia was reported in late 2014. Specifically, a link to a file weighing more than 19 gigabytes, consisting of over 4,000 financial documents and data on exactly 5,190,396 citizens of Serbia, began to circulate on social networks, originating from the Privatization Agency's register of free shareholders, and including their name, last name, middle name and Unique Master Citizen Number. Following an ensuing process of inspection, it was determined that the document had been publicly available for ten months and had been downloaded "many times" (Rizmal et al, 2016, p. 17).

Data from the Statistical Office of the Republic of Serbia for 2018 show that of the total number of citizens surveyed, 34.2% of them purchased/ordered goods or services online over the previous three months. Furthermore, most of the respondents made purchases/orders to the amount of EUR 50 (59.7%), which shows that respondents lack confidence in the security of online transactions. The Statistical Office's survey data on the use of ICT in the Republic of Serbia in 2019, concerning ICT security, indicate that companies are not yet fully aware of the importance and need for information security. This is best seen from the indicator showing that only 14.7% of surveyed companies have provided protection against ICT security incidents and that 23% of staff are aware of ICT security obligations. The survey has also revealed that only companies in the information and communication industry have a developed awareness of the importance and need for information security, which is not the case for enterprises in other industries, where committment is only sporadic.

Some authors believe that without standardization there can be no smart industry. In October 2018, using social networking platforms, the International Organization for Standardazation promoted ISO standards and their role in society and the economy with the aim of timely preparing its members for the 4th Industrial Revolution (Vidas Bubanja et al., 2019, p. 77). The analysis of the number of companies certified to the ISO 20000-1, ISO 2700 and ISO 9001 family of standards in the Western Balkans and the countries in the region shown in Table 2 indicates that, in comparison to others, three countries (Romania, Hungary and Bulgaria) stand out in terms of the intensity of their engagement in the process of enterprise certification. Of the countries of former Yugoslavia, the Republic of Serbia has the highest number of companies certified to two of the three series of standards analyzed.

Table 2: Number of ISO 20000-1, ISO 27001i and ISO 9001 series of standards certificates in the countries of the Western Balkans and the region (ISO, 2018, Survey 2018)

Countries	**ISO 20000-1**	**ISO 27001**	**ISO 9001**
Slovenia	-	80	1.710
Croatia	10	158	2.343
Macedonia	25	36	436
Serbia	22	223	2.427
Montenegro	-	11	137
Bosnia & Herzegovina	-	40	1.346
Romania	51	585	9.299
Bulgaria	92	404	5.943
Hungary	30	484	6.658

Data from the Business Registers Agency (SBRA) show that there are 129,727 companies operating on the market of the Republic of Serbia. If we were to compare these data to the number of companies certified to ISO 9001, we would arrive at **the percentage share of certified companies in the domestic economy** which amounts to **0.0187%**. The percentage share of certified companies in the domestic economy is even lower if other international standards, such as ISO 27001, ISO 20000-1 and similar, are to be taken as parameters for comparison. If we were to analyze the application of Integrated Management Systems (IMS) in domestic companies, we would find out that the data are not encouraging. Namely, the two most widely used standards, ISO 9001 and ISO 140001, which also represent the basic standards of IMS, have been incorporated in 3,596 enterprises only, in other words, **the percentage of companies that have integrated these two standards is 0.0277%.** These data point to a traditionally underdeveloped awareness among local entrepreneurs and managers of the importance and need to apply international standards, both in terms of the company and its employees, and in terms of other stakeholders. The low percentage of domestic enterprises that have international standards implemented is an indication of their non-competitiveness, as well as of an insufficient number of companies that have achieved business excellence, which is a serious problem for the national economy in the long run. Therefore, it is necessary to develop an environment that will motivate companies to implement international standards and achieve business excellence. However, these activities need to evolve in several directions. The first activity is related to market regulation, i.e. to establishing free competition in the domestic market. This activity is extremely important as, in a regulated market, domestic entrepreneurs might see the benefits of implementing IMS and business

excellence. In parallel to this activity, it is necessary to raise awareness among local businessmen of the importance and benefits of implementing international standards. This area requires the support of various institutions and associations in the fields of education, guild and professional associations, the Ministry of education, science and technological development, Ministry of trade, tourism and telecommunications, the Ministry of economy etc.

CONCLUSION

Enterprises face major challenges, the active use of ICT in business operations being one of the largest. Information security poses a serious challenge for businesses, but indirectly for the national economy as well. Namely, the consequences of cyber-attacks, data theft and other cyber threats are growing every year and present a grave problem. Although much is being said in theory about the importance and models of data protection, businesses are still not taking this area seriously. Apart from the IT sector, the majority of other industries has not yet raised awareness among their executive officers about security threats prevention. Furthermore, practice has shown that it is the IT managers that are mostly involved in these matters, much less executive officers or risk managers. The reason for this attitude among executive officers lies in the fact that they view the issue of information security from a technical rather than a business point of view.

From the legislative standpoint, the Republic of Serbia has commenced its work in the field of information security. However, the problem for information security is the fact that companies in the Republic of Serbia are not using the ISO 9001, ISO 27001, ISO 20000-1 and similar management standards, as a tool for defence against the security risks they face in business practices sufficiently enough. As a consequence of the low number of companies certified to the international family of standards ISO 9001, ISO 27001, ISO 20000-1, etc., the national economy is characterized by poor competitiveness, insufficient care for end-users, poor protection against security risks, inadequate employee competence in the field of information security.

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RISK MANAGEMENT APPLICATION TO PROTECT THE POTENTIAL ELEMENT OF CRITICAL INFRASTRUCTURE

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ABSTRACT

Critical Infrastructure (CI) is a phenomenon of contemporary society that is addressed by several states. All states are making efforts to ensure that critical infrastructure elements are adequately protected and secured. Securing them is a priority, since destroying or disrupting them would disrupt the functioning of the sector concerned, or failures could also lead to the failure of other sectors as all sectors are interconnected. Risk management can be applied in practice to ensure the protection of critical infrastructure elements. ISO 31 000 risk management is an effective tool for identifying, evaluating, analyzing and managing risk. A wide range of methods and techniques can be applied within the risk management process, which can improve the entire risk management process. The results obtained through the risk management application can take the protection of the CI element to a higher level. Increasing the level of protection can ensure the smooth operation of a critical infrastructure element.

Key words: critical infrastructure, risk management, protection, critical infrastructure element, sector

INTRODUCTION

Infrastructure is a key component of each country's sustainable development. All countries need efficient transport, energy, communication systems and many others that are important for maintaining the standard of living of the population and for the functioning of the various components of the state. That is why international organizations, as well as individual states, strive to achieve the required level of security for key components. The key components are the elements of critical infrastructure, the destruction or disruption of which would have a significant impact on the lives of the population and on the functioning of the national economy. Therefore, it is necessary to focus on increasing the security of critical infrastructure elements, which can also be achieved by the application of risk management itself. Through the application of the entire risk management process, we are able to identify the sources of risk and take adequate measures to reduce the identified risks to an acceptable level, thereby increasing the protection of the critical infrastructure element.

RISK MANAGEMENT

The present is characterized by an increase in the risks, whether natural or anthropogenic, that contemporary society must deal with. Risk management is applied in practice to identify risks in a timely manner and then take appropriate measures to reduce them. Risk management is the systematic application of managerial policy, procedures and experience to communication, consultation, contextualization and identification, analysis, evaluation, treatment, monitoring, and risk review activities. (Risk assessment methods) Risk management is an effective tool to help you make effective decisions. Its effectiveness lies in taking into account the uncertainty and the possibility of future events. Based on this, the organization or object can take adequate measures to ensure that its activities

are not affected. The entire risk management process is shown in Figure 1 and is contained in the standard STN ISO 310000 Risk management. (Belan, 2015)

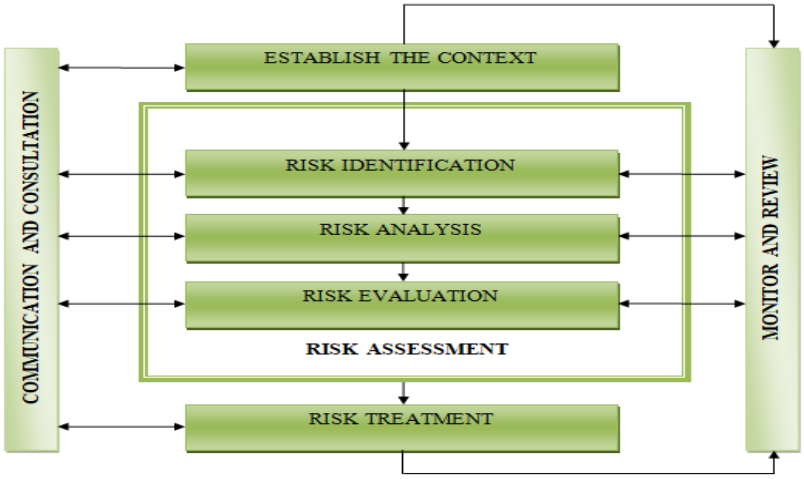

Figure 1: Risk management process

The individual parts of the risk management process will be described in practical application to a potential critical infrastructure element. Therefore, theoretical knowledge will not be specifically described in this chapter, as it would be too lengthy.

APPLICATION RISK MANAGEMENT

The risk management process was applied to the Varín electric substation, see Figure 2, which can be considered as a potential element of critical infrastructure in Slovakia. The electric substation is located between the villages of Gbeľany and Varín in the district of Zilina, about 10.5 Km from the town center. The primary task of the substation is the transmission of 400 kV electricity to the surrounding towns and to other distribution stations such as Liptovska Mara, Sucany, Bosaca in the Czech Republic Nosovice electric station. Currently, SSDE a.s. and serves as a backup substation in case of failure of the substation in Zilina Zavodie.

Figure 2: Electric Substation Varín

Element determination based on cross-sectional and sectorial criteria defined in Act no. 45/2011 on Critical Infrastructure is not possible, as the law provides only a general characteristic of the criteria. These criteria are considered to be sensitive information in Slovakia which is not publicly available.

Establish the context

Creating coherence in the risk management process involves taking into account internal and external factors in risk management. The goal is to set internal and external parameters and boundaries that determine the organization's attitude to risk and risk management activities that each organization should take into account. (Belan, 2015) Through the analysis of internal and external environment we can identify possible sources of risks that could be a source of threat to the object. The entire analysis of indoor and outdoor environments will not be given as it is lengthy for this type of article. From the analysis of the external and internal environment, specific sources of risk will be mentioned in other parts of risk management.

Defining risk criteria

The risk criteria assess the identified risks and assess their severity. Each organization can set conditions based on its own situation when defining risks. Defining risk criteria determines which risks are acceptable and which are unacceptable. Semi-quantitative analysis will be used to define risk criteria through the application of a simple point method. The level of risk is expressed as a combination of the probability of occurrence of the risk and the severity of the risk. (Risk assessment methods) Mathematically we express this relationship as follows:

$$R = P * C \quad (1)$$

Where:
R is the value of risk,
P is the probability of a threat,
C is consequence of the threat.

In order to express the probability and consequence, the point values are given with the frequency of the threat in Table 1 and Table 2.

Table 1: Expression of consequence

Value	Consequence	Financial losses	Deskription
0	no	There will be no financial losses of 0 €	There will be no power outage.
1	low	Financial losses of less than 10 000€	There will be a power outage of up to 1 hour. This outage may be the activity of entities dependent on the supply of electricity or the population.
2	not significant	Financial losses up to 100 000 €	There will be a power outage for several hours This power outage will jeopardize the activity of entities dependent on electricity supply and the population.
3	middle	Financial losses up to 150 000 €	A power outage of less than 1 day will be compromised by the activity of entities dependent on the supply of electricity and the population.
4	high	Financial losses up to 200 000 €	A 24-hour power outage This power outage will endanger the activities of entities dependent on electricity supplies and the population.
5	very high	Financial lossess above 200 000 €	Power outage for more than 1 day This power outage will significantly jeopardize the activities of entities dependent on electricity supplies and the population.

By means of numerical values expressing the probability of occurrence and the severity of the expected negative event, the values are entered in the risk matrix, see Table 3. The result of this matrix

is defined risk limits, see Table 4, which will determine the importance of individual risks. Based on the determination of the risk value, we can take an adequate position to the assessed risk.

Table 2: Expression of probability

Value	Probability	Frequency
0	unlikely	almost never
1	very low	every 100 years
2	low	every 50 years
3	middle	every 10 years
4	high	every year

Table 3: Risk matrix

P/D	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Table 4: Expression of the resulting risk

Point value	Resulting risk
1-7	acceptable risk
8-13	moderate risk
14-19	undesirable risk
20-25	unacceptable risk

Risk assessment

Risk assessment is the part of risk management that provides a structured process of identifying how an organization's objectives can be influenced. Risks are analyzed on the basis of probability of occurrence and possible consequences before deciding whether to take precautions for the risk in order to avoid damage to the functioning of the facility or organization. The entire risk assessment process consists of:

– the identification of risks;
– risk analyzes;
– risk assessment (Belan, 2015).

Risk identification

Risk identification is a crucial basis for effective risk management. After identifying the risks, the organization can take an active role in addressing the identified risks. On the identification of risks in the Varín substation a list of potential risks that could arise and negatively affect the functioning of a potential element of critical infrastructure has been constructed, i.e. substation Varín. In Table 5, you can see a fragment from the overall table of the list of potential risk sources. The entire list contains 31 identified risk sources.

Individual risks were selected from the risk catalog, which, due to its size, cannot be included in the paper. The catalog can be seen in the Critical Infrastructure Protection Methodology in the field of electricity generation, transmission and distribution from the Czech Republic from where it was taken over.

Table 5: List of potential risks

Number	Type of risk	Type of risk
1	Natural threats	Fire
2		Flood
3		Earthquake
4		Landslide
5	Technical failures	Construction destruction
6		Technical failures
7		Back-up power failure

Risk analysis

Risk analysis is a process that involves understanding the nature of risk and determining its level. The risk analysis can be said to be an input into risk assessment and decisions that managers have to make to avoid widespread impacts. (Belan, 2015) In the risk analysis, each identified risk will be assigned a value of probability and consequence, which will select risks according to the criteria set out in the previous chapter into appropriate groups: acceptable risks, moderate risks, undesirable and unacceptable. Based on their grouping, we are able to take adequate measures to avoid damaging the functioning of a potential element of critical infrastructure. The fragment analysis will be part of the risk analysis, see Table 6 of the overall Risk Assessment Table.

Table 6: Calculation of risk value

Number	Type of risk	Type of risk
14	Organizational failures	Security service failure
15		Operating error of employees
16		Failure to follow working procedures
18		Forcible entry of a stranger into the premises
19		Impersonation of employees
7		Intentional damage to space by employees

Risk assessment

The last step concerning risk assessment is the actual assessment of risks and their arrangement according to the set rating scale. You can see a sample of the risk ordering in Table 7.

Table 7: Sorting risks by importance

Acceptable risk			
2	Flood	9	Construction destruction
3	Earthquake	24	Terrorist attack
Moderate risk			
27	Unauthorized use of the application	31	Attack or fall of a flying object
Undesirable risk			
16	Operational error of employees	23	Unauthorized entry into premises
19	Forcible intrusion of a stranger	30	Stress
22	Pretending of user identity		

The risks are listed in the table, from acceptable risks to unacceptable risks. No unacceptable risks have been identified in the example risk management application. Attention will therefore be focused on the undesirable risks for which measures will also be proposed at the risk management stage.

Risk treatment

Risk management is the last stage of risk management. As part of the risk management process, the assessment process is repeated, it is decided whether the residual level is acceptable to the organization, the creation of risk management procedures if the risk is not acceptable and the subsequent assessment of the effectiveness of the treatment implemented. (Belan, 2015) The following undesirable risks were identified in the evaluated object: operational error of employees, forcible

intrusion of a stranger, unauthorized entry into premises, stress, pretending of user identity. Preventive measures will be demonstrated on the following risks.

Forcible intrusion of a stranger, unauthorized entry into premises

These two risks can be effectively avoided by increasing the level of breakthrough resistance of the perimeter and sheath protection. An increase in breakthrough resistance could be achieved by the application of microwave detectors. Microwave detectors would be designed to detect motion in an external environment. The detectors emit a high-frequency signal and evaluate changes in the signal reflected from the environment (see also Figure 6).

Figure 6: Demonstration of microwave wave detectors, Source: Microwave barriers

This proposal serves as an example of a possible security measure aimed at increasing the protection of the building.

CONCLUSION

Critical infrastructure is a very complex system that is essential for the functioning of society. Protection of elements can be achieved by application of risk management, which is an effective tool to identify and subsequently eliminate the identified shortcomings. The practical demonstration was directed to a potential element of CI. The risk management application has identified potential shortcomings that could endanger the functioning of the facility. Based on the results achieved, it can be concluded that risk management is an effective tool that can and must be applied in different areas and directions.

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INFORMATION SECURITY MANAGEMENT STANDARDS: A SERBIAN EXPERIENCE

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ABSTRACT

The increasing amount of data that is collected, stored and processed on individuals, working and living environment is becoming an increasing security problem. Information management systems are becoming a central part of business, both in large and small and medium-sized enterprises. The introduction of information security standards is proving to be a necessary step to reduce the security risks connected to organizational assets. This paper presents the analysis of standards in the field of information security in Serbia and observations on their practical application.

Key words: standards, ISO 27000, information security, security risk.

INTRODUCTION

There is a constant growing need for a large amount of data. The problem of information security and implementation of information security management systems has attracted a great attention of researchers and international standardization organizations in previous years (Yildirim et al., 2011; Kerti & Nyikes, 2015; Syreyshchikova et al., 2019; Janaćković et al., 2019; Chopra & Chaundhary, 2020). Many standardization organizations have paid attention to the issues of defining standards for secure information management. Some of them are presented in (Kerti & Nyikes, 2015).

Certain problems arise during managing information security, especially in small and medium-sized enterprises (SMEs) (Yildirim et al., 2011). The entire management system, from defining security policies, to practical implementation of certain procedures and selection of corresponding measures, requires additional engagement of available resources, which is an additional burden for the SMEs. The standardization of these systems significantly improves their efficiency. The implementation of an information security management system requires the additional engagement of certain resources - financial, human and material. This investment is significantly influenced by the external environment and industry related factors (Weishäupl et al., 2018). The information security process based on the ISO/IEC 27001 requirements in industrial environment is a complex process that can be described by corresponding indicators and quantitative criteria (Syreyshchikova et al., 2019).

INFORMATION SECURITY STANDARDS

The complexity of the problem has led to definition of a large number of standards, which are often very difficult to systematize. The classification of standards has been raised as a research question for many years. For example, in (Krause, 1995), the author describes the classification of IT (Information Technology) security standards and connection with corresponding IT security techniques and mechanisms. In order to structure the available IT security standards, attempts to form specific

ontologies have been made. In (Meriah & Rabai, 2019), the authors analyze six main ontologies concerning the application of ISO/IEC 27000 series of standards. Figure 1 presents the SRPS ISO/IEC 27000 family of standards currently valid in Serbia, starting from general to specific ones.

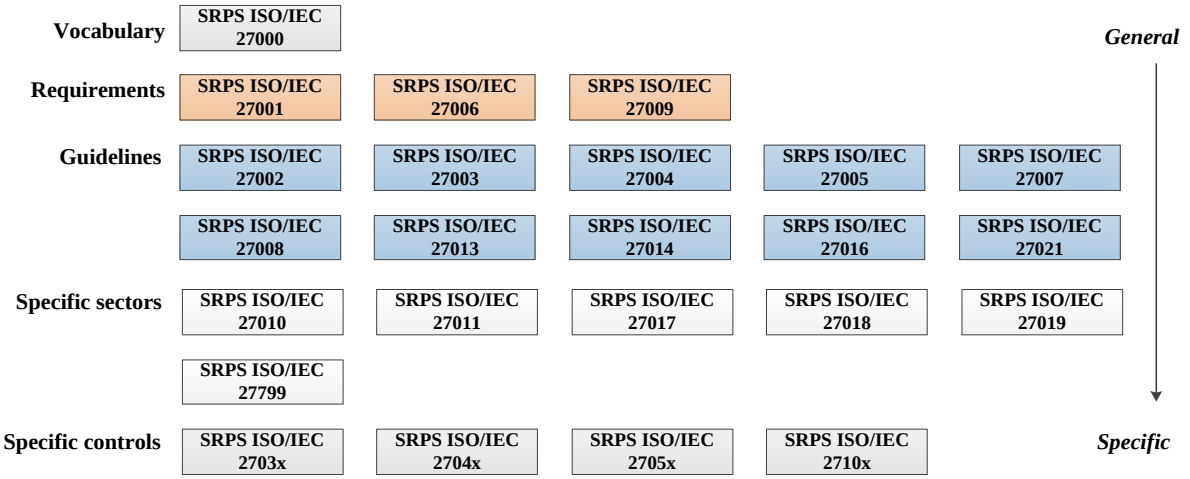

Figure 1. The relationships among SRPS ISO/IEC 27000 family of standards (based on the Office of the Government Chief Information Officer, 2019)

Detailed information about the Serbian standards shown in the previous figure and their corresponding international standards is shown in Table 1.

Table 1. Representative standards from the ISO 27000 series in Serbia

Serbian standard	International standard	Description (IT - Security techniques)
SRPS ISO/IEC 27000:2018	ISO/IEC 27000:2018	Information security management systems - Overview and vocabulary
SRPS ISO/IEC 27001:2014	ISO/IEC 27001:2013	Information security management systems - Requirements
SRPS ISO/IEC 27002:2015	ISO/IEC 27002:2013	Code of practice for information security controls (with corrections)
SRPS ISO/IEC 27003:2017	ISO/IEC 27003:2017	Information security management - Guidance
SRPS ISO/IEC 27004:2017	ISO/IEC 27004:2016	Information security management - Monitoring, measurement, analysis and evaluation
SRPS ISO/IEC 27005:2019	ISO/IEC 27005:2018	Information security risk management
SRPS ISO/IEC 27006:2017	ISO/IEC 27006:2015	Requirements for bodies providing audit and certification of information security management systems
SRPS ISO/IEC 27007:2018	ISO/IEC 27007:2017	Guidelines for information security management systems auditing
SRPS ISO/IEC TS 27008:2019	ISO/IEC TS 27008:2019	Guidelines for the assessment of information security controls
SRPS ISO/IEC TS 27013:2018	ISO/IEC 27013:2015	Guidance on the integrated implementation of ISO/IEC 27001 and ISO/IEC 20000-1
SRPS ISO/IEC 27014:2015	ISO/IEC 27014:2013	Governance of information security
SRPS ISO/IEC 27019:2019	ISO/IEC 27019:2017	Information security controls for the energy utility industry
SRPS ISO/IEC 27021:2019	ISO/IEC 27021:2017	Competence requirements for information security management systems professionals

The security problems and techniques can be specific for different sectors. Therefore, standards for specific sectors have been created. Representative sector-specific standards are presented in Table 2.

The SRPS ISO/IEC 27009:2019 standard defines requirements for sector specific application of the ISO/IEC 27001 standard.

Table 2. Some sector-specific standards from the ISO 27000 series in Serbia

Serbian standard	International standard	Description (IT - Security techniques)
SRPS ISO/IEC 27009:2019	ISO/IEC 27009:2016	Sector-specific application of ISO/IEC 27001 - Requirements
SRPS ISO/IEC 27010:2018	ISO/IEC 27010:2015	Information security management for inter-sector and inter-organizational communications
SRPS ISO/IEC 27011:2018	ISO/IEC 27011:2016	Code of practice for Information security controls based on ISO/IEC 27002 for telecommunications organizations
SRPS ISO/IEC 27017:2019	ISO/IEC 27017:2015	Code of practice for information security controls based on ISO/IEC 27002 for cloud services
SRPS ISO/IEC 27019:2019	ISO/IEC 27019:2017	Information security controls for the energy utility industry
SRPS EN ISO 27799:2017	EN ISO 27799:2016	Health informatics - Information security management in health using ISO/IEC 27002

Table 3 presents representative control-specific standards from the ISO 27000 series of standards in Serbia compared to corresponding international standards. These standards are, among others, dedicated to network security, security and privacy in the Internet of Things systems, security of applications, storage security, big data security, and electronic discovery and cyber-security problems.

Table 3. Some control-specific standards from the ISO 27000 series in Serbia

Serbian standard	International standard	Description
n.a.	ISO/IEC 27030 draft	IT - Security techniques - Guidelines for security and privacy in Internet of Things (IoT)
SRPS ISO/IEC 27033	ISO/IEC 27033-1..6	IT - Network security standards
SRPS ISO/IEC 27034	ISO/IEC 27034-1..7	IT – Application security standards
SRPS EN ISO/IEC 27040:2017	ISO/IEC 27040:2016	IT - Security techniques - Storage security
n.a.	ISO/IEC 27045 draft	IT - Security techniques - Big data security and privacy processes
SRPS ISO/IEC 27050	ISO/IEC 27050-1..4	IT - Electronic discovery standards
n.a.	ISO/IEC TS 27100 draft	IT - Information Security, Cybersecurity and Privacy Protection - Cybersecurity framework develop. guidelines

The number and specificity of standards in this class require additional organizational attention in their practical application.

DISCUSSION

Information technology risks require particular management, standards, and methods (Janaćković et al., 2019). For example, management information systems for safety purposes have some quality criteria and evaluation methods for the assessment of collaboration activities among different stakeholders (Janaćković et al., 2014). In the safety management systems, among others, the data refer to employees, the means they use at work, protective equipment and training they have received for safe work and regular work activities, the state of the work environment, and the movement of hazardous substances in the environment. Also, SCADA systems are used to monitor technological processes, while various wearable sensors are used to monitor the condition of employees and their working environment. All this leads to creation of large amounts of data. Their use and storage is increasingly becoming a security issue. Specific security problems emerge in telecommunication organizations, utility industry and energy utility industry, which was the cause of definition of

corresponding sector-specific standards. Also, the imporance of inter-sector and inter-organizational communication is emphasized in the corresponding standard (SRPS ISO/IEC 27010:2018). Health informatics also has problems with information security, which is discussed in a separate standard.
An analysis of the standards applied in Serbia has led to the following conclusions. Standards from the ISO 27000 class are very rarely applied, except in organizations in very sophisticated fields, technological and IT companies. They are not implemented in a wider range of organizations. The organizations usually base their business on a quality management system and the introduction of certain basic standards for environmental and occupational safety. Information, like other intangible resources of organizations, is still not considered in Serbia as a significant resource that needs particular attention from a security viewpoint. This is supported by the fact that many ISO/IEC 27000 standards have been adopted with a delay of at least one to two (or even more) years. Taken into consideration that the cycle of change of modern standards today is usually three to five years, this significantly reduces the possibility of their larger implementation in practice.

CONCLUSION

Information is becoming very important in modern business today. The information security is vital for the successful functioning of businesses in all sectors, whether they are public or private. Standardization is a good way to define certain guidelines and rules concerning information security. In Serbia, it is particularly important to increase the importance of the security of information as an important organizational resource. Applying the ISO/IEC 27000 class of standards can significantly help in better information security management. Greater awareness of the importance of managing information security risks will lead to better overall organizational outcomes and performance.

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FUZZY LINGUISTIC VARIABLES IN MATHEMATICAL ACTIVITIES IN KINDERGARTEN

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ABSTRACT

In this paper, the application of fuzzy logic in mathematical education is viewed from the perspective of pre-school education. The aim of the paper is to give a brief overview of examples from the literature related to fuzzy logic and to point out the presence of fuzzy linguistic variables in the everyday life of a preschool child, as well as the importance of developing and respecting the approximate reasoning of preschool children. Although crisp mathematics requires crisp arguments that characterize our cognitive development, preschoolers start from common argumentation and use vague words. Fuzzy logic is an excellent tool for supporting such approximate reasoning which allows preschoolers to model real-life situations using vague words.

Key words: fuzzy linguistic variables, fuzzy logic, preschool children, mathematical education, mathematical modeling.

INTRODUCTION

Classical mathematical logic deals with formal languages and is dichotomous; there are two values of True and False in it. When the language syntax is specified, that language is called the formal language. Classical logic presents real-world problems as either black or white, while fuzzy logic allows real-world problems to be represented as shades of gray. Propositions in fuzzy logic containing fuzzy linguistic variables. Values of linguistic variables are words of the natural language and they consist of: basic linguistic values (high, low, long, short, deep ...), linguistic modifiers (very, somewhat, medium, strong) and linguistic connectives (and , or not).

Fuzzy logic is widely applied at different levels of education, from kindergarten to college (Garcia-Honrado, 2013), but is also present in educational evolution, laboratory experiments, training education, student academic evaluation scoring, etc. (Ilahi, Widiaty, & Abdullah, 2018). In this paper, the application of fuzzy logic in education is viewed from the perspective of pre-school education. The aim of the paper is, in accordance with the importance of learning through examples highlighted by Polya (2009), to give a brief overview of examples from the literature related to fuzzy logic and to point out the presence of fuzzy linguistic variables in the child's everyday life as well as the importance of developing and respecting the approximate reasoning for preschool children.

The first part of the paper deals with integrated learning as a process of making connections between concepts and experience, allowing the child to analyze one problem from different angles. The second part of the paper presents the stages of mathematical modeling, ie. translating real-life problems into mathematical language. The third part of the paper provides a brief overview of examples from the literature that illustrate fuzzy sets, fuzzy linguistic variables, fuzzy set operations, fuzzy relations, as well as fuzzy logical reasoning.

INTEGRATED LEARNING

The Basics of Preschool Education Program (2018) emphasize that a child is a unique and holistic being, a being of play, committed to learning, and rich in potential and competencies. Therefore, an integrated approach to learning and development is based on the connected experience of the child and not through the isolated content of particular areas. In planned learning situations within the project, children explore natural and physical phenomena while developing different languages and modes of expression. In this way, the child develops mathematical, scientific and technological competences, develops logical-mathematical thinking when solving problems in life-practical situations.

The learning of preschool children is integrated, children learn by looking at one topic from several angles and thus the child learns together by networking knowledge from different fields. A child as a creature of the game, possesses his or her own competences and develops them through learning by exploring real-world problems, translating them into his own language, testing hypotheses, finding solutions, making his own decisions and putting them into action. This approach to learning enables the overall development of the child (Milošević, et. al. 2019).

The math is integrated into real-world problems. Thus, integrated activities allow children to be mathematicians-researchers who recognize and solve tasks in the world around them, translating them into their own language and mathematics language, analyzing and naming phenomena depending on the context, gaining a comprehensive picture of the problem and experimenting. Children must go to their own way to the solution, and along that path they need to make decisions, developing their own language, computing with words, and using the approximate reasoning inherent in preschool children, which indicates the presence of a fuzzy logic in mathematics education of preschoolers. At this age, children also develop crisp reasonig, if, for example, the goal is to adopt the concept of a circle or concepts that are precisely defined in crisp mathematics.

FUZZY LOGIC IN MATHEMATICAL EDUCATION

Crisp Mathematics is based on a well-defined system of axioms and theorems that are very precise and consistent. However, when modeling real-life situations, it is very common to use vague terms that need to be translated into mathematics. Zadeh (1996) exposes a computing with words methodology that uses the theory of fuzzy logic and fuzzy sets. Therefore, fuzzy set theory can be very useful in mathematics education and a tool for modeling spoken language and uncertain situations from everyday life as well as for making conclusions (Voskoglou, 2000).

Problems that children notice in everyday life can be "translated" into mathematical language using mathematical modeling. Voskoglou (2011: 49) states the stages of mathematical modeling:

- „ Analysis of a given real world problem, i.e. understanding the statement and recognizing limitations, restrictions and requirements of the real system.
- Mathematization, i.e. formulation of the real situation in such a way that it will be ready for mathematical treatment, and construction of the model.
- Solution of the model, achieved by proper mathematical manipulation.
- Validation (control) of the model, usually achieved by reproducing through it the behavior of the real system under the conditions existing before the solution of the model (empirical results, special cases, etc.).
- Implementation of the final mathematical results to the real system, i.e. “translation” of the mathematical solution obtained in terms of the corresponding real situation in order to reach the solution of the given real problem.”

FUZZY LINGUISTIC VARIABLES IN KINDERGARTEN

Below is an overview of examples from the literature dealing with fuzzy linguistic variables. The examples that are present in the everyday life of preschool children as well as in mathematical activities integrated with other fields in kindergartens were selected. There are often situations in everyday life that if we want to model mathematically it is necessary to use fuzzy sets theory (Voskoglou, 2018). The following examples are in line with the integrated learning that is experienced in kindergartens, in which real-life situations are mathematically modeled using the concept of fuzzy sets, which is consistent with the ability of children to use approximate quantifiers and approximate reasoning.

Example 1 (Sobrino, 2013:76):
A child of three years may have problems with crisp reasoning, but he or she will certainly have the approximate reasoning ability. Approximate reasoning includes approximate quantifiers such as “fewer” and “more” and the arguments used by the child in decision making are more often implicit than explicit. Thus, a child of this age is fully capable of deciding whether it wants, for example, fewer vegetables and whether or not it wants more cookies.

Example 2 (Garcia-Honrado, 2013: 686):
Let the figures be given. Figures can be grouped according to whether they satisfy the property being defined, they do not satisfy the property, or they partially satisfy it.

Example 3 (Voskoglou, 2000: 1):
Fuzzy sets can be defined when referring to real-life objects like a river, a mountain, a city of a school, etc., for example "long rivers" or "high mountains" of a country, the "young people" of a town, the "tall pupils" of a school, e.t.c..

Example 4 (Sobrino, 2013: 81):
Fuzzy logic deals with fuzzy lingustic variables such as “young” and “tall” that are measurable, but not with variables like “happy” that are not measurable in the same way as the previous two. When “Athletes are tall” is said, then “tall” is a fuzzy linguistic variable, ie a vague predictor whose value depends on the context. The same man may be tall enough to play hockey and cycling but not tall enough to play basketball. Also, the value of the fuzzy linguistic variable “young” depends on whether we are talking about a teacher or chess player.

Example 5 (Garcia-Honrado, 2013: 686):
Preschoolers may be asked to single out non-tall friends, thus introducing the concept of negation.

Example 6 (Garcia-Honrado, 2013: 686):
A pre-school child may be asked to relate two elements that are of the same color or are in the same tone, thereby introducing fuzzy relations.

Example 7 (Janković, 2019: 56):
When talking to preschoolers about money, they talk about the price of the goods, what is cheap and what is expensive. Goods can be classified on the basis of the following requirements: expensive goods, cheap goods. Also, fuzzy relations between objects can be established by bringing in goods with a similar price.

Example 8 (Janković, 2019: 55):
Children in kindergartens measure weight, volume, length. Objects of similar mass can be classified, thus establishing the fuzzy relations between objects. Children can form two sets where one set will contain objects that are heavy (or very heavy) and another set will contain objects that are not heavy, thus introducing the concept of negation. In the activities of measuring mass, length, volume, fuzzy relations and linguistic modifiers and conjunctions are used.

Example 9 (Zadeh, 1996):
Fuzzy logic provides methodology for computing with words. Let *p1* and *p2* be the propositions:
p1 = Carol lives near Mary
p2 = Mary lives near Pat.
If the question arises "How far is Carol from Pat?", conclusion is the proposition *p3*:
p3 = Carol lives not far from Pat.

Example 10 (Sobrino, 2013: 83):
A cyclist can move very slowly, slowly, slowly, very quickly depending on the size of the freewheel and chainring. Let *p1* and *p2* be the propositions:
p1: On a bicycle, with a small freewheel and a large chainring, I go fast.
p2: I selected a very small freewheel and a very large chainring.
Conclusion is the proposition *p3*:
p3: I go very fast.

Ten examples are given that are suitable for the development of approximate reasoning and computing with words of preschool children. Examples include the formation of fuzzy sets, the use of fuzzy linguistic variables, the operations on fuzzy sets and fuzzy relations, as well as fuzzy logical reasoning.

CONCLUSION

This paper reviews examples from the literature relating to fuzzy linguistic variables that can be applied in pre-school education. Examples should help educators to encourage the approximate reasoning of preschool children, encourage children to compute with words, and evaluate the linguistic variable depending on context. Although crisp mathematics requires crisp arguments that characterize our cognitive development, preschool children start from common argumentation and use vague words (Beth, & Piaget, 1961). Fuzzy logic is an excellent tool for supporting such approximate reasoning and allows preschoolers to model real-life situations using vague words.

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HESITANT FUZZY LINGUISTIC VIKOR METHOD: AN APPLICATION FOR ENERGY STORAGE UNIT SELECTION

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ABSTRACT

Fuzzy set theory and its extensions were integrated into decision making literature in the last 50 years because of their flexibility to express linguistic and vague evaluations. Mathematical expressions are inadequate in some decision problems, where decision makers have uncertain and hesitant thoughts on decision elements. The concept of hesitant fuzzy sets and hesitant fuzzy linguistic term sets were introduced into the literature as an extension of intuitionistic fuzzy sets to model hesitant linguistic evaluations made by decision makers. Some researchers developed new methods based on these concepts to solve different decision problem by using their flexibility on expression of evaluations. In this study, hesitant fuzzy linguistic VIKOR (HFL – VIKOR) method was used to determine the rank of alternative energy storage units for an energy network with renewable energy resources. Five different energy storage unit technologies were evaluated by using HFL – VIKOR method with respect to economic, social, environmental and technical criteria.

Key words: Hesitant fuzzy linguistic term sets, VIKOR, Energy storage unit selection, Sustainable energy supply, Fuzzy decision making.

INTRODUCTION

People make different decisions everyday as a regular activity of daily life. Selection of the items to be bought, determination of walking direction or choosing the seat for sitting in public transportation are some of daily decisions. Decision making is a selection process between two or more alternatives. Decisions, which is made by considering one criterion and under certain values of alternatives are easy. An alternative with a close value to desired solution is chosen in these kind of problems.

However, making a decision is not so easy in many cases. Decision problems are generally more complex, which means they contain a number of conflicting criteria to evaluate before making a decision. We can think about a choice of a house to rent as an example. Decision maker has to take several criteria like location, safety, price, building age, etc. into account during the decision process. New buildings are generally expensive but they provide more safety for their owners. Hence, the decision maker has to consider all criteria simultaneously to make a good decision.

Decision problems with a finite number of conflicting criteria and a set of alternatives are commonly named as multi-criteria decision making (MCDM) problems. There are several MCDM techniques introduced into the literature and they have a wide range of application area among researchers so far. AHP, ANP, TOPSIS, VIKOR, ELECTRE and PROMETHEE can be listed as some of the common techniques of MCDM. These techniques can be utilized for decision problems that have either qualitative and quantitative criteria and decision process with these methods are very easy to understand and to apply. All of the methods provide a compromise solution that is obtained by aggregation of all decision criteria.

Expressions and statements related to the decision elements in a problem may be linguistic terms and this can cause uncertainty over the decision elements. For example, age of a building can be expressed by using "old" word. It is not certain to uncertain to understand the real age of building from this word. One person can consider the building is constructed 30 years ago, while another person considers the age of the building as 40. This kind of elements can be expressed by the help of fuzzy set theory. Fuzzy set theory was introduced into the literature by Zadeh (1965) and Bellmann and Zadeh (1970) firstly integrated fuzzy set theory into decision-making concept.

Based on the progress of the methodological concepts of fuzzy logic, extension of the ordinal fuzzy sets of Zadeh have been developed. Some of these extensions are Type-II Fuzzy Sets (Zadeh, 1975), Intuitionistic Fuzzy Sets (Atanassov, 1983), Neutrosophic Fuzzy Sets (Smaradache, 2002), and Hesitant Fuzzy Sets (Torra, 2010).

Among the aforementioned extensions of ordinal fuzzy sets, Hesitant Fuzzy Sets seems to be a good tool for expressions those contain hesitate thoughts of decision makers confronted in decision making applications. Rodriguez et al. (2012) introduced the hesitant fuzzy linguistic term sets concept for decision making and this concept provides the opportunity of using a context-free grammar for evaluation of decision elements. By using this approach, opinions of hesitant decision makers can be included into decision model more accurately.

In this study, hesitant fuzzy linguistic term sets based VIKOR method of Liao et al. (2015) was presented with an energy storage unit selection decision. The main advantage of the methodology is the combination of the handling uncertain and linguistic expressions ability of hesitant fuzzy linguistic terms set concept and the superiority of VIKOR method on finding a compromise solution on decision problems.

The rest of the paper is as follows: A brief explanation of the methodology is presented in the second part. Third part consists of the application of Hesitant Fuzzy Linguistic VIKOR method. The paper is concluded in the fourth part by providing comments and suggestions for further research.

METHODOLOGY

Using a single term may not be adequate to express feelings and thoughts of experts in evaluation of elements of complex decisions in case of uncertainty. Fuzzy linguistic variables are very limited for the cases that experts hesitant about several values of a linguistic variables. Let us consider the selling price of an item is defined by linguistic variables as very low, low, fair, high and very high and an expert feels hesitant about the price of the item to be fair or high. In such cases, fuzzy linguistic variables are inadequate to express the evaluation of experts and more complex linguistic terms are required to define this kind of evaluations. Hesitant fuzzy linguistic term set concept was proposed by Rodriguez et al. (2012) to model complex linguistic evaluations. Evaluations are semantically represented in this model by using hesitant fuzzy linguistic terms and a context-free grammar. Improvement of the elicitation of linguistic information is aimed by this concept and hesitant thoughts of experts are taken into account. Hesitant fuzzy linguistic terms are constructed by using context-free grammar, which can be expressed be as follows, where "|" symbol indicates alternative elements

P = { I ::= <primary term> | <composite term>
<composite term> ::= <unary relation> <primary term> | <binary relation> <primary term> <conjunction> <primary term>
<primary term> ::= s_0 | s_1 | … | s_g |
<unary relation> ::= lower than | greater than | at least | at most
<binary relation> ::= between
<conjunction> ::=and}.

Liao et al. (2015) extended hesitant fuzzy linguistic terms into VIKOR (Vlse Kriterijumska Optimizacija Kompromisno Resenje) method of Opricovic and Tzeng (2004). Each step of the method was redefined by the concepts related to hesitant fuzzy linguistic terms. By this way, hesitant evaluations of experts on alternatives are taken into account and advantages of the VIKOR method is utilized.

Due to page limit restrictions, details of the methodology cannot be provided in the paper. Readers may refer to the related papers for detailed expressions of methodology. But, application steps of the method can be followed in the application part.

APPLICATION OF ENERGY STORAGE UNIT SELECTION

Application of the Hesitant Fuzzy Linguistic VIKOR (HFL-VIKOR) method was presented in this section on an application for selection of energy storage units. Energy storage units are important for hybrid energy systems, because they reduce the voltage fluctuations and energy shortages problems occur in these systems. So, determination of the best energy storage unit is an important decision for hybrid energy systems.

Steps of the method are as follows:

Step 1. Definition of selection criteria, alternative storage units, linguistic terms and decision matrix

Economic, technical, environmental and social factors of storage units are effective on the selection decision. Based on these factors, 5 alternatives named CAES (Compressed Air Energy Storage) underground, CAES aboveground, Pumped hydro, Flywheels, Li-ion battery were evaluated in this study.

Primary terms are words that state the performance of alternative in terms of each criterion such as very low, poor, fair, moderate, high, very good, etc. and the linguistic variables for primary terms used in this study were presented in Table 1.

Table 1: Linguistic variables for criteria and numerical equivalents

Criteria \ Numerical Equivalent	-2	-1	0	1	2
Economic (C1)	very low (vl)	low (l)	moderate (m)	high (h)	very high (vh)
Technical (C2)	very poor (vp)	poor (p)	fair (f)	good (g)	very good (vg)
Environmental (C3)	very low (vl)	low (l)	moderate (m)	high (h)	very high (vh)
Social (C4)	very poor (vp)	poor (p)	fair (f)	good (g)	very good (vg)

Based on these definitions, linguistic judgment matrix of alternatives was constructed according to opinions of two experienced experts of an energy company after brainstorming and presented in Table 2, as follows:

Table 2: Linguistic judgment matrix of alternatives

	Economic (C1)	Technical (C2)	Environmental (C3)	Social (C4)
A1	between moderate and high	between fair and long	greater than high	good
A2	at least high	between fair and long	moderate	good
A3	moderate	higher than long	greater than high	between poor and moderate
A4	less than moderate	fair	at most low	between moderate and good
A5	very high	less than fair	moderate	very good

Step 2. Transformation of linguistic judgment matrix into HFLTS judgment matrix

In this step, linguistic judgment matrix was transformed into HFLTS judgment matrix, which represents the linguistic elements for each evaluation, by using the grammar rules. HFLTS judgment matrix was presented in Table 3.

Table 3: HFLTS judgment matrix

	C1	C2	C3	C4
A1	{m, h}	{f, l}	{vh}	{g}
A2	{h, vh}	{f, l}	{m}	{g}
A3	{m}	{vh}	{vh}	{p, m}
A4	{vl, l}	{f}	{vl, l}	{m, g}
A5	{vh}	{vs, s}	{m}	{vg}

Step 3. Determination of the ideal solutions

Positive and negative ideal solutions were determined in this step. Assuming all the criteria in HFLTS judgment matrix were benefit type, positive ideal solution is the maximum value of each column and negative ideal solution is the minimum. Formulation for comparison of the hesitant fuzzy linguistic elements can be found in Liao et al. (2015). Only the ideal solutions were provided here in Table 4 due to the page limit restrictions.

Table 4: Ideal solutions

	C1	C2	C3	C4
d^+	{vh}	{vh}	{vh}	{vg}
d^-	{vl, l}	{vs, s}	{vl, l}	{p, m}

Step 4: Calculation of the group utility and individual regret measures

By using the hesitant fuzzy linguistic Euclidean metric proposed by Liao et al. (2015), the group utility ($HFLGU_i$) and individual regret ($HFLIR_i$) measures were determined. Criteria weights were assumed to be 0.2917, 0.3819, 0.0625, and 0.2639, respectively. The formula for these two measures and calculated HFLGU and HFLIR values were given as follows:

$$HFLGU_i = HFLEL_{1.i} = \sum_{j=1}^{J} w_j \frac{d_{ed}\left(H_j^+, H_j^i\right)}{d_{ed}\left(H_j^+, H_j^-\right)}$$

$$HFLIR_i = HFLEL_{\infty.i} = \max\left(w_j \frac{d_{ed}\left(H_j^+, H_j^i\right)}{d_{ed}\left(H_j^+, H_j^-\right)} \right)$$

Table 4: $HFLGU_i$ and $HFLIR_i$ measures

	$HFLGU_i$	$HFLIR_i$
A1	0,4153	0,1826
A2	0,3718	0,1826
A3	0,4161	0,2639
A4	0,7242	0,2917
A5	0,4145	0,3819

Step 5. Calculation of compromise measure

In this step, compromise measure, which defines the rank of alternatives, was calculated by using the following formula. In this formula, $HFLGU^+$ = min $HFLGU_i$, $HFLGU^-$ = max $HFLGU_i$, $HFLIR^+$ =

min $HFLIR_i$, and $HFLGU^-$ = max $HFLIR_i$ and the HFLC values were calculated under θ=0.5 assumption.

$$HFLC_i = \theta \frac{HFLGU_i - HFLGU^+}{HFLGU^- - HFLGU^+} + (1-\theta) \frac{HFLIR_i - HFLIR^+}{HFLGU^- - HFLGU^+}$$

Table 5: HFLGU, HFLIR, and HFLC measures

	HFLGU	HFLIR	HFLC
A1	0,4153	0,1826	0,0617
A2	0,3718	0,1826	0,0000
A3	0,4161	0,2639	0,2667
A4	0,7242	0,2917	0,7737
A5	0,4145	0,3819	0,5606
+	0,3718	0,1826	
-	0,7242	0,3819	

The rank of alternatives was found according to the ascending order of these measures in sixth step.

Step 6: Obtaining the compromise solution

According to the VIKOR method, the alternative with the minimum compromise measure (HFLC) value has to be checked to be the only compromise solution. If the alternative satisfying the following conditions, it is said to be the compromise solution to the problem.

Acceptable advantage condition: To satisfy that condition, the difference of HFLC measure for the two alternatives with minimum values is compared with 1 / J – 1, where J denotes the number of evaluation criteria. In this application HFLC measure difference for the minimum two values was equal to 0.0617, where 1 / J – 1 was equal to 0.3333. That means, the first condition was not met.
Acceptable stability in decision making condition: An alternative must be the best alternative for each ranking of HFLGU, HFLIR, and HFLC measures. A2 was the best alternative for all rankings and this condition was met.

In this case, 1 / J – 1 values for the following elements of HFLC ranking has to be checked. Alternatives that have a smaller difference than 1 / J – 1 with the minimum value are all accepted as compromise solution. In this application, HFLC value of A3 has a difference of 0.2667 to A2. On the other hand, A4 and A5 has greater differences than 0.3333. So, A2, A1 and A3 were determined as compromise solution to the application, which means CAES aboveground, CAES underground or Pumped hydro can be selected.

CONCLUSION

Fuzzy extensions of multi-criteria decision making methods helps decision makers for expression of their linguistic and uncertain thoughts and feelings about decision elements. Different values of decision elements can be taken into account by using these extensions and uncertainty can be handled by this way.

In this study, HFL-VIKOR method was used for determination of the compromise solution to the energy storage unit selection problem for hybrid energy systems. Three alternatives were determined as selectable at the end of the evaluation.

In further studies, this study can be extended by inserting sub-criteria of the four main criteria in this application. Moreover, weight values of criteria were determined based on an assumption. Some analytic approaches to determine criteria weights, such as Analytic Hierarchy Process or Analytic

Network Process can be integrated to develop a hybrid decision model in further studies. Combination of different criteria types (cost type and benefit type) can be used.

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BUSINESS QUALITY OF DOMESTIC COMPANIES IN THE CITY OF ZRENJANIN

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ABSTRACT

The authors present the results of business quality research, observed from the business aspect of management. The research was conducted in domestic companies on the territory of the City of Zrenjanin. Based on the results of the research, it can be concluded that the business quality of the analyzed domestic companies in the city of Zrenjanin is unsatisfactory, which confirms the hypothesis. Inadequate knowledge of international standards in the field of quality management is present in the companies covered by this research. Business efficiency is at a low level because some companies do not conduct modern methods and techniques. Respondents do not recognize the basic aspects of business quality, productivity, costs, and their impact on price, all within an adequate management system of the organization. However, for the quality, management is a paramount. Therefore, it is necessary to adopt new knowledge and implement it in practice. This includes the application of information and communication technologies (ICT) for more efficient business and new technologies brought by Industry 4.0 to increase productivity and improve the quality of existing products / services.

Key words: business quality, knowledge productivity, modern methods and management techniques, Zrenjanin.

INTRODUCTION

The company conducts business according to business principles in order to achieve the best possible results and survive on the market, while satisfying its economic interests, the interests of all employees, society and the country in which it is located. The principles of business economics are labor productivity, economy and profitability. The task is the realization of goals, the realization of profits through cost reduction. This implies an increase in the quality of products or services, better placement, market survival and prosperity, equally in all industries.

Knowledge, with the advent of globalization, takes a new form in the implementation of new technologies, information systems, information flow and new forms of marketing, product and service innovation, production process quality management and environmental protection. Every change in the organization and reaction to external influences from the environment, starts from the management. Management directs the organization in which direction the business will move, makes important decisions that need to be implemented in order for the company to inevitably develop and accept changes.

Within this paper, a research was conducted with the aim of determining the quality of business of domestic companies in the City of Zrenjanin, through scientific methods. By conducting a survey, it can be determined whether the business quality is satisfactory considering the elements of business. How much productivity, efficiency and profitability affect the business quality. Factors influencing the

improvement of the company's profitability, ie economic growth and economic development of the City of Zrenjanin will be identified.

In order to assess the situation of business quality of economic entities in the City of Zrenjanin and conduct research in the order to achieve a realistic view of the problem, the respondents were managers of private and public companies. Managers have different levels of education, as well as qualifications tailored to different industries. The idea was, as far as possible, to represent almost all industries that are specific to this region.

ENTERPRISE AND KNOWLEDGE PRODUCTIVITY

In the modern economy, the company is the basic form of business organization, and in theory can be defined as "a pool of resources that a dynamic entrepreneur places in lucrative business areas, whose business success is determined by its ability to identify trends in human needs and ways to meet them. in the development of science and technology, on the other hand" (Besic & Djordjevic, 2017, p. 31). Economically successful business is achieved by achieving pre-set economic goals of the company. Business efficiency is the degree of success in achieving goals (Staletic, 2016).

Knowledge and Productivity

Productivity observed in a narrower sense is focused on labor productivity, by showing "the efficiency of current work - to achieve the best possible results with as little work as possible" (Staletic, 2016, p. 13). Until recently, in practice, the production worker increased productivity by working more or longer. Today, knowledge specialists are becoming the largest special group in the workforce in alldeveloped countries. In theory, there are six factors that determine their productivity, and they are: the question "What is a task?, a knowledge specialist should manage himself, continuous innovation is part of the task, continuous learning and teaching , quality is more important than quantity, it should be seen as an "asset" and not as a cost" (Sajfert, Adamovic, & Besic, 2005, p. 35). The knowledge specialist achieves quality, not minimum but optimum if not maximum. According to Drucker "the knowledge yield needed to establish how existing knowledge can be used to achieve results, in fact represents what we mean by the term management" (Sajfert et al., 2005, pp. 34-35). Drucker views management as the central organ of the knowledge society, and considers the manager responsible for the application of knowledge and the results achieved by such knowledge. Some domestic authors speaks the new society is characterized by knowledge that will become a strategic source of power and wealth (Besic and Djordjevic 2017, p. 20).

The basic social group will be the knowledge users, these are persons capable of putting knowledge into the function of performing business activities. Drucker calls them "knowledge workers." Some authors speak of a society in which instead of "responsibility for people's performance" comes "responsibility for the application of knowledge and the effect that is achieved thanks to it" (Besic and Djordjevic, 2017, p. 20). According to Drucker, the knowledge worker is a "factor of production" through which today's highly developed societies and economies like the United States, Western EU countries, Japan and increasingly Russia, become and remain competitors (Drucker, 2006, p. 240).

In theory, Drucker believes that it is the job of the worker to turn information into a product or service to be effective. "Such a knowledge worker is, above all, expected to make sure that the right things are done, whether he works in industry, in a hospital, in a government body or in a trade union, at a university or in the military" (Dracker, 2006, p. 238). While the author Ceha notisesthat the main problem in the field of management in domestic companies is that is based on outdated management techniques and principles (Ceha, 2015, pp. 305-306). The problem is especially relevant to domestic companies that have been privatized by domestic capital owners. This author notices a similar situation in the sector of public companies, with the exception of high-tech companies such as Telekom Srbija. When he talks about the application of modern methods and techniqueshe specifically thinks about the application of management standards and integrated management systems, techniques

such as benchmarking and reengineering, as well as management concepts such as corporate social responsibility and relation marketing (Ceha, 2015, pp. 305-306). In order to achieve business improvement in global domains, it is necessary to constantly improve the knowledge of managers. According to Ceha (2015), usually middle level managers of narrower interest, in the field of quality, informatics, language, business communication, go to training in domestic companies, which is essentially insufficient. Primarily, domestic managers must become effective, and then encourage the remaining employees to be effective. Only in a knowledge-based organization, the productivity of knowledge and the productivity of each employee in particular, make the organization, that is, the whole system productive.

Business Quality of a Company

One of the modern management techniques is quality management. Quality management improves the quality of business of the entire company. Achieving an optimal relation between the price and the quality of a product or a service, by participating in the global market is based on the continuous improvement of business productivity (Djordjevic & Cockalo, 2007, p.18). According to the same authors (p. 21), the business aspect of quality implies increasing efficiency, reducing costs, increasing productivity, increasing profits and long-term survival of the company. Starting from the fact, first noticed by Edwards Deming, that the business quality is based on improving productivity and knowledge, many of our experts in the field of management and quality management confirm and cite Deming's setting "chain reaction". Namely, Deming was the first to notice that when quality is improved, productivity is also improved. And he called the interdependence of business quality and productivity a “chain reaction” (Sajfert et al., 2006, p. 16); (Djordjevic and Cockalo, 2007, p. 16); (Besic and Djordjevic, 2017, p. 19).

Standardization and Integrated Management Systems

Standardization and Management Process of the Organization

In theory, Cvjetkovic speak state that the ISO 9001 standard has been implemented in a huge number of companies with a clear goal of improving product and service innovations, which can only be achieved with the right approach to management. Knowledge and treating knowledge as a fundamental resource in the company. According to the same author, it is clear that knowledge is the key resource for innovation, but also for the development and establishment of a Quality Management System (QMS) (Cvjetkovic, 2016, p. 93). The importance of knowledge is also recognized in the version of the ISO 9001: 2015 standard, where knowledge is positioned as a resource (Arsovski and Stefanovic,1-2, 2016, pp. 17-26; Cvjetkovic, 2016, p. 93).

Integrated Management Systems

The application of the IMS concept can be of great importance in the global market for companies coming from countries in transition. Instead of building long-term Total Quality Management (TQM) in a shorter time, business excellence goals can be achieved by applying one by one modules of integrated management systems, based on compliance with the requirements of international standards ISO 9001, ISO 14001 and ISO 18001 (Sajfert et al., 2006 , pp. 51-54).

RESEARCH METHODOLOGY AND RESULTS

Within the conducted research, the problem of the research is to determine the quality of business of domestic companies in the City of Zrenjanin, seen through the impact of achieving productivity, work efficiency, cost reduction and profitability of companies. The subject of this research is to determine the possibilities for improving the quality of business of domestic companies in the City of Zrenjanin, by increasing productivity and work efficiency based on the application of modern management methods and techniques, new knowledge and introduction of new technologies.

The authors used the questionnaire as a direct structured interview. The questionnaire consists of two groups of questions. The first group of questions refers to general information about the respondent and the organization. The second group of questions are the attitudes of the respondents about the business and work of the company they manage. It is questioned the need for representation of international standards, application of modern management methods and techniques in the function of business efficiency, which includes the application of information technology, new knowledge and work technology, productivity of all business processes, business profitability and competitiveness of companies in the global market.

The hypothesis is: "The quality of business of domestic companies in the City of Zrenjanin is not satisfactory."

The research was conducted in the period from December 27, 2019, to January 25, 2020. Domestic companies registered on the territory of the city of Zrenjanin were examined. Intentional, appropriate sample, and the respondents are managers of domestic companies. The quality of business of all companies operating in one region is equally important, so this research covers both the private and public sectors.

Research Results

The authors surveyed 30 managers (businessmen, entrepreneurs, owners) in different positions, of all levels of education. 16 managers in companies (large, small, medium) of the private sector and 11 state and/or public, as well as 3 JSC (Joint Stock Company) and/or majority owned, were surveyed. The research covered various economic branches: machine industry (1 company), processing (1), food (1), textile industry (2), construction and architectural company (1), IT companies (2), telecommunications (1), and other activities: trade (2), health (3), crafts (1), culture (2) and various services (4).

The questions in the first part of the Questionnaire entitled General data on the organization and the respondent refer to general data on the organization, company and the respondent. They are focused on the size of the organization, ie the number of employees in the organization, the ownership structure of the organization, business areas, position and function of respondents in the organization, as well as the level of education. The area of business with the most respondents is industry 10 (33%), followed by health 6 (20%) and services 6 (20%), IT sector 3 (10%), trade 2 (7%), culture 2 (7%) and craft 1 (3%). The representation of the size of the organization is as follows: the most, 12 respondents (40%) are from the organization up to 250 employees, then 7 (23%) up to 10 employees, 6 (20%) up to 50 employees and 5 (17%) over 250 employees. The highest level of education is VII1-14 (46%), VII2-8 (27%), IV-5 (17%) and VI-3 (10%).

Answers from Questionnaire II Respondents' views on individual questions will be taken into account in order to draw the necessary conclusions about the hypothesis. Variables that show the application of international standards in the field of quality management, achieving efficiency and productivity, assessment of profitability, will be discussed below.

To the question: Do aspects of business quality apply in your organization ?, 23 (77%) respondents answered in the affirmative, while 6 respondents (20%) answered "no". One respondent (3%) did not answer the question. If the answer to the previous question was yes: the answers were offered in alphabetical order, taking into account that two respondents circled two answers each. The answers chosen by the respondents are quantitatively shown in the first Figure 1.

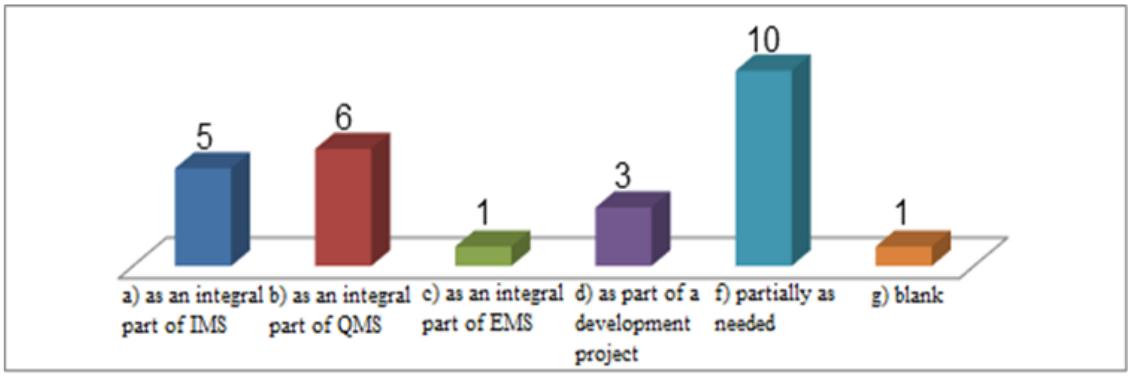

Figure 1. Quantitative presentation of respondents' answers to the question: Are aspects of business quality applied in your organization?

It is noticed that most respondents apply quality, the answer under f) partially, as needed 10 (38%) it is wrong acoring to the concept of Quality Management. Then under b) as an integral part of QMS 6 (23%) and a) IMS 5 (19%), which are essentially correct attitudes, ie determinations in accordance with international theory and practice. Three answers under d) as part of development projects (12%), one c) as an integral part of EMS 4% and one answer under d) 4%. When we look at the total sum of the correct answers of QMS and IMS, we notice that it is almost equal to the incorrect one. It can be interpreted that half of the answers indicate ignorance of the essence of the theory and practice of quality.

Business efficiency in the conditions of rapid technological changes and changes in the market requires the application of modern management methods and techniques. Respondents presented their views on the following questions: In your opinion, does the application of modern management methods and techniques affect the improvement of business efficiency? 20 respondents, or 67%, answered in the affirmative, and 8 respondents, or 27%, answered no. Two respondents (6%) did not answer the question. If the answer was yes, the respondents stated - why? Of the 20 respondents who answered yes to the previous question, 13 (65%) answered and expressed their views, while 7 (35%) did not answer. Based on these data, it can be noticed that the efficiency of business is low, because 13 (43%) respondents out of a total of 30 implement modern management methods and techniques in their business.

One of the important variables is the business quality and in support of this follows the analysis of the answer to the question: In your opinion, what is most important for achieving aspects of business quality? (Respondents had the opportunity to circle up to three answers). Respondents gave the most answers: quality of products and/or services 22 (26%), improvement of customer satisfaction 15 (18%), improvement of business productivity 12 (14%), good price-performance ratio of products 11 (13%), protection of life environment 7 (8%) and cost reduction 7 (8%), organization security management 5 (6%), distribution speed 4 (5%) and supplier cooperation 2 (2%). Below is a graphical presentation of these research results. Figure 2 gives a quantitative overview of these responses.

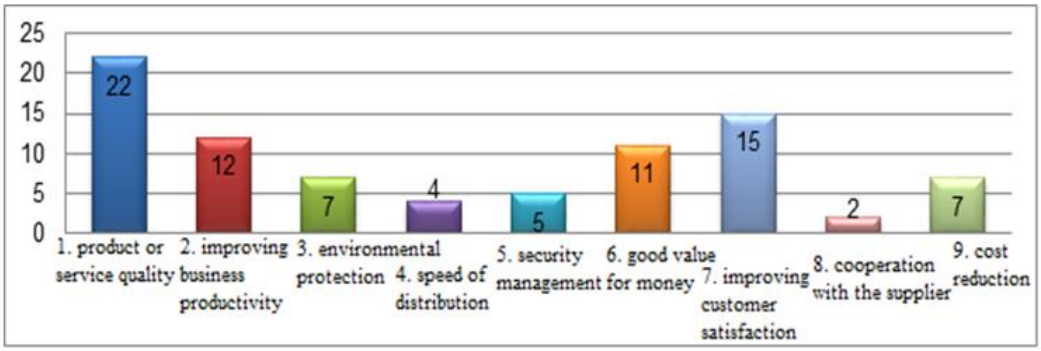

Figure 2. Quantitative presentation of respondents' answers to the question: What is most important for achieving aspects of business quality?

Based on these answers, it was determined that the most important thing for respondents is the quality of products and/or services, then improving customer satisfaction, and only then improving business productivity, which should come first, which leads to cost reduction, good price-quality ratio. Respondents do not recognize the basic aspects of business quality, namely productivity, costs and their impact on price, all within an adequate management system of the organization. Such results essentially indicate the wrong focus of the respondents, which can result in wrong actions in business practice. The most important thing for quality is management, not the quality of products and/or services.

The variable productivity can be analyzed from the answers given by the respondents to the question: How do you achieve an increase in productivity in your company? Respondents opted for the following answers: improving the quality of existing products/services 14 (31%), applying new knowledge 8 (18%), applying information technology 8 (18%), introducing new technologies 8 (18%), research and development new products/services 4 (9%), something else 3 (6%) (Figure 3).

It is necessary to first adopt new knowledge and then implement it in practice. This implies the application of information and communication technology for more efficient business and new technologies brought by Industry 4.0 to increase productivity and improve the quality of existing products/services. The last important variable for analyzing the results is the profitability of the company. With a score of 1-5, respondents rated the profitability of their company as follows: 18 (62%) satisfactory 3, 5 (17%) very high 4, 4 (14%) partial 2, 2 (7%) very high 5 , 0 (0%) very low1, taking into account that one respondent did not answer this question (Figure 4).

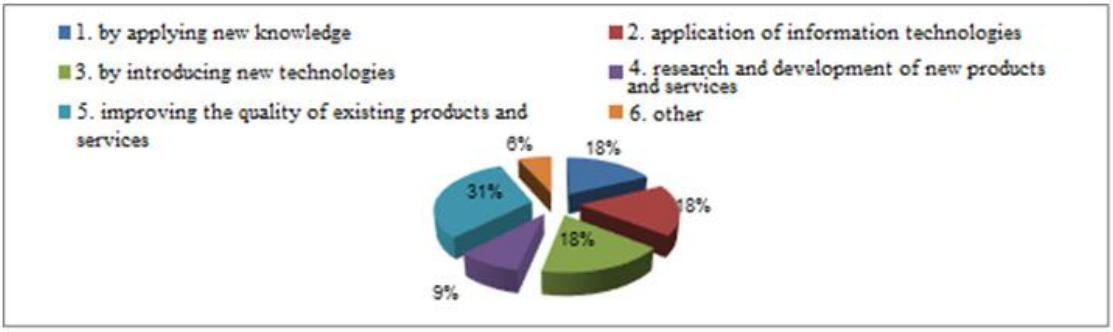

Figure 3. Percentage of respondents' answers to the question: How do you achieve productivity growth in your company?

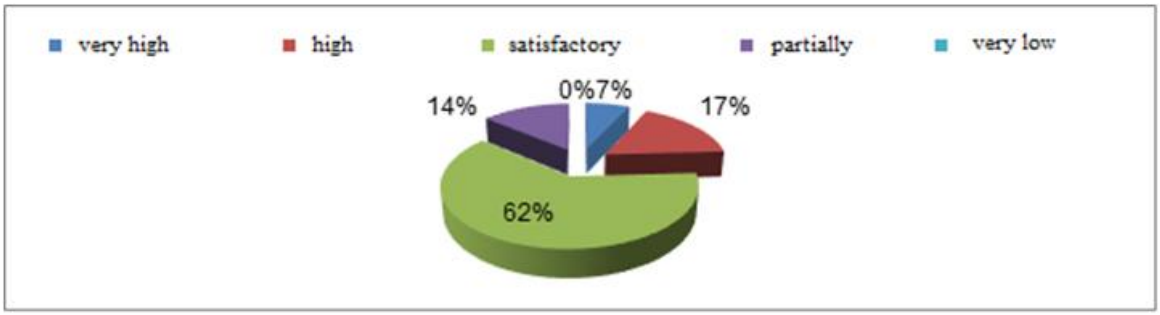

Figure 4. Percentage of respondents' answers to the question: Evaluate the profitability of your company according to the above criteria

The very fact that most of the surveyed managers rated their profitability with a grade of 3 (satisfactory) is not encouraging, given that much more investment, knowledge and work is needed to enable the growth and development of companies and long-term survival in the market.

CONCLUSION

Based on the results of the research, it can be concluded that the quality of business of the analyzed companies in the City of Zrenjanin is unsatisfactory or insufficiently adequate. Thus, the hypothesis: "The quality of business of domestic companies in the City of Zrenjanin is not satisfactory", based on the research, was confirmed. Inadequate knowledge of international standards in the field of quality management is present in domestic companies covered by this research. Business efficiency is at a low level, because some companies do not manage modern methods and techniques. Respondents do not recognize the basic aspects of business quality, productivity, costs and their impact on price, all within an adequate management system of the organization. These results essentially indicate the wrong focus of the respondents, which can result in wrong actions in business practice.

The most important thing for quality is management, not the quality of products and/or services. It is necessary to first adopt new knowledge and then implement it in practice. This implies the application of information and communication technology for more efficient business and new technologies brought by Industry 4.0 to increase productivity and improve the quality of existing products/services. In the short run, profitability does not depend exclusively on quality, which is a long-term category. Quality management and IMS are long-term phenomena and contribute to profit and development in the long run.

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STANDARDIZATION AND SYSTEM STANDARDS USAGE IN THE FIELD OF OCCUPATIONAL AND ENVIRONMENTAL SAFETY

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ABSTRACT

The complexity of the challenges that a modern organization faces imposes the need for constant adaptation and creation of responses not only to current demands but also to those that are "expected". The role of system standards (ISO 9001, 14001, 45001 and others) is to help organizations to improve their occupational or environmental protection performance. The application of system (management) standards is a prerequisite for effective, timely organized and cost-saving occupational and environmental protection processes. This paper analyzes the importance of standardization process and system standards application in this field of working and living environmental protection with reference both to civil and military practice.

Key words: standardization, system standards, working and living environment protection

INTRODUCTION

The beginnings of processes that in modern times are associated with standardization, either directly or indirectly, are reflected in the human need to measure certain things, or goods, before everything else for the needs of early commerce. In this sense, the forerunner or a precursor to that will be developed during the industrial age into the first phase of standardization in sense of precise definition are the first unit of measure (weights, lengths, areas, volumes, etc.) for the exchange of goods within the first civilizations that originated in the Nile Valley, or Mesopotamia. This indicates the fact that shows that from the beginning to the present age human kind has the need to quantify but also to unify the measurements of natural phenomena and objects from nature and its built environment. The next step represents the harmonization of units of measure between different civilizations, because already then were reported the problems of matching or "translating" the units of measurement used in Ancient Greece, Rome or Egypt. The first step of the internationalization of units of measurement and defining a universal measurement framework came about with the formation of the Roman Empire, during the so-called "Pax Romana" period, which was characterized by significant progress in the field of technical sciences, military techniques, cultures, etc. It is then for the first time that the need for harmonization is clearly defined the process of production, that is, the quality of products intended for the military, above all, in either to which part of the Roman Empire it is produced (Vasovic, 2017).

With the development of society, skills and knowledge and the division of labor, an obligation for quality has been imposed in terms of product and service design. Today's form of quality monitoring comes from of medieval Europe, where artisans organized themselves into some form of cooperative society prescribing basic principles for product quality. Until the early 19th century entire production in the industrial world followed this craft model. Factory systems put an emphasis on product control, which began in the mid-18th century in Great Britain, and it evolved with the industrial revolution (Vasovic, 2016).

SYSTEM STANDARDS USAGE IN THE FIELD OF OCCUPATIONAL AND ENVIRONMENAL SAFETY

The ISO 9001 series of standards deals with various aspects of quality management and contains some of the most famous ISO standards. These standards provide guidance and tools for organizations that want to make sure their products and services are constantly up meet customer requirements and needs. The ISO 14001 series of standards covers various aspects of environmental management and protection. These standards provide practical tools for organizations seeking to identify and control their environmental impact and continually improve their environmental performance. The ISO 45001 is the relatively new international standard for the OH&S area. Occupational Health and Safety (OH&S) is an essential part of an organization's strategy for managing professional risk. The implementation of the OH&S system enables an organization to: protect its employees and others under its control, complies with legal requirements and supports continuous improvements.

Using the similarity of the all system standards there is a possibility to integrate some of the common requirements into the unique integrated management system. Figure 1 presents the base of the system standards integration scheme, starting from ISO 9001 as the core one, to other system or specific standards like ISO 14001 or ISO 27001, depending on the needs of an organization (BS PAS, 2012).

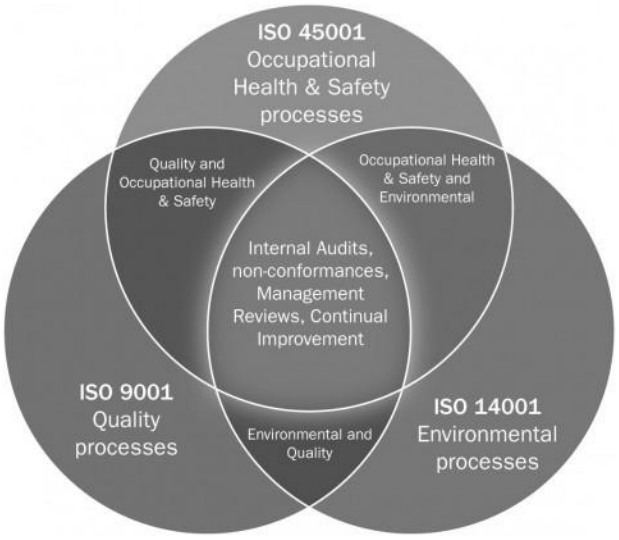

Figure 1: Combined – integrated management system (Michelle-Louise, 2019)

Detailed structure comparison of the abovementioned system standards is shown in Table 1.

Table 1: The comparison of the most representative ISO family of system standards (ISO 2015, 2018)

ISO 9001:2015		ISO 14001:2015		ISO 45001:2018	
	Introduction		Introduction		Introduction
0.1	General	0.1	Background		
0.2	Quality management principles	0.2	Aim of an environmental management system		
0.3	Process approach	0.3	Success factors		
0.3.1	General	0.4	Plan-Do-Check-Act model		
0.3.2	Plan-Do-Check-Act cycle	0.5	Contents of this international standard		
0.3.3	Risk-based thinking				
0.4	Relationship with other management standards				
1	Scope	1	Scope	1	Scope
2	Normative references	2	Normative references	2	Normative references
3	Terms and definitions	3	Terms and definitions	3	Terms and definitions

ISO 9001:2015		ISO 14001:2015		ISO 45001:2018	
4	Context of the organization		Context of the organization		Context of the organization
4.1	Understanding the organization and its context	4.1	Understanding the organization and its context	4.1	Understanding the organization and its context
4.2	Understanding the needs and expectations of interested parties	4.2	Understanding the needs and expectations of interested parties	4.2	Understanding the needs and expectations of workers and other interested partie
4.3	Determining the scope of the quality management system	4.3	Determining the scope of the environmental management system	4.3	Determining the scope of the OH&S management system
4.4	Quality management system and its processes	4.4	Environmental management system	4.4	OH&S management system
4.4.1	Establish, implement, maintain and continually improve				
4.4.2	Maintain documented information				
5	Leadership	5	Leadership	5	Leadership and worker participation
5.1	Leadership and commitment		Leadership and commitment		Leadership and commitment
5.1.1	General				
5.1.2	Customer focus				
5.2	Policy	5.2	Environmental policy	5.2	OH&S policy
5.2.1	Establishing the quality policy				
5.2.2	Communicating the quality policy				
5.3	Organizational roles, responsibilities and authorities		Organizational roles, responsibilities and authorities		Organizational roles, responsibilities and authorities
6	Planning	6	Planning	6	Planning
6.1	Actions to address risks and opportunities	6.1	Actions to address risks and opportunities	6.1	Actions to address risks and opportunities
6.2	Quality objectives and planning to achieve them	6.2	Environmental objectives and planning to achieve them	6.2	OH&S objectives and planning to achieve them
7	Support	7	Support	7	Support
7.1	Resources	7.1	Resources	7.1	Resources
8	Operation	8	Operation	8	Operation
8.1	Operational planning and control	8.1	Operational planning and control	8.1	Operational planning and control
8.2	Requirements for products and services	8.2	Emergency preparedness and response	8.2	Emergency preparedness and response
8.3	Design and development of products and services				
9	Performance evaluation	9	Performance evaluation	9	Performance evaluation
9.1	Monitoring measurement, analysis and evaluation	9.1	Monitoring measurement, analysis and evaluation	9.1	Monitoring, measurement, analysis and performance evaluation
10	Improvement	10	Improvement	10	Improvement
10.1	General	10.1	General	10.1	General
10.2	Nonconformity and corrective action	10.2	Nonconformity and corrective action	10.2	Incident, nonconformity and corrective action
10.3	Continual improvement	10.3	Continual improvement	10.3	Continual improvement

The environmental protection or occupational safety challenges can vary, particularly from primary to secondary and tertiary sector. Nevertheless, is it noticeable that majority of the requirements that organization is supposed to meet are derived from the ISO 9001, as the core (and oldest) one.

DISCUSSION

The use of system standards in European Union and the Republic of Serbia has seen a steady increase in the number of organizations that use them. For instance, the number of ISO 14001 issued certificates is steadily increasing in Republic of Serbia, and in 2016 there were 1,139 valid certificates. Compared to 2015, the number of certificates in the Republic of Serbia increased by 1.7%, while in

Europe it increased by 0.7%. According to research conducted by the International Organization for Standardization, there are significant differences between countries in the number of certificates issued for the ISO 14001 standard (SEPA, 2019). The situation with the ISO 9001 standard usage is similar, while there is still insufficient data to evaluate the ISO 45001 standard usage having in mind the fact than only two years have passed since its publication.

CONCLUSION

The practical role of the system standards is to help organizations to sustain demands of all stakeholders. The needs and expectations of users/customers include products (and/or services) that are aligned with requirements, reliable, available when needed and suitable for maintenance. Employees expect better workplace conditions, health organization care and security, personal development and advancement opportunities. Owners/investors expect faster return on investment, better results and higher profits. The needs and expectations of the community are reflected in the organization's fulfillment the requirements of laws and other regulations, to take care of its environmental impacts, to be rational user of natural resources and to demonstrate both responsibility for health and safety and to manage the impact of its products, processes and activities on society as a whole, and in particular on the local community. Acknowledgment

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CONDITIONAL MONITORING IN INDUSTRY 4.0

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ABSTRACT

In this paper, the authors dealt with the implementation of modern maintenance technologies that fit within the concept of Industry 4.0, and which requires from this segment to maximize productivity and production efficiency. Maintenance methodology based on conditional monitoring is the only form of maintenance that fits into the aforementioned concept. The popular "Conditional Monitoring" is a modern approach, where modern systems and software tools for monitoring the status of the system are used to maintain a particular system. Applying the right instruments tends to increase production efficiency in terms of reducing maintenance costs and sudden system shutdowns, which is actually one of the largest sources of production costs.

Key words: Industry 4.0., production, Conditional Monitoring, efficiency.

INTRODUCTION

The globalization of markets has put companies in a tough position. Namely, through globalization a large number of markets are globalized thus enterprises face a more vibrant and intense competition (Bakator, M, et al., 2019). Today is a very topical issue among the major competitors in the global industry is titled Industry 4.0. According to this all indications (developing machines, computer software, robotics, etc.) global business networks will soon appear. They will unite their "smart" machines, storage systems and manufacturing facilities in the form of cyber-physical production system (Crnjac, M., Veža, I., Banduka, N., 2017). In the field of maintenance, the first step towards Industry 4.0 is the automation of systems implemented in production. Conditional monitoring represents a revolution in the system maintenance, as well as a methodology that within your system uses modern equipment for diagnostics. In this way, the system leads to constant monitoring, which allows to increase the productivity and efficiency of production. According to the statement (Rivera, D. L. et al., 2019) with the expansion of digitalization and the advent of the Industry 4.0 concept, we strive to optimize industrial production, with a fundamental approach to gathering important data. A recent survey conducted in the real-world industry, 68% of surveyed firms confirmed that they had a strategy that was implemented with respect to appropriate databases that deal with data collection from measurement sites in their company. while 30% stated that their strategy is in development and that they strive to follow the modern concepts required by Industry 4.0. In addition, 60% of respondents think that they are collecting the necessary data well or even excellent, while only 32% think that it is generating and processing the collected data well (Lueth, K. L. et al., 2016).

IMPORTANCE OF INTRODUCING INDUSTRY 4.0 INTO MANUFACTURING FACILITIES

The development of digital and advanced technologies, as well as innovation in production processes, presents challenges for the development of all technologies, including robotic technology. The convergence of digital and other technologies, and above all the sensory technology, has influenced the development of robotic technology (Majstorović V. et al., 2015). The fourth industrial revolution, or Industry 4.0 (also addressed as I4.0 or I4) is characterized with cyber physical systems (CPS) with its main goal to meet the necessary agility in the production process in order to increase overall efficiency and effectiveness of the entire industry (Bakator, M. et al., 2018; Lu, 2017). As the authors (Sanders, A., Elangeswaran, C., Wulfsberg, J, 2016) define in their work Industry 4.0 can increasingly support lean manufacturing processes, reducing various forms of waste (transport, time, defect products/services etc.) as it applies information and communication systems. Although much has already been learned from Industry 4.0, there are still gaps in the application of all technologies within this concept.

Management of large databases in the industry 4.0

With the application of new advanced technologies in manufacturing processes, the amount of data is doubled every year, resulting in a large amount of raw data (Khan, N. et al., 2014). Using appropriate methods, algorithms and software tools, different types of data can be collected from different parts of the production environment, called big data. Although the term "big data" has become a ubiquitous word in the scientific-research vocabulary, there is no general definition to indicate how big data is really "big". Therefore, the term itself has remained rather vague and gives no specific meaning because the notion of its size is too generic. However, most definitions are data oriented, while data analysis does not stand out as a fundamental step in transforming data into useful and necessary information. Therefore, we define Big Data Analysis as an advanced technology for revealing hidden information among vast amounts of data collected by different devices, using advanced analytical techniques such as data mining, advanced statistical analysis, predictive analytics, etc (Chen, Y. et al., 2016).

MANAGEMENT AND METHODOLOGY OF CONDITIONAL MONITORING

Condition monitoring is used in condition based maintenance and is its basis. Organizations that resort to conditional based maintenance methods have large amounts of data to handle within the system. The records being tracked represent a complex amount of data, however research shows that sometimes this data is of no use to organizations that have implemented this type of maintenance. If such occurrences are frequent, that is, in order to improve the risk assessment, it is necessary to introduce new risk assessment methods (Jardine, 2002). Figure 1. shows the maintenance status monitoring method.

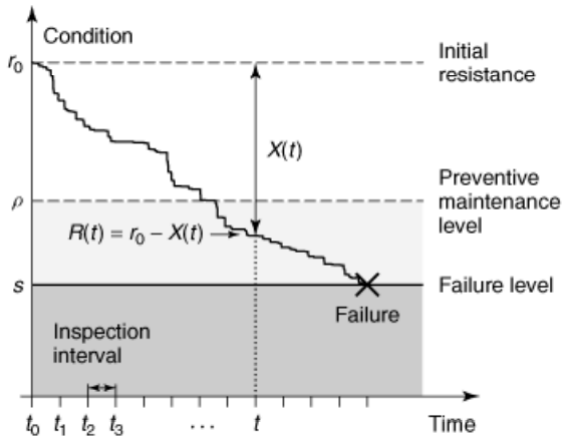

Figure 1: Conditional based maintenance (Mazzuchi, T., Noortwijk, J., Kallen, M., 2008)

Maintenance activities are therefore mostly not standardised and not planned and scheduled propertly. Subjective estimations are more taken into account than the possibility of amore precise scheduling (Pfeifer, 2019).

In order to implement CBM, (Wetzer, J.M. et al., 2000) consider it has been ejected well, which is always necessary to enable modern devices that fit the controllable system, and that allow for adequate integration into the maintenance program. The CBM concept consists of three key steps towards (Jardine, A. K., Lin, D., & Banjevic, D, 2006):
Gathering relevant data to create a successful system,

– Data processing (information management), processing of signals important for understanding system issues,
– Deciding on the method of maintenance based on the data collected, proposing an effective maintenance policy.

Two important aspects of the conditional based maintenance concept are diagnostic and prognostic. Diagnostics as a maintenance aspect according to the condition, deals with the detection, isolation and identification of the occurrence of a problem, before its occurrence. The detection indicates whether an error occurs during the monitoring of the system being monitored, while the isolation task is to locate the fault of the defective system component. The function of the identification process is to determine the nature of the error that occurs on the component, system. Figure 2. shows an automated maintenance system.

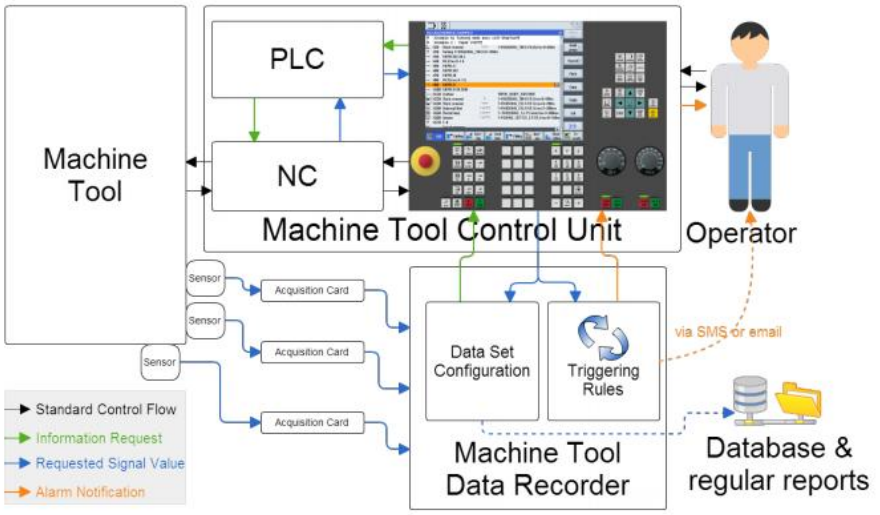

Figure 2: Automated maintenance system (Jimenez-Cortadi, A. et al., 2020)

Fault diagnosis is the process of tracing a fault by identifying its symptoms, applying knowledge, and analyzing test results.

Implementation of conditional monitoring in hydraulic system

Modern hydraulic systems have required a large number of duty cycles during production, especially when it comes to hydraulic presses. In order to achieve this, it is essential that the application of adequate condition maintenance concept reducing the number of undesirable failures and system downtime. In the example of hydraulic presses, this type of maintenance is carried out by conditional monitoring of the drive elements of the press, namely hydraulic pumps, in this case a centrifugal pump. To test the main parameters of condition, flow, pressure and temperature, modern turbines with can software are used. Figure 3 shows one diagnostic of a Siemens hydraulic press.

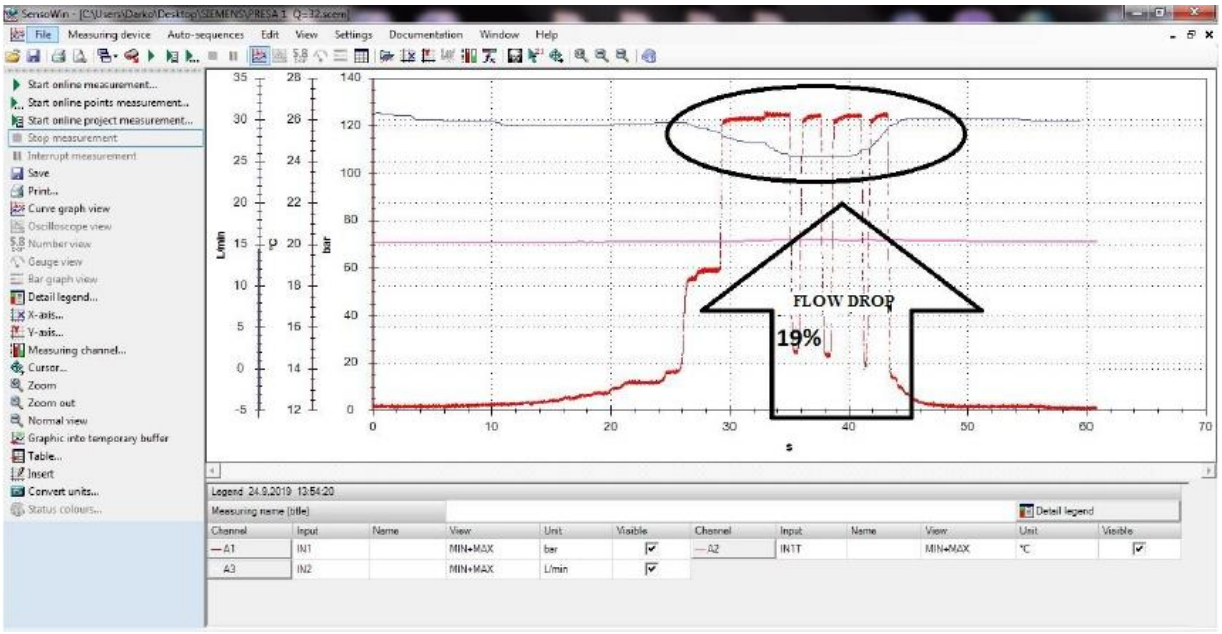

Figure 3: Diagnostic of hydraulic press

It can be seen from the PQ diagram that an adequate response was obtained by pump testing, that at a maximum pressure of 120 bar, a flow decrease of 19% occurs. This result indicates that the pump utilization rate is less than optimal and that it should be replaced within the next 6 months in order to avoid corrective measures.

The implementation of the CBM concept achieved the appropriate optimization of the work hidden in which the concept was applied. Figure 4 shows a diagram in which there are available data about the optimization of a hydraulic press with the application of the concept of CBM.

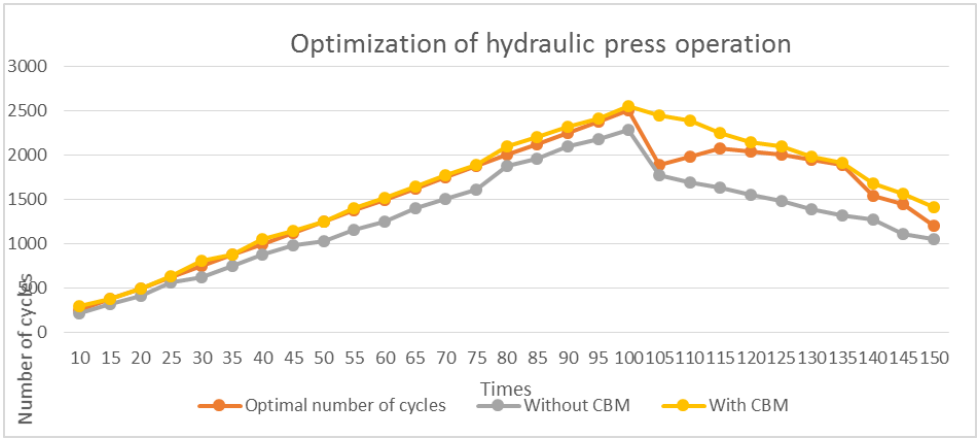

Figure 4: Indicator of optimization of hydraulic press operation with CBM concept

According to the diagram, it is concluded that the implementation of the CBM concept increases the number of system cycles, which enables a higher percentage of productivity and efficiency.

CONCLUSION

Throughout the paper, we demonstrate the approach to maintenance that falls within the contemporary concept of Industry 4.0. The use of modern methods of technical diagnostics belongs to the concept of Conditional monitoring. By implementing such a system maintenance methodology, efficiency is

increased and unexpected system downtime is reduced. Inserting such concept of maintenance in industrial systems, there is a primary objective of any system, and to increase productivity and efficiency are directly used to increase economic viability. This technique requires some investment in hardware and software units but in a short period of time the investments pay off and they become long-term solutions

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THE SIMULATION OF STORM ASSESSMENT ALGORITHM ON THE POWER DISTRIBUTION SYSTEM RELIABILITY

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ABSTRACT

The analytical methods that predict the reliability of power distribution systems are typically based on the assumption that all failures are independent. This is practically true under normal weather conditions and absolutely wrong for extreme weather. The main difficulty is that multiple atmospheric faults occur during a storm. At that time, it is unlikely that the requisite enough number of crew will be available, which will, as a consequence, have long power outages for individual power consumers. The paper describes the power distribution system reliability is modeling during the storm using sequential simulation. Weather storms are modeled as bad conditions, characterized by a range of probability distribution functions and dependent on the storm intensity. An algorithm for the modeling and analysis storm assessment was developed to identify a potential failure on the power distribution system. Also, algorithms have been created to simulate the performed activities after the storm in order to bring the distribution system into operation as soon as possible.

Key words: simulation, algorithm, storm assessment, distribution system

INTRODUCTION

Delivery of electricity in extreme weather will often be suspended. The most common reasons are that high winds and storms break down trees that fall on the transmission line and thus use them to interrupt electricity delivery. In addition, it may be the case that the use of electrical discharges results in a thunderstruck in an electrical station or houses, so that cause the faults. In order for the delivery of electricity to be a continuous, primary goal in the storm event is necessary to deploy available teams to eliminate failure in locations where the fault occurred and to eliminate it as soon as possible. The paper presents algorithms used to simulate actions performed during and after a disaster and which aim to improve the reliability of electricity distribution to end consumers.

THE SIMULATION ALGORITHMS OF STORM WEATHER

The simulation storm weather is performed through two phases. The simulation first phase simulates a period of storm weather, and the second simulates the repairs and maintenance that are carried out when the storm stops. During the first phase of simulation, the likelihood of failure of power equipment increases. The most critical aspect in simulating the impact of storm is modeling the impact on fault intensity. If there is a large amount of data from the previous period related to the occurrence of incidents, the relationship between the intensity of storms and equipment failures can be determined. The fault intensity model can be derived from physical models. When creating a simulation model, each element is tested for failure at any time interval (Zhu, 2007). In order to

achieve proper results, the weather assessment and simulation must be repeated several times. The impact of storm on overall reliability is then determined by simulation over a long period of time. Storm estimation can be determined using the algorithm in Figure 1 (Ewald, 2012; Lui et al., 2015). This algorithm can be applied in storm modeling and simulation. To determine the impact of storms on reliability, we need the information of two parameters: wind speed and storm duration. To determine these values, it is necessary to have data on previous storm events in order to perform analysis and modeling. The initial parameters are the average wind speed and the minimum duration of storm. The ultimate criterion is that the wind speed is below the specified speed for minimum duration of incidents. An algorithm for identifying potential weather events is given in Figure 2 (Mishra, 2019; AlAli, 2015).

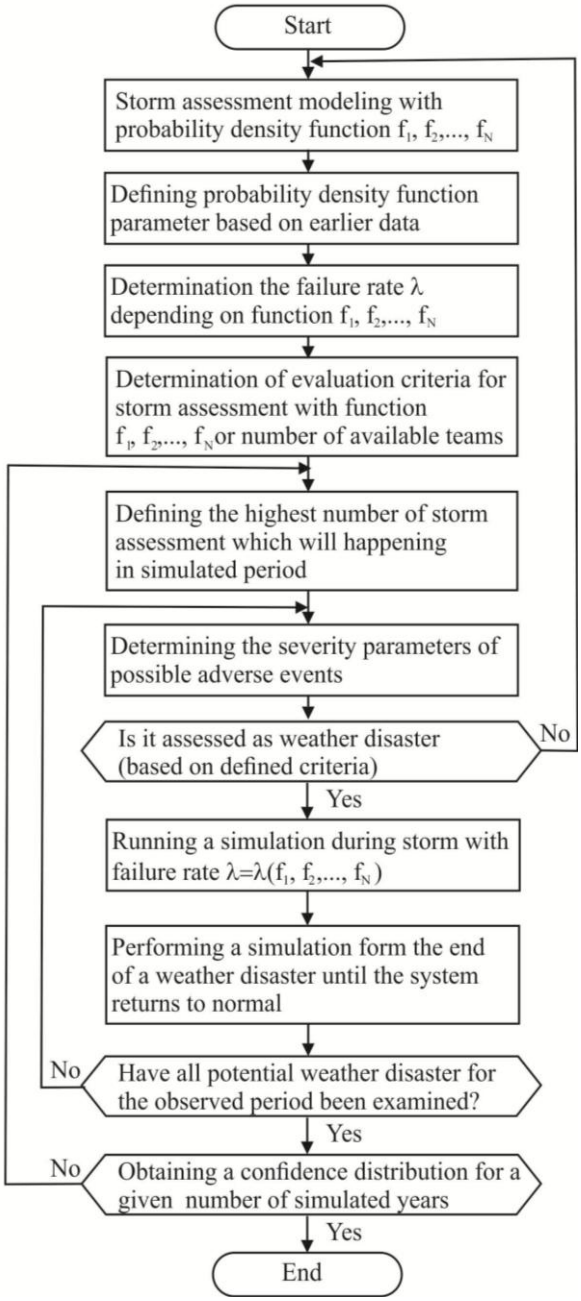


Figure 1: A storm assessment simulation algorithm

The following parameters are required to analyze the storm weather:
v - average wind speed in storm event,

t_{start} - time of storm beginning,
t_{end} - time of storm ending,
$v_{\min}$ - minimal wind speed,
t - time duration of storm in hours,
$t_{\min}$ - minimal time duration of storm in hours,
E - wind energy,
$E_{\min}$ - minimal wind energy.

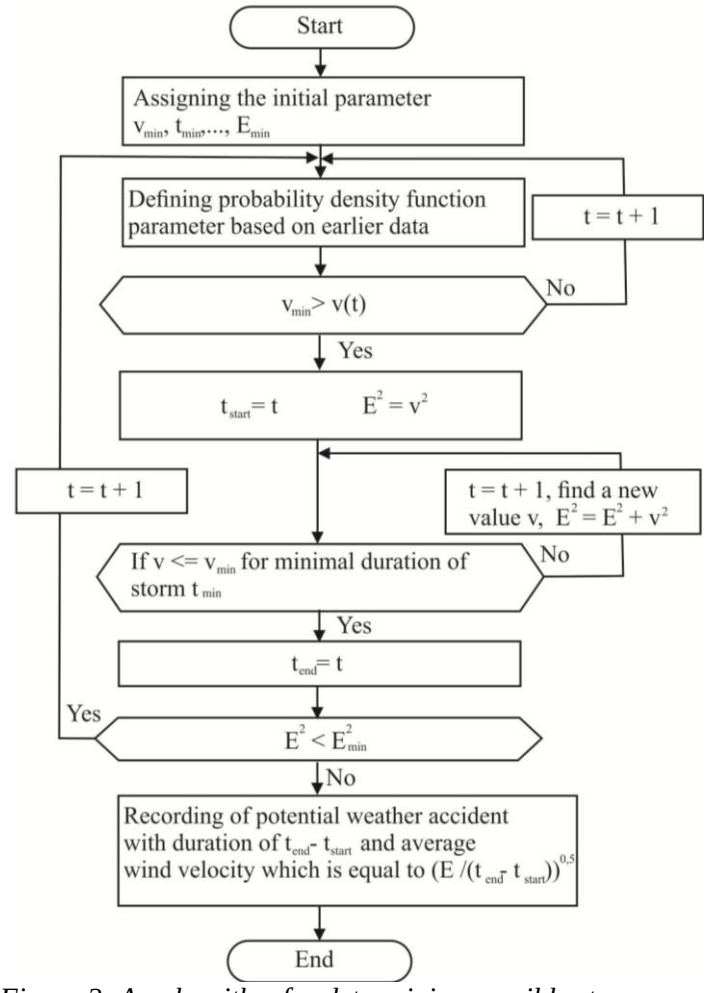


Figure 2: An algorithm for determining possible storm event

RELIABILITY ANALYSIS OF POTENTIAL STORM EVENTS

Due to the occurrence of storm weather, it is necessary to determine the density function of the storm duration and the wind speed. Usually the log normal distribution is used. Probability density function for the duration of potential storm events f_t and probability density function of wind speed f_v are:

$$f_t(t-t_{\min}) = \frac{1}{\sigma_t(t-t_{\min})\sqrt{2\pi}} \exp\left[-\frac{(\ln(t-t_{\min})-\mu_t)^2}{2\sigma_t^2}\right]$$

$$f_v(v-v_{\min}) = \frac{1}{\sigma_v(v-v_{\min})\sqrt{2\pi}} \exp\left[-\frac{(\ln(v-v_{\min})-\mu_v)^2}{2\sigma_v^2}\right]$$

where are: μ_d, σ_d, μ_v и σ_v log normal parameters obtained using data from the previous period of storm events (Brown, 2009; Cadini, 2017).

At higher wind speeds, the failure rate increases, so the resulting failures are modeled as a function of wind speed (not constant values). The faults related to overhead (transmission) lines are mainly due to the breaking of tree branches or falling of the pole due to storm weather, so this size is proportional to the square of the wind speed. The failure rate due to weather conditions for overhead lines at wind speed is obtained as:

$$\lambda(s) = \lambda_{base}\left(\frac{v}{v_{base}}\right)^2 \tag{1}$$

where are:
λ_{base} base failure intensity,
v_{base} - base wind speed.

The data on the intensity of overhead line faults due to wind is very difficult to obtain, since no such fault is recorded in the operating statistics. This value is determined by setting the wind speed to twice the mean calculated speed. Then, it will be adjust the fault intensity and compare it with the previous data. The total expected number of failures N_k in the system is determined by summing the number of failures of all elements in the system (Sultan, 2020):

$$N_k = t \cdot \left(\frac{v}{v_{base}}\right)^2 . \sum_{i=1}^{n} \lambda_i \tag{2}$$

where is: n number of overhead lines in distribution system.

Mean Time To Repair-MTTR for each overhead line section is defined or known. The total expected repair time equals to product of MTTR of each line and the expected number of failures on that line. The total expected troubleshooting time during a storm is determined by summing the fault elimination time at all transmission lines in the system:

$$T_k = t \cdot \left(\frac{v}{v_{base}}\right)^2 \cdot \sum_{i=1}^{n} \left[MTTR \cdot \lambda_i\right] \tag{3}$$

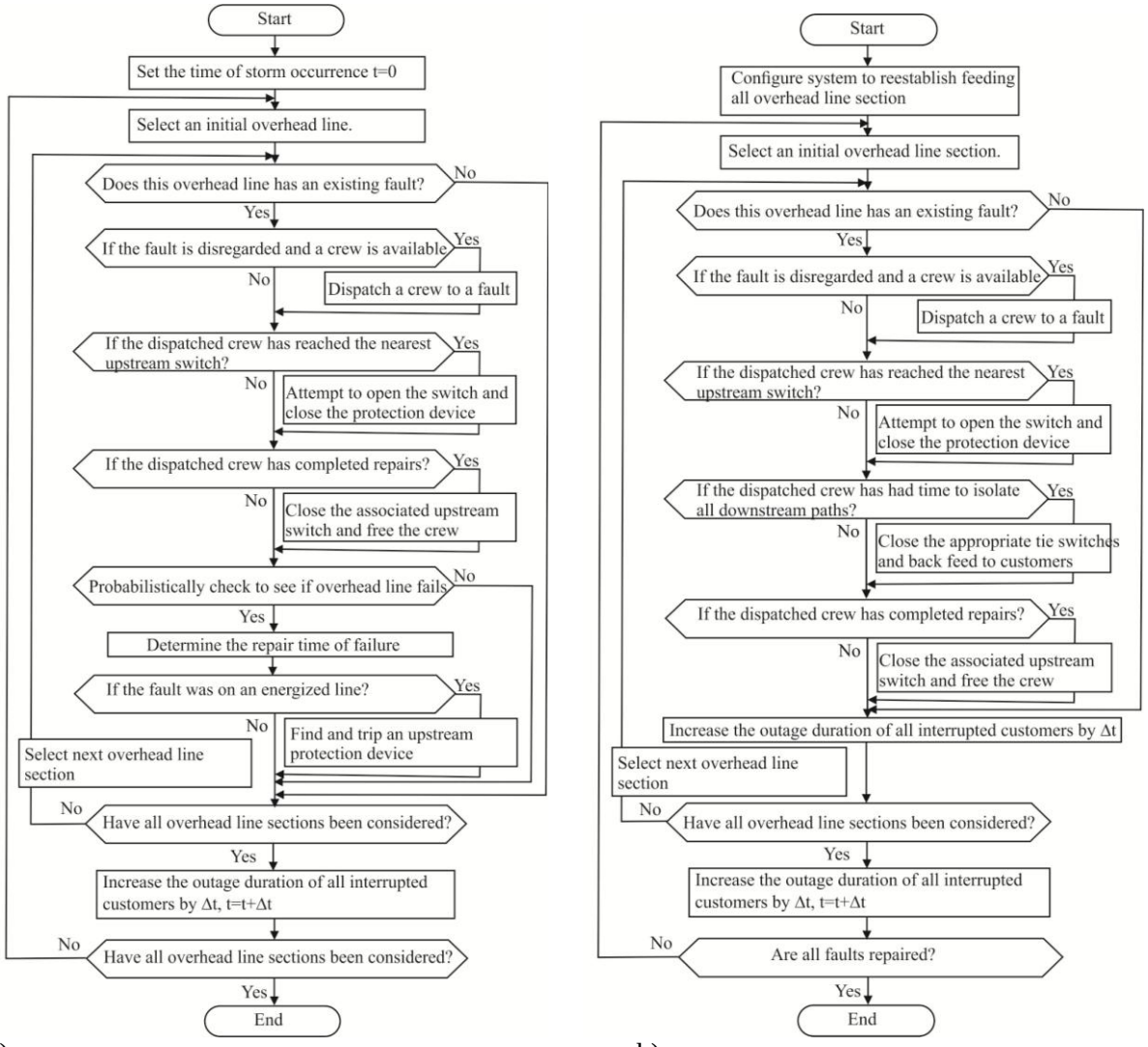
To simulate storm events in a year, the following steps must be followed. First, the number of potential incidents equal to the average number of incidents from the previous time period is generated. Each event has a specific duration and the wind speed is determined by applying a probability density function that matches the data previously collected.

The second step is to determine whether a potential storm events meets the criterion defined for a weather disaster. If the given criteria are met, a weather disaster is determining. The simulation of the system determines the impact of the occurrence of a storm events on any consumer during the observed year.

Each storm events must be analyzed in detail to determine the reliability of each consumer's power supply during a weather disaster. This is achieved by applying a simulation consisting of two phases (Figures 3 a) and b)). In the first phase, the simulation starts with the occurrence of a weather disaster and ends with the termination of a weather disaster. When the failures appear, the dispatched crews must be prepared to dispatch on the place where failure is obtained. In the event of unnoticed damage

to the equipment, safety problems may arise during re-establishment of the power supply. The algorithm for the first phase of the simulation is shown in Figure 3. a) (Eve, 2018).

The first phase of the simulation starts with normal system operation. It is then checked if a failure has occurred during the first time interval. If a failure occurs and the crew is available, then crew is sent to the location where the failure is occurred. If all crews are unavailable, any teams that become available will be sent to the location where the failure occurred. Firstly, more critical failures to a larger number of consumers are eliminating. The process continues until the storm stops and then the second phase begins.



a) b)

Figure 3: An algorithm of implementation activities for: first phase a) and second phase b) of storm weather

The second phase of the simulation consider at the type of failure and the establishment of consumer power. In this case, it is assumed that no additional system failures will occur. At this stage, the system may have uncorrected failures that were not eliminated in the first stage (teams were sent to the location of failure, fuses blown, switches open, etc.).

The first task is to check if the power supply can be restored within the estimated time period. If this is not possible, some consumers may need to find alternative power sources. The simulation is performed as in the first phase, except that no new system failures occur at this stage and the troubleshooting crew establishes the power supply to as many customers as possible. The second

phase of the simulation continues until all faults have been eliminated and the power supply has been restored to all consumers. The second phase of the simulation is shown by the algorithm in Figure 3. b) (Cerrai, et al., 2019).

The duration of interruptions in the delivery of electricity to consumers varies from year to year. Based on the data collected in previous years, it is possible to determine how close the interruption time will be for the next time period. So, for example, interruptions that occur during the normal operation of the distribution system are on average about 3.8 hours per year. However, due to storm weather, annual outages are higher than under normal operating conditions.

CONCLUSION

A distribution system fault when storm weather begins impacts on many different customers in interruption of electric energy. The aim of simulation the actions of crews are to minimize time of interruption of electricity supply. The lengths of sustained interruptions depend of various factors: the length of storm, number of available crews, distance of interrupted customer form distribution center, nearest upstream switch, how long fault to be repaired. All of these factors are critical to distribution system reliability and should always be taken into account.

Acknowledgement

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AN ALTERNATIVE STATISTICAL LOSS FUNCTION FOR MANAGEMENT DATA IDENTIFICATION

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ABSTRACT

Loss functions have critical importance in data identification like regression modelling. This study focuses on the location-using statistical loss functions for appraising univariate measures. In addition to conventional expressions, an alternative function is suggested. The function has been applied to Serbian airlines data. The results indicate some potentialities for management data identification.

Key words: Loss function, Radogram, Airline data.

INTRODUCTION

In statistical data analysis, use of a loss function in data identification processes has crucial importance. Both conventional statistical data modelling and machine learning are performed based on loss functions. In general, the loss functions are developed based on descriptive statistics such as central tendency measures. Therefore, location-based measures like mean, median and mode calculations can be accepted as the ground of the loss functionality. From a data analytics framework, when model values deviate too much from measurement data, loss function learns to decrease the error in estimation (Härdle et al., 2015).

Tourism in Serbia is officially recognized as a primary area for economic and social growth. The hotel and catering sector accounted for approximately 2.2% of GDP in 2015. Tourism in Serbia employs some 75,000 people, about 3% of the country's workforce (OECD; RS). In recent years the number of tourists is increasing, especially foreign once for about hundred thousand arrivals more each year. Tourism, transport and other business services participate in the total export of services in the world with 75%, with tourism having the largest share of 28%. Tourism as an activity takes an increasingly important place in the world economy (Petrović, 2007).

Because management data, as more specifically airway records characterizes by different factors and addresses big data warehouse, alternative statistical evaluations with new components are also required.

Measure of location using statistical loss function provides input information used in data processing. Therefore, many investigations were conducted to suggest reliable loss functions (Rosasco et al., 2004; Nie et al., 2018). In regression-based analyses, mean and median are used to minimize the deviations as the standard indicators. Squared loss and absolute loss as well as bias and entropy losses have gained popularity in the last decades (James et al., 2013).

In this study, a new minimizer, a radogram-based minimizer for square toot of the absolute loss deviations is suggested (Bigdeli et al., 2014). This measure is an outlier-resistant minimizer and it provides some details to inspect the deviations.

FIELD AND METHODOLOGY

Application Field

Airline is one of the safe and effective transportation providing a bridge between distance cities and countries. Airline mainly has two types of transportation which are domestic and international. In some cases, these modules can be intertwined due to connection flights (Lantseva et al., 2015).

Flight density and carried passenger numbers have instructive indicators to appraise the level of air transportation in referenced place. However, the extraordinary flight and passenger mobility can be recorded and mostly this trend depends on many temporary social (holiday, festival), economic (discount, campaign) and natural factors (climate). Therefore, the determination of the centre of gravity (density) based on the deviations addresses a critical measure for taking some precautions and making decisions.

Loss Functions

In a statistical model assessment, a loss function is structured by difference between measured *y* and model $\hat{y}$ values as follow (Paolino, 2017):

$$\left(y,\hat{y}\right)\rightarrow l\left(e\right)=l\left(y,\hat{y}\right) \tag{1}$$

In Eq. (1), *e* denotes the residual provided by $\left(y-\hat{y}\right)$.

Although statistics and machine learning communities use different types of loss functions, the most common expressions are squared (l_2) and absolute (l_1) losses. The effective regularization regression models Ridge and the Lasso employs these functions, respectively.

The general way to minimize the squared loss function is calculating the mean. The squared loss (l_2) deviations can be structured in a general form as follows (Dayal, 2020):

$$f\left(x\right)=\sum_{i=1}^{n}\left(y_i-x\right)^2 \tag{2}$$

Similarly, the median of the values of a variable *y* minimizes the absolute loss (l_1) deviations (Dayal, 2020):

$$f\left(x\right)=\sum_{i=1}^{n}\left|y_i-x\right|. \tag{3}$$

Alternative function

When viewed from the aspects above, the first loss function addresses a quadratic error calculation as well as the mean. This loss may have a drawback against the extreme values because of the nature of the averaging. On the other hand, absolute loss function has an outlier-resistant structure From a spatial data analysis perspective, Eq. (2) and Eq. (3) refer variogram and madogram functions used in modelling spatial dependence (Peyk-Herfeh and Shahbahrami, 2014). In a similar direction, absolute value in square root can be suggested as an alternative loss function which addresses radogram measures used for spatial dependence measure. The alternative function can be presented as follows:

$$f(x)=\sum_{i=1}^{n}\sqrt{|y_i-x|} \tag{4}$$

The loss function expressed in Eq. (4) uses the lowered power and therefore more resistant to outliers. In addition, the smoothing level is relatively small. Put it differently, this loss deviation could provide the details more.

IMPLEMENTATION

Data and Descriptive Statistics

To explore the capability of the loss functions on the management science data, a case study has been designed. To explore the touristic capability based on airline data derived from ORS (2020). The data set includes the yearly (2003-2019) passenger (domestic and international) arrivals have been considered.

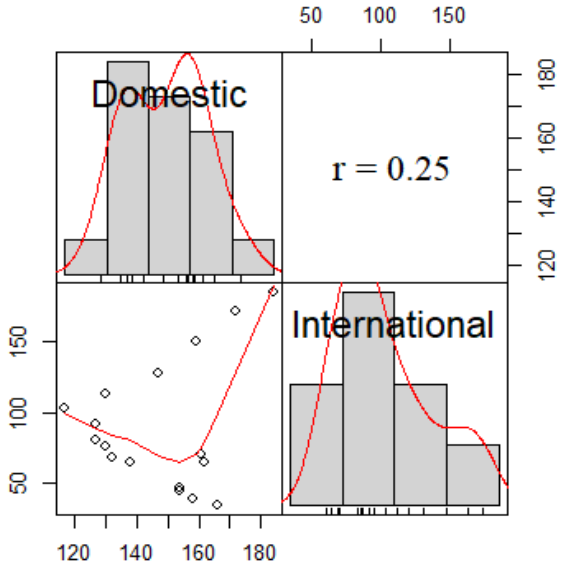

Figure 1: Relationship between flight types

The descriptive statistics of the data set is summarized in Table 1. As seen in Table 1, the big range and standard deviation refer more variability for the international flights.

Table 1: Summary statistics.

	Domestic	International
Minimum	117.0	34.0
Maximum	184.0	185.0
Range	67.0	151.0
Median	154.0	76.0
Mean	148.1	90.1
Standard Deviation	18.9	45.7

Results and Discussion

The plots created for all the statistical loss functions are illustrated in Figure 2. The key functions plotted reveal the central tendency clearly. It is clear that the alternative function provides more details

than the others. In figure 3, one each extreme values have been added in data sets. As seen in the plots, the suggested loss structure can compensate the outlier values like l_1 function performed.

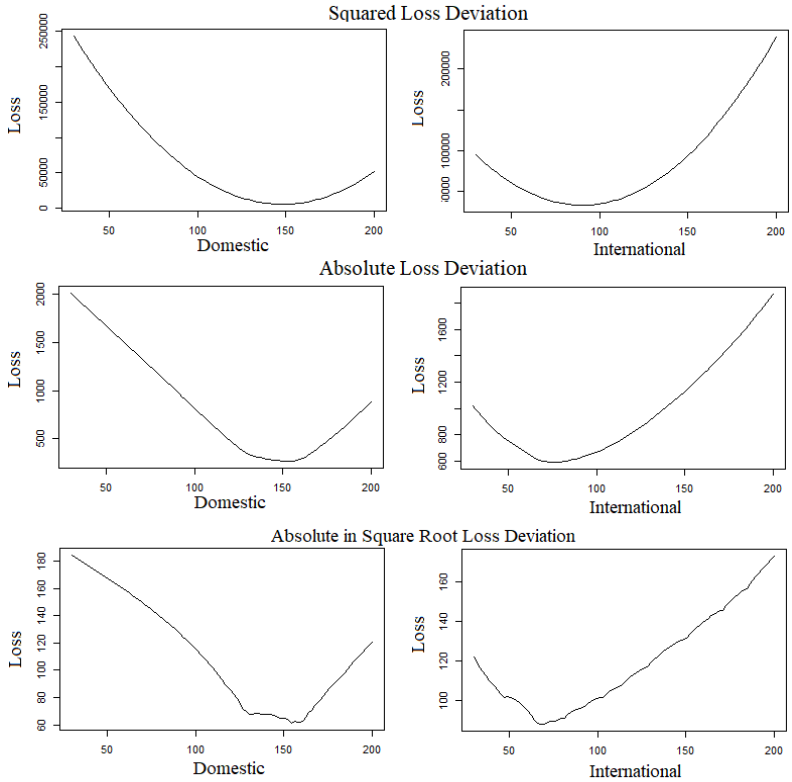

Figure 2: Identification by statistical loss functions

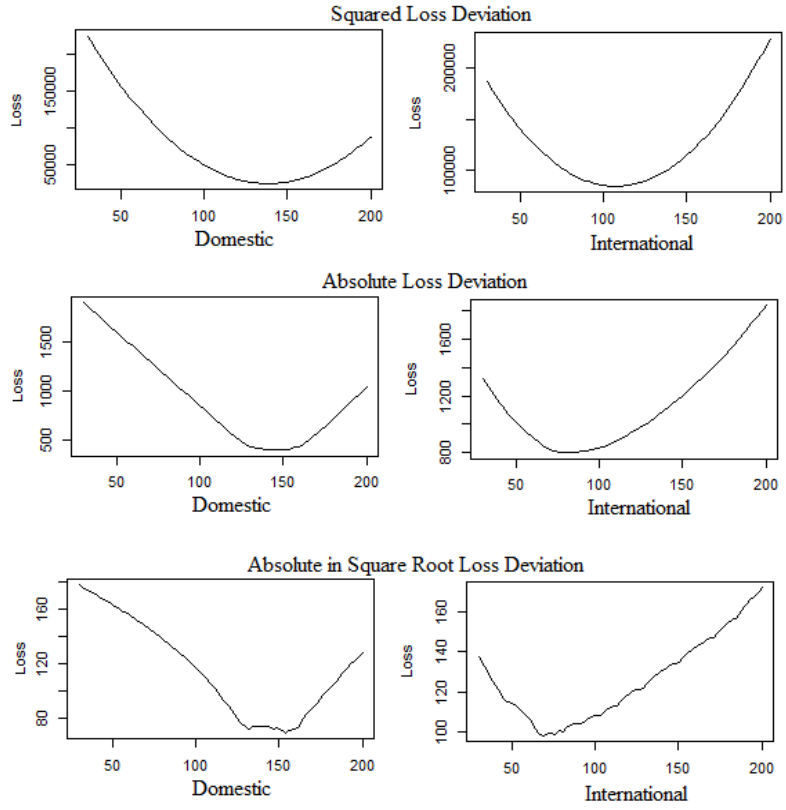

Figure 3: Outlier effect on statistical loss functions

CONCLUSIONS

In system modelling, loss functions are employed both for classification and regression purposes. In this study, a location-using statistical loss function for appraising univariate measures has been practised. To show the effects of the functions types on management data, a passenger data set derived from the airlines have been evaluated. The outcome revealed that the alternative method has an outlier-resistant property and it is sufficient to follow the trends in detail.

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Session B: HUMAN RESOURCE MANAGEMENT

Papers (pp. 111-142):

SPECIFIC FEATURES OF THE MARITIME CALL THROUGH ERGOSOZOLOGICAL AND ERGOSOPHOLOGICAL DETERMINANTS

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ABSTRACT

Paleological records as well as a contemporary view of the maritime profession indicate that the profession is dominated by specifics both in the performance of work and professional tasks and in the domicile view. This applies in particular to seafarers engaged on long-voyage vessels, where the actual ship represents their work and livelihood for several months. There are many challenges in the maritime profession that the engaged subject (seafarer) needs to overcome in order for the cargo vessel to safely perform the transport service activity. The peculiarities which the naval call imposes gradually but strongly influence the disturbance of the circadian rhythm and regimen of the seafarer's life and work, which is manifested by the psychosomatic sufferings and socio-physical changes of his personality. More than three decades ago, maritime ergosophology recognized this issue and, in order to prevent it as adequately as possible, finds its justified place in highly educational, professional maritime studies. Maritime ergosophology and its "sister" Maritime ergosozology has justified its purpose, but nevertheless warn that navigation on modern "long voyage" ships in many cases imposes certain psychosomatic suffering and socio-physical changes that constantly reinforce everyday stressful situations in seafarers. For this reason, Maritime ergosophology indicates that in the prevention of the overall health of seafarers, safer navigation-ship and cargo, it is necessary to continually consider the current issues and to address them from a much more humane scientific point of view.

Key words: “long voyage” ship, maritime ergosozology, maritime ergosophology, nostalgia, sexual abstinence, urbo-dynamic system, urbo restrictive system, nausea.

INTRODUCTION

Maritime as a segment of transport and service activities is of great importance for the sustainable development of universal living needs, production and trade and many other economic and service activities. This paper will not take into account domestic and international legal regulations, without which maritime affairs cannot be a legitimate and legal activity. The aim of this paper is to assess the validity of technical, technological, operational and service transport capacities on the one hand, while observing and diagnosing the involvement of entities on board a "long voyage" on the other. The term "long voyage" means overseas and overseas voyages with vessels (vessels) intended for the current service-driven activity.

When it comes to the crew (crew) aboard a “long haul” who is hired to perform regularly predictable and extraordinary work tasks, then we look at the same in three basic directions. The first relates to personnel (N-boaters) operating the ship, maneuvering to enter and leaving the port of transshipment, anchoring and anchoring in the port waters, and stacking (storing) cargo and goods in the ship's storage space for balance of the ship, as well as personnel which takes care of the maintenance of all deck spaces, systems, subsystems and elements. The staff of this observation are the so-called. professional seafarers and seafarers. Professional seafarers are persons who, through regular educational and professional (theoretical and practical) engagements, have acquired the right to manage, control and ensure safe navigation of all seas and oceans as well as other navigable waterways (Great Lakes, inter-ethnic rivers), not only ships as a navigable settlement. but also of all the engaged persons on board and the cargo transported. Therefore, they are professional seafarers,

unlike engaged seafarers who carry out the assigned work duties on board the "long voyage" and are not specifically trained in nautical-management activities. Professional seafarers in the hierarchy of the lowest to the highest rank are: cadets (beginners in the maritime profession of this type), then 3rd deck officer, 2nd deck officer, 1st deck officer (CIF), RTG (radio telegraphist and in some situations, and assistant telegraphy) and finally the most responsible person on board the "long voyage" of the transport service is the commander-captain of the ship. Other crews on board the nautical-deck service are: steersmen, sailors, morostromo (leader of the deck), electrician-electronics technicians, carpenters,…, and some other work engagements, which very often depends on the type of ship.

When it comes to the second classification (BM naval engineers or naval engineers), a hierarchy is also evident, referring to staff trained in this part of the maritime service-naval engineering. The sequence of hierarchy in the service of ship-engineer engineers from the lowest to the highest vocation is: machine assistants (beginners in the maritime profession of this type), then the 3rd officer of the machine, the second officer of the machine, the 1st officer of the machine and the most responsible person in the ship's engine the complex is the capo-manager of the machine. These are professional seafarers, while seafarers in the machine are: mechanics, machine-lubricant, and some other work engagements, which very often depends on the type and size of the ship. The third classification of engaged personnel aboard the "long voyage" referred to as "BPO" (white-support staff) shall be classified as I-vi and II-chef, waiter (s) and young man (s) of the kitchen.

Discussions about vessels, and therefore the ship "long voyage" intended for transport and service activities with all predictable/unpredictable process developments, should be guided through a scientific and practical dialogue, taking into account all national, international rights, which on the one hand is absorbed by Maritime ergosozology, while, on the other hand, Maritime ergosophology is of less importance. Educationally professional scientific subject called Maritime ergosozology is a coin (greek-latin:Ergo-work; sozo-protect and logos-learning or science) whose material sublimates the necessary technical and technological presences related to the protection of the ship's steering-propulsion and other work systems, sub-systems and elements. It is important to note that Maritime ergosozology as a science of occupational safety is in line with the International Codes related to the presented scientific and practical material.

Unlike Maritime ergosozology, Maritime ergosophology (coin-cr-ergo-work, sopho-wisdom and logia-learning or science) offers the most adequate educational preventive vitalities that contribute to the specific and in no way easy maritime life as painlessly as possible. It is because of the knowledge that all engaged personnel on long-haul merchant vessels are surviving on a daily basis that Maritime ergosophology and its "sister" Maritime ergosology have for more than three decades been tasked with communicating to maritime profession candidates the truth about the maritime profession and all, not very pleasant events in choosing a profession that they can and often do encounter. This saying goes well to say that "nine-crust sea bread!"

APPLICANTS FOR MARITIME TITLES

Our three decades of research into candidates who have opted for training in the vocations of the maritime professions (boaters and shipbuilders, and earlier radio telegraphers) are very different when it comes to the main motive for these professional maritime professions. The results highlight radiotelegraphisist (now this call is not as educationally evident as before), who in 91.27% of cases stated that the primary motive for them was the love of the maritime call and getting to know the world, while the profit motive was on the fourth with a index of 28.11%. In the period from 1986. by 1991, the parameters obtained indicate that the choice of maritime profession for sailors and boaters was approximately the same. This can be justified in some ways by the fact that for maritime titles (secondary maritime school educators as well as higher maritime schools) were candidates whose more than a century or more decades of domicile domicile. After that period, the number of candidates wishing to be educated for a professional maritime call from the north, or land, is evident. Their main

motive for choosing this profession is in 76.88% of cases the desire for "easier earnings", i.e. for faster work engagement (employment).

This is supported by the inadequate and insufficient familiarization of candidates with the requirements imposed by the maritime call, as well as the strategy of enrollment of candidates at the Faculty of Maritime Studies, which envisages that candidates who have graduated from high school, traffic direction and similar professions can directly enroll in the mentioned sections. who did not have any points of contact with the maritime profession in their curricula. It is these candidates who, due to their high school graduation, have an advantage over other candidates and even those candidates who have graduated from high school with a lower grade. This is not good considering all the specifics imposed by the maritime vocation-maritime profession. Our research notes that many candidates, due to their undergraduate and undergraduate admission to maritime titles, were unable to continue their higher education studies on a regular basis and had previously completed a high school diploma, which is borne out by the fact that these students already have an educational foundation in the field of the maritime profession, which is not the case with high school students and other high school candidates who have not specifically been trained in maritime titles.

Centuries-old knowledge, especially decades-old research using modern methods used to determine the candidate's reticence in choosing a profession, indicates that the risk to the work process, candidates and demanding work vitality (professional relationship) has tripled among those who opted for a current call for higher earnings. faster access to employment, housing solutions and the like. In these respondents, a lack of love for choosing a professional calling is one of the very serious factors, not only of work risk but also of life risk on board, among other crew members.

A serious problem cited by our respondents in the work engagement (admission of candidates) is the quality or unprofessional behavior of the staff, who in a “well-established” way expects the candidate to be remunerated. There are also those cases, as our respondents say, who already knows in advance who will be accepted for the required job (relatives, friends, godparents, political, religious, national and other affiliation.) The above is nothing new, as it happens in the near future. to all working-life industries, which is detrimental not only to the current institution and its sustainable progress, but also to the detriment of the received candidate, and thus of society in general.

Maritime ergosophology requires that candidates for maritime vocation, on the one hand, be informed in a timely manner of challenges that do not support any profession, not even the moral vitality of the candidate, the reputation of his family and society in general. When we say this, we are referring to those criminal offenses that unfortunately are increasingly occurring on ships sailing on lines from countries that are recognized as geophysical areas, where various types of drugs are produced and illegally distributed. When it comes to these dishonesty-criminal acts, regardless of whether the participants are persons with the epithet "professional seafarers" or persons who are "seafarers", it certainly does not support the reputation and traditional maritime values.

Maritime ergosophology has long recognized that maritime calling is very often, especially in these current times, a choice that is very little or not recognized by candidates because of a "love of calling", which has a strong influence on the reputation of the maritime economy and the current company.

SPECIFIC FEATURES OF THE MARITIME CALL

Each work engagement imposes specific characteristics that have a task and goal, not only to meet current job profiles, but also to work safety and consistent placement of products and services with a guarantee of gaining trust between the parties in business cooperation and the challenges posed by business competition. The maritime call is specific to all other land-based work activities. The main difference between land-based employment and long-voyage employment is the fact that the engaged person, specifically the seafarer, is separated from his or her family or spouse at the time of taking on board the job. This saying does not apply to employees onshore. So, after the end of working hours

and completed work-professional assignment, the engaged person goes ashore to his family and shares with them and participates in all regular and imposed requirements, which is not possible with the engaged persons on board the "long voyage". Apart from the aforementioned evident specificity is reflected in the fact that the engaged person on land has clear limitations between work and living space, which opens the possibility of social diversity. The "long voyage" vessel is dual in character for the engaged subject on board. On one aspect, the ship "long voyages" is a urbo-restrictive system, while on the other hand, in the same time and space, it is a urbo-dynamic system.

Due to the condition of the waterway (waves, sea currents, etc.) and the spatial dynamics (movement of the ship), the ship "long voyage" as an urban system is subject to various external influences, which additionally requires that the engaged entity adapt to evident intrusions. The adaptive mechanism of an engaged entity on board a "long voyage" is not always ready enough to mitigate imposed challenges such as nausea (seasickness), psychological and biophysiological destruction, and much more. Maritime ergosozology indicates that the operation of the ship's main and auxiliary facilities constantly "sends" vibrational effects as well as a certain noise, which negatively affects not only the reliability of his psychomotor, but also his socio-personal dispersions. It can be added to this statement that rocking, staggering and staggering of a ship in navigational conditions has a very serious effect on the occurrence of psychosomatic suffering and socio-physical changes, which dysfunction certain biophysiological vitalities and their values. The purpose and characteristics of the "long voyage" ship due to the current urbo-dynamics on the one hand, and on the other because of the urbo-restrictive space, require the engaged subject on board to contribute to a reduced adaptive effort to reduce work-life risks.

Maritime ergosophology, in its scientific oeuvre, primarily wants to inform every candidate for maritime vocation, as well as those subjects who have previously been professionally engaged on board the "long voyage", about the possible destructive phenomena that very often occur in relation to socio-personal misunderstandings, hierarchical distrust or disrespect, whether observed from the “lower to the higher hierarchical level, and vice versa, from the higher to the lower). Possible discrepancy in the hierarchical relation has a negative impact on the control and sustainable reliability of the system of work, regardless of whether it is a techno-mechanical failure, i.e. dysfunction and/or failure of drive-control, control-safe systems and subsystems. These undesirables are often aided by the meteorological conditions in navigation (storm), socio-personal actuality as well as the biological rhythm and mode of life and work of the current seafarer. Maritime ergosophology as a modern science offers, in addition to preventative models and methods, certain curative interventions aimed at reducing dispersion and eliminating current work-life risks, which disrupt the work-life values of the individual and all members of the ship's collective. It is not necessary to repeat that, among other things, Maritime ergosophology in the domain of Maritime ergosozology aims at ensuring that the ship of "long navigation" as a transport and service system safely perform service activities from the port of embarkation to the port of disembarkation, ie. from the sender to the consignee of the goods and cargo.

The specificity of the maritime call is also observed in the following phenomena:

- Impact of time on navigation and staff employed (weather forecast - meteorology).
- Constant, monthly work hours according to the "Guard" system ("4-8").
- Fear of potential dangers: contagion, sickness, sudden deaths, minor and serious physical and mental injuries that can be observed in oeuvre a) fear of the already known and b) fear of the unknown.
- More monthly separation from members of the immediate and wider family.
- Impact of ship space restriction.
- Sexual abstinence
- Restriction of personal choice in the milieu of sociocultural creation and recreation.
- Notice crew members and domicile work environment.
- Unpleasant events by individuals that violate the reputation of most honorable seafarers and maritime traditions (physical and verbal assaults, disrespect for hierarchical vitality, smuggling of narcotics, weapons and other illegal goods).

All of the above and much more that disturbs the circadian rhythm and the regime of life and work of a seafarer aboard a "long voyage" can be elaborated in scientific and in every other context through the evident phenomena of psychosomatic suffering and sociophysical alterations of the sailors of the "long voyage".

CONCLUSION

Maritime as an economic service activity can be defined in a narrower and broader sense:

1. In the narrow sense, seafaring is the art of navigation, that is. skills for managing and maneuvering a ship while sailing, sailing and sailing in a port of transshipment, anchoring and mooring out of the port's aquatic area.
2. In the broad sense, the term maritime affairs covers many activities, directly or indirectly related to maritime affairs, through two basic points of view:

- the sea as a medium of communication,
- the sea as a resource of natural resources.

It is indisputable that much attention is paid to maritime, sea and waterways as a local, national, regional and global resource, no less than is the case with ship types and cargoes and goods on sea-waterways. However, we have to admit that very little is discussed, both in scientific and other circles, about the seafarer, as the main actor of the transport-service, maritime economic activity. It is true that the seafarer is mentioned very often when discussing the financial profit or loss of a company, an accident, economically-viable profitability, his engagement and the like, but very little is given to his personality in the context of preserving and promoting his, especially mental and physiobiological health.

This deficiency was recognized more than three decades ago by Maritime ergosophology, which in the domain of scientific practicalism wants to pay much more attention to the seafarer, his overall activities and influence on his health, in the oeuvre of prevention and curative care. Maritime ergosophology seeks to point out, in a consistent scientific approach, all those destructive phenomena that directly or indirectly affect the development of occupational pathogenesis and stress in "long navigation" seafarers, with the aim of preventing and eliminating them as soon as.

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THE ROLE OF SOCIAL NETWORKS IN HIGHER EDUCATION INSTITUTIONS: EVIDENCE FROM THE REPUBLIC OF SERBIA

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ABSTRACT

The modern age is marked by the development of technological trends that influence changes in business. Changes have included all spheres of life and a major change that affects the daily life of modern technology is the Internet. In modern forms of communication Internet is an essential element, along with the social networks that are experiencing their expansion in marketing. In the field of education, higher education institutions strive for the best possible communication through the Internet and social networks. This paper aims to highlight the importance of the presence of educational institutions in an online environment. This paper examines how successful is the performance of the faculties at University of Novi Sad on the social network Facebook and does the performance affects the number of students enrolled. The research results show how important the online presence of the faculty is in relation to the stakeholders in the modern world of communication.

Key words: higher education institutions, social networks, students, academic staff.

INTRODUCTION

The beginning of the 21th century was marked by development of information and communication technologies and Internet (Latysheva, Karlova, & Koryakina, 2015). A refinement of internet tools brings significant changes in marketing approaches. The traditional marketing approach has remained in the shadows, with the development of the internet and the emergence of new ways of advertising. One-way communication that characterizes traditional marketing cannot compete to the effectiveness of two-way communication provided by the Internet. Print media, radio or television no longer have as much impact on the target audience as Internet marketing channels have. Digital technology has transformed the way we live and work and has impacted every industry from retail to healthcare. Now, more than ever, organizations and their employees face the challenge of developing and sustaining their business and engaging clients in an ever-evolving digital space (Dodson, 2016). Through Web 2.0 and social network sites, organizations engage more with their customers. With ability to comment, like and share content on social networks, customers are more and more active in communication with organizations, and they collaborate in process of getting services or creating products. This trend is noticeable in the field of education, and an increasing number of higher education institutions have official accounts on various social networks. There is a limited amount of research concerning how higher education institutions use social networks. However, the existing studies indicate higher education institution marketers tend to base their activity at social networks sites on instinct and feeling rather than planned strategy which results in oversaturated feeds and little engagement (Peruta & Shields, 2017).

LITERATURE REVIEW

Social network sites became a new way of spreading the news about educational offers of universities (Biczysko & Jabłońska, 2016). More than two billion active users frequent social network sites, enabling firms to connect with a mass audience in a cost effective and simplistic way (Kodish, 2015). Higher education institutions are following the business experience for social media implementation, because young people have interest in new possibilities. This interest enforces higher education institutions to look for more competitive advantages for study promotion (Zailskaite-Jakste & Kuvykaite, 2012). Networked environment should be created and information has to be available where audiences can find it, and it often needs to be customized (Ranchhod, GurAu, & Lace, 2002). As higher education institutions operate within dynamic, competitive and challenging environments, designing a strong marketing strategy is a necessary priority for them to achieve their marketing goals (Eger, Egerova, & Kryston, 2019).

In contemporary conditions, the higher education's system is characterized by high rate of globalization, increase of mobility of scientists and students, influence of information and communicative technologies that leads to changes of this system. The presence of higher education institution in the Internet becomes one of multiple ways of promotion in global educational market. It allows university to show its concrete contribution to the world science development and on the other hand, to be presented in various global rankings (Latysheva, Karlova, & Koryakina, 2015). The communication of higher education institutions in social networks is important since active involvement of prospective students in communication in social network helps for prospective students to choose the university where they would like to study (Zailskaite-Jakste & Kuvykaite, 2012).

More universities in Central Europe have started to apply different marketing techniques and activities including brand management and customer relationship. Different communication tools are used by educational institutions to create varying levels of connection between the organization and public (Eger, Egerova, & Kryston, 2019). In order to add social media to their marketing arsenal, universities must choose their platforms wisely in order to be truly present and garner a significant amount of brand engagement, which leads to student satisfaction and loyalty (Iosub, Ivanov, & Smedescu, 2016). Universities absorb experience from business in promotion, market research and others (Zailskaite-Jakste & Kuvykaite, 2012). The growth of usage of social media in the past years has transformed the ways in which the internet is experienced by most users. It is also time to use the social media in a targeted way in order to achieve most suitable way of communication of the organization with public (Eger, Egerova, & Kryston, 2019). From the point of view of a higher education institution, social networks may make enrolment activities become friendlier and personalized through to the possibility of instant interaction with various groups of stakeholders (Mazurek, Korzyński, & Górska, 2019).

Social networks facilitate communication among higher education institutions and their students, staff and graduates and other kind of followers or page visitors. At the same time, the increasingly competitive character of the higher education market has led to more pro-found use of marketing activities, branding and brand management (Rutter, Roper, & Lettice, 2016).

Higher education institutions are focusing their marketing strategies similar to corporate organizations, and they are trying to stay connected with the new generation through technology. The challenge is that the higher education institutions need to sell itself in the marketplace, yet it is there to search for knowledge and help students achieve their academic goals (Temple, 2006). Every year universities carefully prepare for admission campaign in order to attract the best students. School students make decision about their future higher education institution by diverse criteria. The development of communication and information technologies leads to the fact that 90% of entrants take information about universities from Internet (Latysheva, Karlova, & Koryakina, 2015). Studies into social networks prove that HEIs are increasingly more proficient in utilizing the information appearing on

various social media platforms with a view to making their offers more attractive, improving their image or taking care about the relations with their clients (Pharr, 2016). Most universities are aware of the need for communication with applicants and current students through social networks. Therefore, understanding the characteristics that influence the interactivity and relationship between an organization and its page visitors and influencers is essential for the organization's ability to respond to public on social networking sites in a desired manner (Eger, Egerova, & Kryston, 2019). It is important to notice that today's market of higher education is dominated by a generation of the popularly called digital natives – the young people who are highly technologically literate and treat the Internet as a natural element of their day-to-day life (Jones, Ramanau, Cross, & Healing, 2010). Some studies showed, that all the students use the Internet between eight and ten hours per day, mostly through their mobile phones, for the purpose of obtaining information, communicating through the social networks or staying informed. The most used social networks include WhatsApp, Facebook, Twitter, Snapchat and Instagram (Garza Salgado & Royo Vela, 2019). Interactive features of social networks allow participants to create highly interactive platforms where individuals and communities share, co-create, discuss, and modify user-generated content (Ariel & Avidar, 2015).

Facebook is considered as one of the prime platform for higher education institution to reach their target groups and engaging with them (Eger, Egerova, & Kryston, 2019).The numbers of students who use Facebook record enormous growth, as well as the amount of the time these students spend on mentioned social network site. This increased use of it creates new opportunities and at the same time, challenges for higher education institutions (Alhazmi & Rahman, 2013). According to digital natives, social network accounts can give a better idea of the student life at a given higher education institution, i.e. about the academic culture, atmosphere, attractions, etc. than other sources of information which given higher education institution has. Official HEI social network pages help future students to make a better choice of the place where they are going to study and grow over the next few years (Constantinides & Zinck Stagno, 2011).

Based on the literature review, authors presented following research question:

RQ: Do social networks help faculties to attract students?

For the answer of the research question, authors propose the following research model.

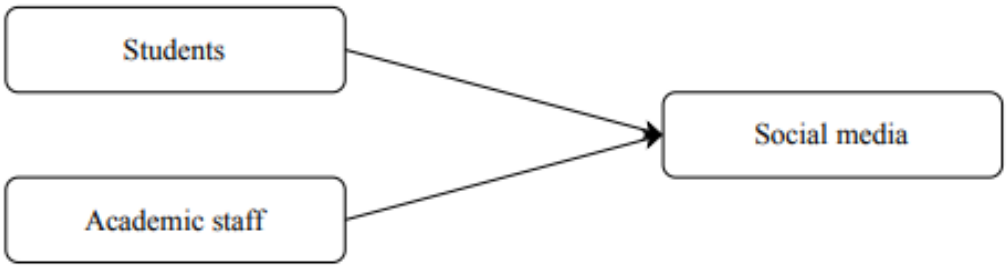

Figure 1. Research model

METHODOLOGY

The full sample presented 13 Faculties from the University of Novi Sad for the academic year 2018/19 (University of Novi Sad 2020; Vesna Jasovic-Surlan et al. 2019). To present the relationship between students, academic staff and Facebook followers, the authors used direct observation for a collection of data (Rakic et al. 2020). Table 1 depict the review of the University of Novi Sad.

Table 1. Classification of the faculties from the University of Novi Sad

Faculty	*Location*	*Academic staff*	*Students*	*Enrolled students*	*Followers on Facebook*
Agriculture	Novi Sad	183	2,266	318	4249
Arts	Novi Sad	282	876	214	7126
Civil Engineering	Subotica	42	579	130	870
Economics	Subotica	88	3,611	785	2841
Law	Novi Sad	51	2,453	483	3335
Medicine	Novi Sad	614	3,998	552	4333
"Mihajlo Pupin" Technical	Zrenjanin	68	1,149	250	3820
Natural Sciences & Mathematics	Novi Sad	418	5,618	655	8456
Pedagogy	Sombor	68	643	229	2055
Philosophy	Novi Sad	327	4,136	800	1787
Sport & Physical Education	Novi Sad	43	1,125	202	466
Technical Sciences	Novi Sad	901	14,626	1914	17652
Technology	Novi Sad	101	1,100	175	1726

For the data analysis linear regression and correlation are used. Moreover, authors used linear regression with two set of predictors which are a common method of confirming model assumptions (Lu and Yuan 2018). Furthermore, for the independent variables are used number of students and number of academic staff. Dependent variable is number of the followers on the Facebook. Correlation analysis compare number of enrolled students and number of followers on the Facebook.

RESULTS AND DISCUSSION

The table 2 shows the results of the regression analysis. Moreover, results show positive and significant relations between predictors and dependent variable.

Table 2. Classification of the faculties from the University of Novi Sad

Predictors	Model parameters
Students	.627*
Academic staff	.294
R	0.895
R^2	0.800
Sig.	0.001

*p<0.05

The results of the model show high value of $\boldsymbol{R^2=0.8}$ for the $p<0.001$. Furthermore, Standardized Coefficients Beta are positive for the both predictors, but only for students is a statistical significant with the value of ***0.627*** for the $p<0.05$. Therefore, results of correlation presented strong and significant relationship between enrolled students and followers on the Facebook ($\boldsymbol{r=0.834}$, $p<01$).

The results of the model give positive answer on the research question. Moreover, these findings could help managers of the higher education institutions to better shape their presentation on the social networks in order to attracts more students. Furthermore, this study presented social network Facebook as a very important tool for creating good relationship between new students and higher education institution.

CONCLUSION

This study presented importance of the social networks for the higher education institutions in the Republic of Serbia. Furthermore, this study presented strong relationship between students and Facebook pages of the Faculties. Therefore, authors could have concluded that social networks channels should be the required part of higher education institutions strategy for attracting students. The limitations of the study is the small sample size from the University of Novi Sad. The other limitation is that data are observed only from the Facebook platform. Further research should need to investigate the all Universities from the Republic of Serbia with more social networks channels (e.g. Facebook, Instagram, Twitter).

This research should provide useful information for higher education institution to realize better presentation on the social networks. With better presentation through social networks, faculties have higher opportunities to attract more students.

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HUMAN RESOURCES MANAGEMENT IN SERIAL PRODUCTION ENTERPRISES

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ABSTRACT

In this paper, it is pointed out that serial production management within enterprises doesn't include only production procedure management, and functions which aim at product placement on the market. Management in this case, also includes human resource management (HRM) and enterprise capital management. Human resources are considered an indispensable resource in almost any enterprise. Their importance is crucial for creating, formulating and managing all enterprise functions. The main goal is to effectively improve production processes and to enhance business performance by adequately applying HRM.

Key words: human resources, knowledge economy, production cycle, serial production, competitiveness

INTRODUCTION

A work system includes people, means (machines, raw material, tools etc.) and appropriate organization. Zelenović (1995) defined the work system as a set of integral elements, which include people and other resources, organized in a way that they successfully accomplish defined goals in a given time and given environment. The work system, depending on what is observed, can be the whole economic system, the enterprise, part of the enterprise, and even an individual workplace (Radaković & Ćosić, 2012.). Employees in a work system have a leadership role in creating and maintaining a competitive advantage, as they are the creative and innovative part of the enterprise. Competitiveness can only be maintained and improved, if the enterprise is ready to keep up with dynamic changes on the market, and with technological development as well as to advance knowledge. The sure path to success is innovation, flexibility, knowledge and quality. In order for serial production enterprises to achieve this, it is necessary to invest in human resources. This also includes that as employees should not be viewed by the management as an individual or group operating a machine. They need to be seen as a source of knowledge and innovation, which can influence production improvement. Many authors, such as Fajol (2006), and Matić (2006.) have addressed the issue of more efficient use of labor in production enterprises. Their goal was to define processes, relations and laws in such environment. Therefore, it is very important to consider the possibility of motivating employees in serial production enterprises in order to improve the production system and overall employee performance.

HUMAN RESOURCE MANAGEMENT

Defining human resource management

HRM can be defined as a strategic and coherent approach to the management of the most valuable assets in companies - people, which individually or collectively contribute to the achievement of the

company's goals (Armstrong, 2006). An enterprise is successful only as much as the individuals - employees are successful. As a creative and innovative part of every business, employees have a leading role in creating and maintaining the enterprise's competitive advantage on the market. Only highly educated, properly motivated employees, with constant and continuous learning of new business skills, can meet the challenges posed by the new business environment and the knowledge economy (Loncarevc R. et al., 2008). Managers in Serbian enterprises are considered to be very aware of the importance of quality communication with employees. In addition, it was noted that feedback is an important input for the HRM process as well as for strategic decisions and policies (Božinović, 2011).

The role of human resource management in the knowledge economy

Business management is analyzed by two, intertwined, and practically inseparable scientific disciplines. First, there is science of leadership and organization, which includes the analysis, design and development of the organizational structure of the organization. The second discipline, science of management, is based on the study of management and leadership, in order to achieve the goals in an efficient and effective way. It should be emphasized that it is important to recognize the importance, not only of organizational goals, but of individuals as well. It is very important that all goals in the company are explicitly defined and have the same direction. Therefore, it is important, that employees' individual goals are synchronized with departmental goals, and further with sectoral goals, etc. Human resources need to be adequately managed. Management has to prepare their employees to cope adequately with change. Employees can react sharply to changes of any kind, and resistance to the new is caused by uncertainty. Therefore, it is very important to determine how to manage and motivate employees. Managers have to clearly state the benefits of the new organization. Almost every organizational change requires employees to change some of their routines, operations, how they do their jobs, and to change their overall behavior. In order to accept and implement these changes, employees need to be truly convinced that the changes will do something good for them and for the organization in which they work, and this employee confidence can best be achieved with tailored techniques to motivate employees (Zakin, 2014).

The importance and goals of human resource management in the knowledge economy

The economy evolved, and through many changes it transformed into the knowledge economy. This new economy has influenced the changing role and importance of HRM. These changes are based on the transformation of the ultimate administrative role in HRM. The role and importance of HRM is focused on the proper organization of business activities. Such organization of activities enables the right person to be engaged in the right place at the right time. It also influences employees and the possibility for their promotion and improvement of their skills and knowledge, as well as adequate motivation and rewards. Through proper coordination of all these activities, the goal is to achieve good results for the enterprise. The benefits of human resource management in the knowledge economy are based on the "art" of acquiring tacit knowledge, a new way of looking at the roles, and responsibilities of managers, as well as the importance of organizational design and business practices in knowledge-based organizations. Nonaka noted the following approach "Creating knowledge puts things exactly where they should be, at the very heart of the organization's human resources strategy." (Nonaka, I., 1998). Organizations have been under constant pressure from the competitive environment over the last 20 years. Therefore, it is an imperative to integrate HRM development and human resource development with strategic management. The effects and relationship between HRM and the knowledge economy have to be viewed and analyzed through numerous changes in the following domains (Harman, C. & Brelade, S., 2007): strengthening the link between the organization and the individual, communication, the role of management, values and ethics.

MANAGING SERIAL PRODUCTION PROCESSES

Production cycle

The production process is the main process in an enterprise that ensures the performance of the basic activity of the enterprise, which is obtaining products (Radaković & Ćosić, 2012.). Product survival on the market depends on its quality, price, production volume and delivery time. These factors can be further subdivided into their variables, and as they are all functionally linked, they can lead to a loss of position in the market, ultimately to the disappearance of products and businesses from the market. The factor with the most interconnections and dependencies is the delivery time, which further mostly depends on production time. In conditions, where monitoring and regulation of business activities is easier and easier, the central part of the purchasing and sales cycle, especially in serial production, is still not fully optimized. The production system includes technological systems and other technical, information and energy structures which in a way ensure the achievement of the set goals of the production process. The production process has to be thoroughly planned in order for it to be smooth, bottleneck-free and efficient. This is important because of schedule and cost. This involves detailed calculations of the machine's operation and the duration of the production cycle. However, operation times of different machine elements and work activities often differ in practice. Therefore, observing and monitoring these elements is of crucial for the production process. The process of evaluation and observation requires good coordination of human resources in order for it to be successful. Further, this includes a fundamental strategy for monitoring, controlling and improving all elements. It is very important that managers pay attention to the suggestions of their employees who are operating the manufacturing machines. Based on their suggestions, adequate improvements of the production process can be conducted.

Production cycle factors and indicators

Important organizational and technical indicators of production success include: the degree of capacity utilization and the production cycle (Klarin,1995.). Reducing production cycles, enterprises can benefit in many ways, including and not limited to reducing production costs, better quality, faster responses to market and customer demands, etc. These improvements in production can be critical to the survival and profitability of an enterprise on the market (Klarin et al., 2016.). Analyzing the production cycle process structure and duration is a key part of the economic and technical analysis of business performance of an enterprise. Further, the production cycle is tightly linked to other indicators, including production volume, productivity, production capacity and working capital (Jovanović et al., 2005.). The duration of the production cycle is one of the main economic and technical indicators of the performance of the whole production process (Jovanović et al., 2014.). One of the main limitations of serial production is the order of operations, where the operation time can be multiplied many times over. The sequence of operations can theoretically be regular, parallel and combined. This sequence depends on the type of sequence of operations. For example, with regular serial type production, cycle times for specific elements are known in advance, however the whole series waits to complete the operation on one machine, and only then moves to another, unlike the parallel one, where, after completing only one piece on one machine, it switches immediately to another. Production cycle times and efficiency is influenced by a number of organizational and technical factors that intertwine with each other. Taking the structure of production cycle time into account, the following factors can influence the production cycle length (Stanisavljev, 2017.): compliance of production processes, organization of job placement, efficiency of internal transport, control efficiency, employee commitment, efficiency of production regulation service, reality production time, and machine working ability. These factors are highly affected by managers as well as other employees. Organizing the work process itself is the task of the employees. Therefore, it is very important that these employees are adequately qualified and motivated to manage a range of factors as efficiently and effectively as possible. Some of the work also addresses problems in production, storage capacity, production planning (Agrawal et al., 2000.), cost reduction, cycle monitoring (Bohm et al., 2010.), machine operation (Ata et al., 2011.) and special methods (Almomani et al., 2010.).

THE ROLE OF HUMAN RESOURCE MANAGEMENT IN IMPROVING SERIAL PRODUCTION

Managing industrial logistics

The need for optimization of material flows arises both in the design of new production systems, as well as in the process of rationalization of existing production systems and processes. Industrial logistics plays an important role as it is directly related to secure production processes, to the necessary resources at all stages of production, and to the modern approach to solving material flows. Such a logistical approach is inherent in both automated and conventional production. For these reasons, transport and storage analysis is conducted with the goal to identify their rational use. Through the introduction of new technologies, and investments in new methods of resource management, the foundations are laid for designing an adequate flow of materials in the production process, which further harnesses the available potential for rationalization. The fact is that in manufacturing systems, the majority of investments is aimed at machinery and equipment, while the rationalization of transport and storage is often neglected, resulting in poorer results. The role of human resources is crucial to this problem. In order to maintain adequate logistics, it is necessary to employ experts, who would manage industrial logic through the rationalization of all production flows, as well as the flows after the production has been completed. Many experts have highlighted lean production as very efficient and effective. Lean production is continuous, from a single-process flow, emphasizing the optimization and integration of machines, materials, people and objects (El-Homsi & Slutsky, 2010). One of the most common mistakes is that the lean approach is viewed through its tools and concepts, as these are the only visible elements, but the true source of the power of lean lies in the ability to learn from mistakes (Bicheno & Holweg, 2009.). In a lean organization, mistakes are seen as a chance for improvement, not as something that should be monitored and banned. The goal is not only to be better than the competition, but to be the best and to be perfect in the specific field of business. In order to achieve this goal, the adequate orientation of employees in the organization, who by their work can influence the best work of all production flows is an imperative.

The effect on competitive advantage

According to the SWOT model, the development of a competitive strategy is followed by internal and external analysis. Further, this is followed by the evaluation and selection of the most affordable strategies (Porter 1996). The chosen strategies will determine which products will be placed on the market (the location and volume of businesses and the resources needed to produce them) (Teece et. al, 1997). Effective implementation of a strategy, requires careful selection and management of the organizational assets and competencies needed to support strategy goals. In addition, it will affect the provision of Sustainable Competitive Advantage (SCA), resulting in superior long-term performance, which is the ultimate goal of the enterprise (Porter 1996). Porter (1979) argues that the core of strategy development is competition. He also noted that businesses need to analyze their competitive environment, choose their strategies adequately, and then obtain the resources (human and material) needed to implement effective strategies (Porter 1980). It is further suggested that businesses have a choice between three generic strategies to achieve above-average performance in their chosen industry. These are cost leadership, differentiation, and focus (or niche orientation). Each of these strategies is determined by the competitive advantage of the two factors and the competitive scope. Therefore, it is very important to adapt the approach to creating and maintaining competitive advantage (CA) (Davidson 2001). The above approach only emphasizes the impact of opportunities and threats in an enterprise's environment on CA. CA is viewed with the assumption that enterprise resources are homogeneously distributed and highly mobile (Barney 1991). Porter's (1985) concept of the "value chain" (Figure 2), highlighted another way of development which facilitates internal analysis, which further enables managers to identify potential sources of CA, by exploring the implemented and conducted activities (Nonaka 1991). In particular, the value chain separates the

enterprise into strategically relevant activities, grouped into two categories: primary, and supporting activities. This way a better understanding of cost behavior and existing and potential sources of differentiation is achieved. Each activity and the connections between them are potential sources of strengths and weaknesses that can suppress or amplify CA (Pearce II i Robinson 1994). Therefore, an enterprise improves CA if it performs its strategically important activities at a cheaper or better price compared to its competitors (Porter 1985).

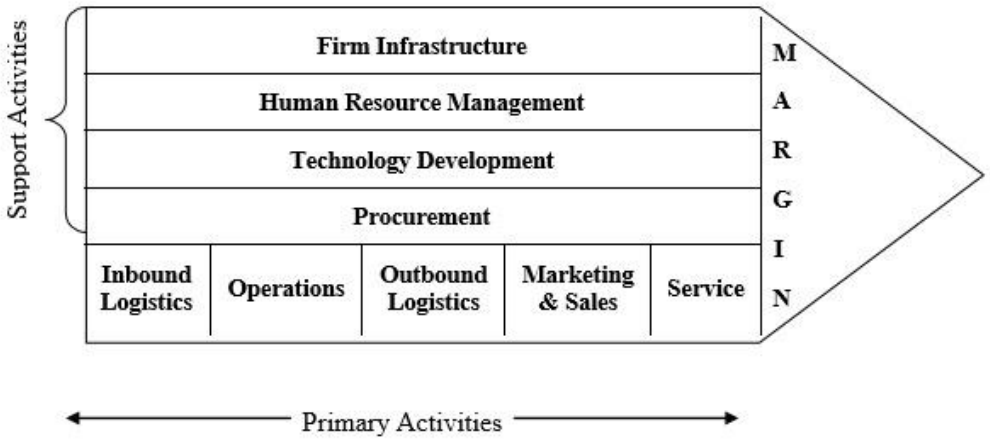

Figure 1. The Value Chain
Source: Porter (1985, p. 37)

In order for an enterprise to influence and control CA, it has to select the right strategies to be implemented in the production process. In addition, for this, the enterprise has to have an adequate team of employees. These employees should be focused on looking at both internal and external capabilities and find ways to improve the enterprise processes as well as human and other resources and capital.

CONCLUSION

HRM is the part of an enterprise which, through its activities, contributes to the achievement of long-term strategies in a way that will attract and retain quality and professional employees and motivate them to work in an efficient and effective way which will further contribute to the improvement of the production cycle. Overall, the role of HRM is to enable an enterprise to succeed by helping people, and through a successful manufacturing process. Knowledge management, which stems from good HRM, is not just about effective information management. It also represents the management of the potentials and talents of employees. From here, management should direct employee potential towards good organization of business activities, and production processes, and motivation and training of employees in the production facility itself. It is, therefore considered extremely important to look at the process of HRM. More importantly, this view should be from the aspect of knowledge identification, which is further developed and put into practice. The main goal of such approach is to achieve organizational and production goals to further achieve competitiveness. It should be pointed out that the success of a modern enterprise depends on the intellectual abilities of employees. It is very important that the benefits of HRM are integrated into production systems.

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KNOWLEDGE MANAGEMENT AS A PREREQUISITE FOR MODERN BUSINESS

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ABSTRACT

The main factor underlying the new model of organization management is knowledge. Continuous improvement of knowledge within and organization is the key factor for development. This is even more pronounced in conducting business amidst the changes brought by globalization. The application of modern management techniques is an essential precondition for the success of business in general. Enterprises from transition countries face difficulties when it comes to adequate application of modern management methods and techniques. This paper analyses the importance of new management models for achieving and maintaining competitiveness on globalized markets. In addition it provides a solid basis for future research in the domain of knowledge management as an important factor for acquiring competitive ability on the globalized market.

Keywords: Knowledge, Competitiveness, Management, Business, Quality.

INTRODUCTION

Modern business conditions are changing daily. Businesses need to adapt their business strategies to sudden changes in the business environment and in the turbulent market. Technology is the most dynamic factor in the development of the global economy, and in practical terms, the eVision business concept is realized within the requirements of the fourth technological revolution. According to the Global Competitiveness Report 2019, the key areas of action in the future are to achieve versatility, technology, integration and education. Knowledge is becoming a product and corporative intellectual ownership is more valuable even than physical resources today. Modern organization must create knowledge but also they must increase value as well. The challenges which follow establishing, keeping and developing competitive abilities on the global market are much greater today than 20 years ago. The following reasons are considered to be crucial:

- New companies are mostly based on services;
- New companies are mostly from the field of knowledge economy;
- The change of techno-economic paradigm causes considerable changes;
- The number of allowed mistakes is far smaller than before;
- The new paradigm is, in great extent, in the phase of pre-standardization, which makes choosing the winners impossible (Reinert, 2010).

The main problems that arise in the process of organizational management in the countries in transition are as follows: failure to adopt modern management logic, lack of understanding of the process of an integrated approach to organizational management, marketing misconception,

inadequate treatment of investment in marketing, organizational structure problems, insufficient speed of adoption of new trends, methods and techniques in management. Domestic companies are still in the initial stage of implementation of modern management techniques and principles, not all of them, but only those who have successfully completed the process of transformation.

In this paper the necessity for knowledge development for achieving and maintaining a competitive position on the market is analyzed. The paper consists of three main sections (excluding the *Introduction* and *Conclusion* sections). The first section reviews the new management model which is based on knowledge and knowledge management. Next, knowledge management in the role of developing competitiveness is analyzed. Finally, in the third section guidelines for business improvement are discussed. The Goal of this study is to provide a concise overview of who knowledge can transform an enterprise and how important it is for acquiring competitive ability.

NEW MANAGEMENT MODEL

The modern understanding of the management process is determined by the work of the fourth industrial revolution and the application of technological advances within Industry 4.0. Also, the impact of the 2008 global economic crisis, which has shaken the postulates of economic security in the development of western countries, is still expected today. Newly industrialized countries are embracing modern management methods and techniques and improving them. Knowledge is becoming a key factor in managing a modern organization. According to some understandings (Bešić, Đorđević, 2019), Knowledge Management is a systematic approach to finding ways to make the best use and implementation of knowledge in an organization. The goal is to maintain sustainable competitiveness or to plan long-term business policies. From a manager's perspective, knowledge management can be seen as a process for optimizing the effective use of intellectual capital to achieve the organization's goals. Knowledge involves facts, perspectives and concepts, as well as problem solving methodology. The essence of the modern notion of knowledge is that it is a tool for improving the productivity of work and the job of the modern organization. According to some understandings (Tisen, et al.) in a modern economy it is not enough to just generate knowledge, make it accessible and hope for the best. Knowledge that substantially enhances value is fundamentally different from ordinary incorporation.

Modern management is based on the process of harnessing knowledge in order to improve knowledge productivity. The process of knowledge management presupposes the systematic building up of a knowledge fund and the application of knowledge in order to continuously improve the efficiency of business organization of the contemporary. The new reality in the business environment requires new organizational and managerial skills. Modern management is based on knowledge sharing, whose ultimate goal should be innovation and the creation of a new business organization. Education for contemporary market conditions must create conditions and a climate that will enable the newly acquired knowledge to be applied to work and knowledge.

In order for an enterprise to effectively manage knowledge, it has to develop and maintain an infrastructure within the organization for acquiring, storing and developing knowledge. Even more important is to develop mechanisms which will allow knowledge distribution among employees and managers, thus integrating the learning process among every employee. This can result in with higher learning rates and innovation intensity within the enterprise. This further indicates that domestic enterprises have to focus on their employees' skills and knowledge, and to nourish and enhance that knowledge with the ultimate goal to increase productivity, innovation, quality, and overall business performance. It is evident that developing new knowledge allows the enterprise to create value for itself and the customer as well. Delivering more value to the customer positively affects competitiveness on the globalized market.

KNOWLEDGE MANAGEMENT AND DEVELOPMENT OF COMPETITIVNESS

Continuous advancement of knowledge productivity, as a fundamental premise of improving the productivity of the business of a modern organization, has become a central issue for all global corporations. The model for improving business of domestic enterprises must be based on the necessity of applying modern market business approaches. This means that it should create competitiveness of domestic enterprises on the global market. Through this improvement process it is necessary to take into account the economic reality of the domestic economy, as well as taking into account the reality of transition flows. Most domestic companies are insufficiently competitive on the global market. Old technology, poor product quality, unattractive packaging and high prices are the main reasons for uncompetitive appearance of Serbian products on the international market.

According to some understandings (Bešić et al. 2019), the following guidelines can be observed as the main guidelines for improving business performance of domestic enterprises:

- developing relationship marketing;
- continuous improvement of business quality and;
- continuous improvement of knowledge of local executives.

The application of relationship marketing as well as integrated management systems is understandable to domestic executives and most domestic companies apply these management methods with variable success. Integrated management systems are applied in domestic enterprises in order to achieve international competitiveness. The domestic economy is the leader in the region when it comes to the number of certified organizations in the ISO standard management standards. This is somewhat logical because of the strong domestic economy compared to other Western Balkan countries. However it is insufficient compared to the total number of active companies in Serbia, such as and in relation to other Southeast European countries.

On the other hand, the results of the research indicated the need to improve the knowledge of managers and employees of domestic organizations. When looking at the views of executives of a resource-based organization traditionally, it can be concluded that up to 54% of respondents believe that their organizations are not knowledge-based or knowledge-creating organizations.

GUIDELIENS FOR IMPROVING BUSINESS PERFORMANCE OF DOMESTIC ENTERPRISES

Based on the review conducted on knowledge management and achieving competitiveness of domestic enterprises, the following can be distinguished as the main directions of business improvement in domestic enterprises:

- adequate application of modern management methods and techniques;
- wider and more comprehensive implementation of quality management systems and integrated management systems;
- business-based approach to improving the productiveness of knowledge.

Managers of domestic enterprises have to incorporate modern approaches, methods, and tools in their decision making process as well as for other business activities. Without these modern management concepts, the enterprise can't successfully compete on the international market. The constant fragmentation and segmentation of markets require that enterprises adopt and function on effective and efficient management principles. In this paper, the importance of knowledge management as a new management approach was discussed. Further, implementing international standards, including quality management systems and integrated management systems is an imperative for adequate business performance. Now, it is also important to note that domestic enterprises shouldn't obtain quality management system certificates just for the sake of certification, but rather the process of certification and maintaining a constant and organic improvement in business quality is crucial for long-term success on the market.

Finally, as noted, knowledge has to be developed, and managed in way that focuses on business productivity and results in higher business performance, higher market performance and a sustained long-term competitive position on the market. This approach to knowledge management requires, as discussed earlier in this paper, adequate infrastructure and education of employees.

CONCLUSION

The future on the global market belongs to those organizations that were the most resourceful, innovative and flexible. Innovations, flexibility and productivity are guidelines for future development in the field of competitiveness and organizational management. Knowledge is the main driving force of permanent productivity growth in companies from these countries. Companies from transitional countries are faced with numerous problems. Among them, the most important are those related to improving knowledge and organization. The application of modern management techniques is the essential precondition for a successful business of domestic companies. Most of modern methods and techniques are based on knowledge.

It can be argued that in order to increase their competitive ability on the international market, domestic enterprises have to change their way of conducting business. More precisely, focusing on intellectual capital allocation and overall knowledge management in the function of increasing productivity, quality, innovation and value for the enterprise as well as value for the customer. As the globalization of markets is inevitable, and the fourth industrial revolution - Industry 4.0 also puts pressure on enterprises to adapt, it is evident that knowledge and knowledge management is necessary tool for successfully conducting business.

The main limitation of this paper is the lack of survey data on specific domestic enterprises. However, the paper focuses on providing a base for future research and to concisely analyse the importance of knowledge management, hence this limitation is more of a guideline for future research in this domain, rather than a limitation per se. In addition, a structured meta-analysis could be conducted, comparing and analyzing data from different studies which investigate the necessity for knowledge and learning in an enterprise.

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KNOWLEDGE AS THE MOST IMPORTANT RESOURCE FOR CONDUCTING BUSINESS IN THE FUTURE

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ABSTRACT

The key resources in creating and maintaining the competitive advantage of an enterprise, as well as in achieving its goals in the present day, which will prove to be the future, is knowledge and intellectual resources. This raises the need for effective management of these resources. Knowledge as a result of employee development has become a strategic resource and a source of competitive advantage for business systems. For this reason, in order to survive and become more successful in the present day, an organization must nurture creativity and adaptability, and it must transform itself into a learning organization. This paper addresses the necessity for intellectual capital allocation and the important role of knowledge in the process of achieving and maintaining competitiveness on the globalized market.

Key words: Modern business, Knowledge, Organizational learning, Competitiveness, Intellectual capital.

INTRODUCTION

The conditions in which today's organizations operate, as well as what awaits them in the future, are constant changes. For organizations to maintain some kind of stability, they must be based on a significant resource - knowledge. Developing knowledge is about acquiring new knowledge, skills and abilities that will enable an individual to respond to the demands that the future brings. In the time ahead, knowledge becomes a personal responsibility. Only those individuals who are adaptable to the conditions and time, as well as those who are constantly updating and innovating old and acquiring new knowledge, will be able to count on a good and secure job, and successful organizations will employ such individuals. Knowledge, unlike other material resources, increases with its use. It could be said that knowledge is the only business resource that is not depreciated but accumulated through its use, while learning is further enhanced. The goal of learning is not only to improve the knowledge and skills of employees, but also to grow and develop the organization. Through the learning processes, the organization becomes more flexible and transforms into a learning organization. Only organizations that permanently achieve the productive effects of using knowledge are able to respond to ongoing market changes. Creating new knowledge and defining it gives organizations the ability to keep up with the demands of the environment, and thereby continuously improve their business performance and competitiveness.

In addition to the significance of knowledge for conducting business and for the organization as a whole, improving knowledge and skills of people is also significant for the economy of the country in which these people live. For this reason, additional investments should be realized in knowledge resources. In this paper a thorough analysis of knowledge and knowledge management for achieving competitiveness is conducted. The main goal of the paper is to provide an overview of knowledge management and the necessity for it in the modern business environment. The paper focuses on

providing a solid basis for future research in the domain of intellectual capital allocation and knowledge management.

THE MODERN BUSINESS APPROACH OF ENTERPRISES

The business of organizations in modern conditions is characterized by their ability to respond at any time to the challenges, demands and constraints that come with their environment. In recent years, the trend of globalization - the creation of a single market, has dictated the need for organizations to change their activities, apply new methods, ways, concepts of work and go beyond traditional practices (Kareska & Davcev, 2016). Modern society is certainly marked by technological changes, which represent the most dynamic factor of development. The ever-changing changes in science and technology are contributing to significant changes in society and affecting and shaping of individuals' lives and, consequently, the business of the enterprise. The development of technology, which has resulted in the information society and the networking of the modern world, has enabled the acceleration of the globalization process of human society. (Djordjevic & Cockalo, 2007). In order for organizations to be competitive, they need to follow modern trends. The digital revolution, the information age, the internet economy, a knowledge-based economy, a knowledge-based society characterize modern business.

Modern business requires more intensive application of knowledge, a multi-disciplinary approach and constant cooperation. Education must impart new skills, such as: information retrieval, critical thinking, effective communication, teamwork, and project management. What should definitely be emphasized is that the modern business environment, as a basic factor of competitive advantage and success of an organization's business, emphasizes knowledge.

KNOWLEDGE AS AN IMPORTANT RESOURCE OF THE FUTURE

Many philosophers tried to define the notion of knowledge, among the first to be Plato, who said that knowledge is characterized by the existence of demonstrability, truthfulness and subjective belief. Knowledge represents a developeded understanding of a particular topic, based on facts and gained through education and experience. Modern organizations and their managers are increasingly relying on knowledge, and less on capital. In fact, it can be said that knowledge represents intellectual capital, which is today, and in the future will be, more significant than physical resources and more valuable than financial capital (Jakupovic & Grandov, 2014). Expertise has a definite lifespan (that lifespan is several years and is steadily declining as business and operations change rapidly). After this period knowledge has to be modernized and changed, so that organizations are up to date, and they don’t lose value and become insufficient.

Given that knowledge is considered to be the most important organizational resource, and learning is the most important ability of an enterprise, it is even more important to manage it properly. Knowledge management is a systemic step in finding ways to make the best use and implementation of knowledge in an organization. The goal here is to maintain sustainable competitiveness or fulfill a long-term business policy (Besic & Djordjevic, 2014).

Knowledge management is an organizational process that helps an enterprise identify, select, organize, expand, activate, and enhance information and content within an enterprise. Knowledge management is a practice that involves the interaction of people, processes and technology. It represents a management function that seeks to improve business performance by increasing the organization's capacity for learning, innovation, and problem solving (Turban, Aronson, & Liang, 2005). Knowledge management is the process of systematically connecting people with knowledge and information in order to work effectively to create new knowledge. An enhanced model of the knowledge management process involves the formation of choices and the implementation of a knowledge strategy, which consists of acquiring knowledge, sharing knowledge, developing knowledge,

preserving knowledge and applying it. This model was completed by evaluating the implementation of a knowledge strategy. The model is presented in Figure 1 (Raudeliūnienė, 2017).

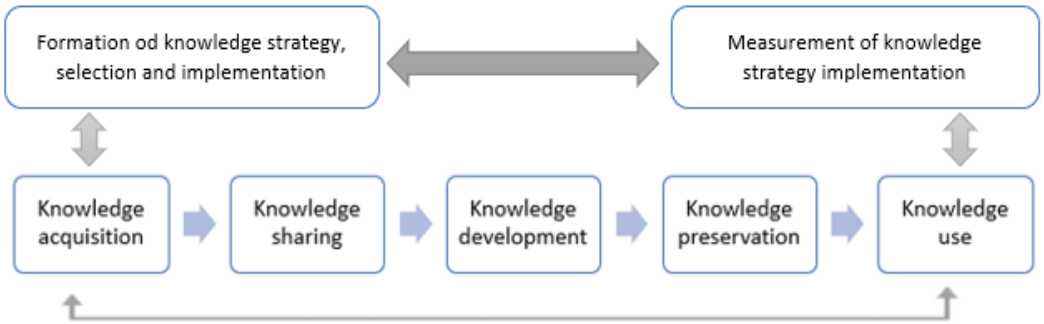

Figure 1: Improved conceptual knowledge management process model (Raudeliūnienė, 2017)

Knowledge management performance is measured through the effects it has on the organization's business, and business results. Knowledge management should contribute to reducing costs, increasing profits, increasing employee productivity, increasing innovative capabilities, organizational stability, and increasing customer satisfaction (Al-Omari, Ahmad, Ahmad, & Ali, 2016). Effective knowledge management, as noted, contributes to increased productivity and efficiency. However, organizations also face many problems in this field. One of the most significant problems organizations face is the departure of workers from the organization as well as the admission of new workers. In the first case, workers leave their own input as well as the knowledge they have acquired in the organization, and in the second case, the knowledge of newly arrived workers may be incompatible or insufficient with the knowledge required by that organization. For this reason, it is very important that organizations strive to build a good network of knowledge sharing within the enterprise, that is, they must motivate employees to participate and openly share useful knowledge, which certainly leads to increased efficiency and productivity of the business. Knowledge management organizations that have a developed knowledge sharing system can expect their employees to generate new innovative solutions to problems, as well as develop more innovative organizational processes. Knowledge management can provide more productive brainstorming and thus improve the innovation process in an organization.

Improving the knowledge and skills of employees is not only significant for the enterprise, it is also important for the workers themselves. Through various forms of knowledge improvement, the worker will improve his performance or find a way to do his job better. Only enterprises who invest in improving the knowledge and capabilities of their employees can achieve increased levels of satisfaction and morale of their employees. Most employees have their weaknesses. Continuous improvement of knowledge and abilities certainly leads to the reduction of these weaknesses, but also leads to an increase in the creativity and innovation of the employees. As mentioned above, advancement of knowledge leads to an increase in employee satisfaction, which certainly means organization, as it reduces the departure of workers and, consequently, the cost of hiring new workers. All of this affects the reputation of the enterprise, because the it becomes more attractive to new professionals who want to improve their skills (The Importance of Training and Development in the Workplace, n.d.).

THE LEARNING ORGANIZATION AND THE ORGANIZATION THAT LEARNS

Successful organizations in the future will be those that build their competitive advantage on knowledge. In the age of knowledge, the success of organizations depends on their ability to create the conditions for creating, sharing and applying knowledge. In addition to creating and transferring knowledge, it is necessary for knowledge to be advanced and to create new knowledge that will contribute to creating value for the organization and customers. The basis of a learning organization is found in a number of theories. One of the earliest mentions of a learning organization relates to

Argyris and Schon, who, for the first time in their book, Organizational Learning: A Theory of Action Perspective, proposed models that facilitate learning processes in organizations (Argyris & Schon, 1978). The very concept of a learning organization is based on the concept of organizational learning, which is based on advocating radical changes in the behavior of managers in employees in organizations, which should lead to changes in the organizations themselves, that is, these organizations are transformed from low-performing organizations into those with high performance (Altagic & Macura, 2013).

One of the most important benefits of a learning organization is the competitive advantage that organizations achieve by creating superior design, manufacturing, cost management, logistics, sales (Santos-Vijande, Lopez-Sanchez, & Trespalacios, 2012). Some of the benefits of learning organizations are:

- increased innovation levels;
- improved business efficiency;
- improved business quality;
- better utilization of resources;
- faster acceptance and implementation of changes;
- long-term gutter delivery facilitation;
- providing better quality products / services to customers;
- improving the corporate image of the organization;
- strengthening the sense of community within the organization.

In fact, most of these benefits point to a positive link between the learning organization and the operational and financial performance of the enterprise.

DEGREE OF EDUCATION OF THE SERBIAN PEOPLE

The success of an organization, as noted above, depends in large part on the knowledge that employees of the organization possess, as well as their ability to improve themselves. The global economy implies that employees are educated and able to adapt to a rapidly changing environment. What is important to emphasize is that the population of Serbia does not have many workers with a high level of education, and even those who have it leave the country due to poor employment conditions. States should base their development strategies on investment in education. This would increase the productivity and competitiveness of these countries.

In terms of GDP, Serbia ranks 72nd in competitiveness, while in terms of higher education, training and skills it ranks 55th (Schwab, 2019). A comparison of the population of Serbia with the population from the region in terms of competitiveness and level of higher education, training and skills is shown in Table 1.

Table 1: Country ranks based on competitiveness and education (Schwab, 2019)

Country	**Competitiveness**	**Education, skill improvement**
Hungary	47	49
Romania	51	72
North Macedonia	82	83
Albania	81	50
Montenegro	73	53
Serbia	72	55
Croatia	63	69
Bosnia and Hercegovina	92	82
Slovenia	35	26

Based on the presented results, it is evident that Serbia is not in adequate position. Therefore, the government should develop programs for stimulating higher education, as well as to organize

trainings, which would further improve the knowledge and skills of employees. This issue has to be addressed on a national level in a systematic way.

CONCLUSION

Organizations today operate in a time that is characterized by constant changes and the need for innovation. In order to implement changes and to innovate, it is necessary to gather and apply knowledge. Therefore, it can be said that knowledge is a key factor for the business of the organizations themselves, but also for its functioning and development in the future. From this it can be concluded that knowledge, as well as constant knowledge development and management, is a cure for organizational problems. The concept of knowledge management is increasingly being developed in practice and management theory. Involving all levels of management in the knowledge management process requires an increase in the competencies of the managers, and therefore their knowledge, which in the end leads to a more appropriate knowledge management within the organization and to increase its competitiveness.

Both organizations and countries must strive to increase prosperity and the quality of education. The importance of continuous training through vocational training is imposed by market needs. Only knowledge created through the educational process and related to the economy, can be structured and used as such successfully in the future. The main limitation of this paper is the lack of direct empirical findings and a structured survey research. However, given that the paper aims at reviewing the importance of knowledge and knowledge management, this limitation is not severe and it should be viewed as a guideline for future research in this domain.

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SKILLS FOR SUCCESSFUL COMMUNICATION WITH MARKET AND MARKETING MEDIA

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ABSTRACT

The media has the power to shape reality. In modern conditions of powerful information and communication technologies it is really not a problem to approach every person on the planet. Statisticians have even developed the theory that six contacts are enough to establish with any person in the world. This means that if we need information or advice, if it is important to contact any person on this planet, it is achievable. The market and media communications specialist must have the skills to attract attention, provoke reaction and stimulate thinking. The four basic skills of good marketing communication through media are: being prepared, being pleasant, being interesting and being dedicated to business. At first glance, they may seem simplistic, but big ideas are basically very simple. However, it is not easy to master these skills. All of them require preparation that encompasses continuous learning and exercise, which entails a thorough knowledge of the business and the topic, especially when communicating with the market and when the media is involved. Skills are used to convey the message and give the impression that a particular business is known more and better than the media. It is especially important to emphasize those aspects of personality that send confidence, intimacy and understanding.

Key words: Marketing communication, Marketing media, Marketing strategy.

INTRODUCTION

From television and radio, through magazines to the internet, daily are offered visions that say what should and should be taken to keep up with the times. Becoming the master of the "media universe" is achievable. This is evidenced by people we know intimately from TV, radio, the Internet or billboards. People who apply marketing communication skills through marketing media have an affinity for others, and the recipients of the media message can appreciate and feel it well. Usually, the ability to look at things from someone else's perspective and from someone else's perspective not only develops compassion and tolerance, but helps to convince other participants in the market (both on the supply and demand side) of the correct attitude conveyed by the media message .

In market relationships, kindness is worth a thousand truths. This is not a new concept - it is about connecting, making and using people. If it were not for a new concept, the custom that the functions in Australia when meeting natives in a wasteland would serve as confirmation. They have to stop and talk and they need to find a mutual relative or friend in the conversation. If they manage to find that common "connection" then they are friends, if they fail then it automatically means that they have to fight each other as enemies. In documented cases, this "search" has taken days and is an example of primitive connection in a substantive sense.

Three authors (Komarcevic et al., 2012) rightly argue that communication is one of the most important factors for a company's success, both nationally and internationally. Communication, as a form of communication and communication between people, businesses and the environment, is extremely important in business because it involves different relationships, interactions and connections between the people who create those relationships. For enterprise organizations to function effectively, to produce or sell goods or to provide services, there must be developed channels of internal or external communication. From this point of view, communication is increasingly becoming a significant source

of comparative advantage for business systems. In this regard, most experts in this field rightly state that without communication it would be extremely difficult, if not impossible, to run any business. In fact, communication happens all the time, at all levels and in all forms of business. When asked why it is so difficult it is not difficult to answer: simply people have to communicate in order to achieve any kind of mutual relationship. In fact, communication is a basic and universal phenomenon and it is a much broader term than language - it involves the transmission of ideas, attitudes, thoughts, plans, desires and communication with others. Thanks to the tremendous and accelerated advancement of information and communication technologies, the volume of human communication has now been reduced to unprecedented proportions. Modern telecommunications offers real-time access to anywhere in the world. Modern technology enables the transfer of information, that is, communication between people in real time, regardless of distance.

RESEARCH METHODS

Computers are now a must-have tool for every market communications and media researcher, since the jobs of planning, processing and producing and presenting reports and research results cannot be imagined without them. Field research is today gaining a whole new dimension. The virtual environment, the cyber space, is a modern “polygon” on which data is collected in a business environment. The specificity of the online research conducted for the purposes of the work is that the automation of the research process has been carried out, in that the stages of data collection, processing and presentation of results have been merged. The corresponding results came in the context of theoretical computer theory-based research and market communications and media research.

THEORY

Today, in the modern conditions of developed information and communication technologies, it is confirmed that every person on the planet can be reached in six steps, that is, in six phone calls, of which only the first three contacts are important. We meet thousands of people in our business and even more private contacts. Some are just incidental interlocutors at various gatherings on various occasions, while others have become valuable clients and even friends.

Gerald Michaelson (Michaelson, G. and Michaelson, S., 2003) wrote "If you want to have a high quality business, you need to have a network that is high in quantity." Statisticians have again calculated that 70% of executives are accepting new jobs for which they receive a higher salary than their previous position, thanks to a large network of high-level contacts. Which indicates that connections and contacts help not only in business but also in personal, career progression.
An expert in market relations and media relations is a provocateur in the positive sense of the word because it attracts attention, causes people to react and think.

Some recommendations on connecting and expanding the circle of contacts where you need to emphasize your presence while connecting with people should be considered: seminars, acquaintances and friends from school or college, student organizations, religious affiliations, business groups, Rotary Club, Chamber of Commerce, political parties and organizations, hobby clubs, family, group support. in a word, market communication experts are expected to be social, to love meeting new people, to be able to make extensive use of new contacts. Otherwise, one has to learn how to communicate. In order to expand the base, there is a crucial training for sympathy. namely, as is true of every muscle in the body, so too must the personality exercise regularly in order to be fit. It is so important that it is even implied that there is a battle on two fronts in market communication: one sells the product and the other, conditionally put, sells a person who communicates with the market. This is where people often forget Dale Krnegi's classic (Karnegi, D., 2016) "How to Make Friends and Influence People." The principles contained in this book may be obvious but rarely applied, these are:

- Be genuinely interested in other people.

- Smile.
- Remember that your interlocutor considers his / her name as the sweetest and most important word in a given language.
- Be a good listener. Encourage others to talk about themselves.
- Talk about topics that interest your interviewee.
- Make the interviewee important and be honest about it.

These items form the basis of correct interpersonal relationships in general, especially in the business world, at all levels of the social ladder and in any business environment.
Also, in order to succeed on a micro level, or in one's own business environment (if the goals are less focused and if one tries to be accepted only in the collective, ie with people in one's own environment), some generally accepted rules are also valid, which is good. mentioned, these are:

- Express interest in topics that we are not closely qualified for, as well as other people who are not our superiors or direct associates,
- If we have just been admitted to an environment, we need to take a walk with an acquaintance who knows the employees in order to "break and melt the ice" as soon as possible and meet the employees,
- Once we get to know the employees, we need to find out their views, ideas, get their phone numbers and addresses,
- Make friends even when we think we don't need them
- Make business cards, and like the Japanese, share them with everyone (it is confirmed that people really keep them),
- At social events, try to get to know as many people as possible, and later write them in a message saying you are glad to meet them,
- As the network of acquaintances expands, so should the nurturing of contacts, it is crucial to keep in touch all the time (postcards, greetings, thanks, announcements, help here),
- Deliver on commitments and promises.

However, the most important thing is knowing the market, and it should be accessible to the media even when it is not appropriate for some reason. Effective communication can increase commitment, job satisfaction, can play a role as a link for promoting and developing collaboration between organizational stakeholders, facilitate diffusion through teamwork, enhance internal control and facilitate strategy development. Many authors also point to the fact that communication matter of the role of managers in contemporary business (Paunović, M., Radović, A., 2018).

In modern business communications, especially in communication with the media, the emphasis was on perfecting communication skills and how to become a better communicator. However, a significant step has now been made in creating the key to effective communication with the media. So, for example, controversial President of the Fox News Channel, Roger Ailes (2005), cited in his book entitled "You a Message" outlined the four basic skills of good communication with the media, namely:

- be prepared;
- be comfortable;
- be dedicated, and
- Be interesting.

Although it seems simplistic, it is not at all simplistic and easy to master these skills. In essence, the most important thing is that those we are addressing need to be convinced that we know more about them, this is achieved by having the figures, facts and our own views on the topic being covered by the media to speak naturally. Proper "naturalness" requires, in fact, good preparation and constant learning. That is, even virtues on musical instruments or top athletes constantly have to practice in order to remain fit, in order to maintain quality. It is essential that the person who communicates with the media feel comfortable, but equally important that others, those who follow a particular medium, also feel comfortable. It would be argued that the key to good communication with the media is relaxation, and this can only be achieved if in some way, or at least in crucial moments of

communication with the media, stress is overcome. This requires special skills of release or relaxation. It is clear that television, newspaper or radio interviews can lead everyone into a state of stress and anxiety that is a bad, even counterproductive, feeling. A noticeable nervousness indicates an unwillingness or insecurity, or even indicates an inadequate suitability to talk on a particular topic. To overcome this primarily bad feeling, Michael Levin in the book "Guerrilla PR 2.0" (Levin, M., 2012) gives the following advice: "Stretch out, take a deep breath, make a circle with your head, close your eyes and project yourself actually into Tibet. Slow down to charge the media batteries. For others to be comfortable with you, it takes a spark, a moderation, a light touch. That doesn't mean you need to change completely, but try to highlight those aspects of your personality that exude confidence and intimacy. Humor, listening and observation will quickly connect you with your media colleagues. "In communicating with the media, some authors suggest applying acting skills. Successful PR masters have been known to collect phrases, witty wit, jokes, anecdotes, quotes, and other wisdom with the intention of keeping the media's attention to the message they are sending. After all, being aware of the above is always worth it, or it can be useful in everyday communication.The digital information age has only slightly changed the essence of communication with the media, with the speed of communication now becoming imperative.

FINDINGS AND DISCUSSION

Contemporary audiences are overwhelmed by the abundance of information all day long, which can ultimately lead to the saturation of the recipient of the message with information, confusion or even contradiction, often resulting in a crisis of corporate identity as well as problems in communicating with the target public (Frencel, L., 2013). . Contemporary marketing in the process of continuous communication with real and potential consumers should provide the necessary information, encourage the creation of the image and reputation of the product and the company itself, which in the end should imply action. buying products. In addition to consumers, businesses are increasingly interested in communicating with stakeholders, ie all stakeholders, such as: suppliers, dealers - intermediaries, competition, government, banks and other financial institutions, employees, the civil sector, etc. other segments. It is through the exchange of information between the listed segments of the public that an image of the company is formed. In doing so, proper relationships with the environment are an important step in creating the corporate image and reputation of the company and its products (Stošić Mihajlović, Lj., 2018).

The main purpose of the communication strategy is to present a market offering that will meet the specific needs of the stakeholders in the market. In addition to what has already been stated, it is stated that there are other goals (Gašović, 2009), such as:

- Building good relationships with the environment,
- Creating the desired image in a market audience,
- Careful creation of the identity and image of the organization, as a special style in the business,
- Promotion of new products, services or information accompanying the product.

The two basic concepts that define business communication are culture and strategy. Culture, as an expression of national values and other differences, creates the basis for communication, and the implementation of a defined strategy creates the condition for competitive advantage of an organization in the market (Rous and Rous, 2005).

Most communication process models are based on two basic components of a behavioral psychology model: stimulus - response. The sender has one idea or perception, which he encodes into a message, whereby it is decoded by the recipient, which provides feedback. The basic functions of marketing communication with the market and through the media are to inform the consumer, with the intention of differentiating and positioning the product and / or brand in the consumer's mind, with the aim of forming positive attitudes and realizing the purchase. This falls within the domain of business advertising. Of course, in addition to realizing the product as the ultimate goal, marketing communication contributes to increasing overall consumer satisfaction. Consumer satisfaction itself is

most often about demonstrating social status, prestige and power, having fun and experience within social networks. It is certain that each person reacts differently to the message being conveyed through the media, which means that the segmentation of the audience is necessary beforehand. Targeted public research has shown that people behave in a way that is consistent with their views and opinions. In addition, belonging to a group determines the way in which the group values are defended. The fact is that communication has a strong influence on the efficiency and effectiveness of the message transmitted through the mass media, because most of the recipients of the information simultaneously receive the message, but they are not independent and independent of each other but condition each other, and are influenced by society and the environment. in which they exercise their basic life and business functions.

CONCLUSION

The environment in which an entity operates is very dynamic and is made up of many factors and factors affecting business and between which different relationships and relationships are established. It is indisputable that in the conduct of its business activities, the company must establish exchange relations with entities coming from the immediate or wider environment. This exchange involves the exchange from the elements of the production process to the information that accompanies those relationships. In today's highly volatile, turbulent and competitive business environment, reliable information is a major limiting factor in a company's business success. The company communicates with its environment through the exchange of information and on the basis of established relationships and positions in the exchange process, the company determines its interests, goals and strategies and positions them in the system of the environment, which determines the direction and intensity of its response. Changes that occur during the business operation of the company and interaction with the business environment are numerous and it is certainly impossible to always predict. But in order to eliminate or at least reduce the negative impact on the company, it is necessary to continuously monitor the key factors acting from the environment, to collect and analyze information, both from external and internal environment. You and The purpose of these activities is to understand how individual elements influence changes in the company, business and marketing strategies, as well as the strategic management of marketing instruments, such as: product strategy, price, marketing channels and marketing communication, both in the current period, so more in the future. Monitoring changes in the middle creates assumptions for identifying the potential of the sales market, the state of demand, the direction and the intensity of changes in the future. An enterprise that is not motivated or incapable of responding adequately, implies proactive response, or at least adapting to the environment in which it operates, is in danger of losing its market position or being displaced over time. In this regard, people working in marketing must understand and understand the main forces operating in the environment, create a good media message and thus affect market opportunities, and superior financial position.

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Session C: MARKETING MANAGEMENT

Papers (pp. 145-166):

DIGITAL MARKETING ACTIVITIES AS A FACTOR IN CREATING COMPETITIVE ADVANTAGE

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ABSTRACT

Information and communication technologies are becoming a key factor in successful business operations and gaining competitive advantage. The development of technological advancements in this area has found a special place in the fight for survival in the market and the creation of as many loyal consumers as possible through digital marketing communications. The modern consumer is becoming aware of their power in terms of engagement, value creation and control over communications. Enterprises need to see the power of consumers in the digital era as an opportunity to gain a competitive edge in the market, through value creation and experience with consumers. The paper deals with the analysis and capabilities of the company through digital marketing activities to provide consumers with quality digital content, which will provide better positioning and differentiation of products in the market, and thus create opportunities for creating competitive advantage.

Keywords:: digital marketing activities, consumer, competitive advantage

INTRODUCTION

As one of the key factors of achieving competitiveness, productivity and efficiency, is the use of modern information and communication technologies. The use of digital technology radically transforms the business model, generating new revenue streams, encourage innovation, change of thinking of employees and orientation towards constant changes. Internet allows the active role of customers, from idea to product, but to use their own products, but also quality monitoring of the degree of their satisfaction by the company. As a result of pressure on the rate of innovation and redefined reaction time to market changes, the companies there is a need not only for changes in the technologies are considered, but also in the way of thinking.

Digital transformation represents the integration of digital technologies in all areas of the business that results in fundamental changes in the business and delivering value to users. Digital platform include: platform for Internet advertising, websites network stores, search engines, social networks, platforms of creative content distribution platform applications, communication services. They bring together a vast community of customers and partners, and create a market on a vast scale and efficiency (Vidas-Bubanja, et al., 2019).

DIGITAL MARKETING AND COMPETITIVE ADVANTAGE

We live in a time where the power of the organization diverted to the consumer, which has an increasing role, is an active, engaged and have control over communications. To digital consumers really have market power they have to be connected to each other and are aware of their power. Content is the basis of the competitive advantage of digital marketing media. Digital marketing allows

consumers, enterprises and other stakeholders to create, share and access digital content (Quinton, Simkin, 2016). Consumers have different approaches to marketing communications some are just passive observers promotion and interaction organizations, while others are active participants in their interactions through social media and interacting with organizations in real time. Consumers are becoming connected, informed, educated and mobile through digital technologies. The power of digitized consumers lies in the fact that they are interconnected, exchange information and experiences quickly and easily, can control communications and thus affect the online image of the brand and the company.

Managing the process of development of internet marketing in companies refers to the organized approach to improving technological premise of using internet marketing, raising the level of marketing knowledge and skills of employees, as well as the development and promotion Web sites of companies. Managing development of Internet marketing is not only the management of this process within the company. These process management refers to the management of infrastructure development, raising the level of education of the population as well as external processes (Osmanbegović, 2009). Gathering a large number of data and information are also important in the corporate CRM, leading to a better understanding of customer needs and more accurate targeting marketing strategies (Jačova, Horak, 2015; Hommerová, Patrovský, 2017). Internet should be seen as a strategic asset that has the potential to take advantage of business learning in the digital environment and thus enable marketers to use traditional marketing wisdom to achieve competitive advantage. (Chauhan et al., 2015).

Globalization of markets and competitive development, created the need for new technologies and innovations and made it difficult the survival and progress of the organization. The solution in this unstable environment is to consolidate and achieve continuous improvement by applying ICT (Seyyed, 2015). The research confirmed that the company considered that the greatest impact of innovative marketing in the context of industry 4.0 represents an increase in the competitiveness of enterprises (Ungerman et al., 2018). Organizations need to invest in digital marketing to enable competitiveness in a growing economy, and should have an emphasis on the use of various tools with which to build a relationship with customers, and therefore competitiveness (Weru, Mbugua, 2017). In today's dynamic global competitive business environment, marketing is based on the technology is essential for the survival of the organization (Kotler, 2012). The technology offers the market new and exciting platforms that allow them to connect with their existing and potential customers to more diverse and relevant ways (Dahlen, 2010).

DIGITAL MARKETING COMMUNICATIONS IN BUSINESS

According to research digital signage market has registered a rise, where the greatest investment growth in 2015 was recorded segments of video advertising and mobile advertising (IAB Serbia, 2015). Research in the field of digital marketing shows that during 2017 recorded growth budget and that for large enterprises allocations for these activities recorded up to almost 15% of the turnover, while the smaller companies, this percentage is slightly lower and is up to 10%. Among the Member States of the European Union, 77% of companies have a website, 45% use social networks to communicate with consumers, 14% of communication strategy is based on blogs, while 16% use multimedia content. When it comes to simultaneous use of the web site and social networks, among these countries are leading companies from the following countries: Malta and Denmark (67%), Sweden (63%), Finland (62%), Great Britain (60%), while the lowest percentage recorded by the company on the territory of Romania (25%), Bulgaria and Polish (26%) (Enterprises Presence on the internet, 2017).

Digital advertising has registered a growth year after year. The highest expected growth rate recorded mobile advertising, with the participation of as many as 62,5% of total expenditure in digital advertising (Worldwide Ad Spending, 2017). Data from the statistical digital market show that the total value of the market of electronic commerce for consumer goods increased by 16% during 2018

(https://wearesocial.com/blog/2018/01/global-digital-report-2018). The digital representation of the brand is becoming increasingly social character. The survey showed that more than 90% of brands present on Facebook. On Twitter is present 85%, and on YouTube 73%. Google+ is not so was popular with brands, so that only 26% of brand managers confirmed the presence on it (TechnoratiMedia, 2013).

The results showed that 89% of marketers want to know the most effective tactics and the best way to engage their audiences on social media, 68% of marketers plan to increase the use of blogs and investments in blogs and original content most important for marketing on social media (Stelzner, 2014). The data show that social media marketing has resulted in: increased sales in retail stores by 10%, increasing the online conversation for 15% and recognizable brand as a leader in digital communications (Being, 2012).

According to research Twitter users recommend specific companies through their tweet messages for products and processes, and they represent 53% of all tweets messages on commercial discussions, while 48% of them expressed intent to purchase certain specific products. (Mackenzie, 2011) 83% of customers who shop during the holidays are influenced by consumer reviews and comments on social networks (Consumer Shopping Habits Survey, 2010). Research on the use of social networks in business was conducted via Twitter during January 2013 where the via link survey approached 200 000 companies, where the majority of them from the United States, Great Britain, Canada and Austria. This research has shown that the primary benefit of social media marketers greater visibility of the company, which is considered 89% of the companies surveyed, increased turnover 75%, better knowledge of the market 69%, while gaining loyal customers 65%. Companies that use everyday community service network responded that sales increased as a result of these efforts (Stelzner, 2014).

Survey data indicate that the most common use of 's social networks for marketing research mostly related to monitoring campaign 60%, trend analysis 48%, competitive analysis 40% and customer care 36%. (https://www.insightsinmarketing.com) Through social networks, companies are approaching to consumers, where through their opinions, attitudes and ideas come to creating adequate marketing decisions.

DIGITAL MARKETING ACTIVITIES IN SERBIA

Digital technologies enable companies with an building and maintaining relationships for significantly larger number of bundles in a more efficient manner, and to collecting and analyzing increasingly complex data on consumer behavior in the purchasing process and their personal characteristics. Consequently, digital technology and the Internet take up the largest primate in the field of direct marketing.

Quality web site became one of the key factors of successful digital marketing. For the survival of the Internet sites of great importance is the quality of service, service to consumers and consumer satisfaction. Online shopping has become one of the increasingly frequent form of buying, so therefore it is necessary to satisfy the needs of many consumers. Results of the research were aimed at selection of the best alternatives to the web site using the TOPSIS methods. These results suggest that the criterion security web site rated as the most important with a weight of 0,304, then design the site with a weight of 0,250, ease of use with a 0,126, information with a weight of 0,124, reliability of 0.099 and at the end of at least essential is estimated interactivity on the site with a weight of 0.097. (Stojanović, Regodić, 2016).

Statistics showed that 67% of consumers use the company's profile to inquire about their work, file a complaint or praise the work and service. Research has shown that failure to respond to this initiative leads to a loss of 15% of consumers. Good response to consumers as a result gave the increase of customers and number of recommendations for good service, because people simply love to a grant their request, suggestion and spent time, so they feel safe, and the company gets feedback firsthand.

The company Masmi is June 2012 conducted research on how companies in Serbia are using social networks for business purposes. The study included 170 companies operating in Serbia. Positions of the respondents responsible for representing the company on social networks are of the ”ordinary” employees (2,9% of respondents) over PR managers, IT sector and marketing director (by 5,3%), the owner of the company (8,8%), followed by marketing managers (12,4%) through senior management (13,5%) to the directors (17,1%) and managers (21,2%). Only 30% of companies use external collaborators to conduct PR and marketing activities on social networks. 35% use social networks daily, while as much as 44% of companies do so only once a week or less often. Only 1,5% of companies regularly sends its employees to further education on social networks. As a reason for communication via social networks, most respondents said that communication through them quickly and easily (58,8%) that the visibility and better positioning of the company on social networking sites increased (58,2%) followed by finding new business partners, clients and customers (44,1%), and that the advertising opportunities favorable (38,5%). (https://igortomic.net/link/smuposlovanju.pdf)

Social Serbia 2018 survey conducted in March by the agency Pioneers in cooperation with the agency Smart Plus Research in order to gain insight into the number of users of social networks, the use habits and their attitudes towards advertising and a variety of other amenities. The research was conducted on a sample of 1000 members of the online population in Serbia aged 13-64 years. Facebook will continue to be the main tool of mass promotion and Instagram him largely on his heels. Only 9% of respondents stated that they are most interested in the publication of brands and companies are following on the social networks. The main reason why the use of social networks is to connect with friends, fun and access to information, while 27% indicated that it is tracking favorite brands. The users in a number of 55% mostly do not trust advertising messages on Facebook, but they look out of curiosity. Commercials famous brands gain more confidence, and general confidence in the ads is decreasing because often not relevant to the target group you are addressing (https://pioniri.com/sr/socialserbia2018/)

The research results showed that the website owns 82,6% of companies, most of them 94,8% are large companies, 90,4% of medium enterprises have a website and 80,1% of small enterprises have a website. Companies through the website usually provide: the contents of the website for regular visitors (86,0%), description of goods or services, price list (82,6%), as well as the possibility for the visitors to familiarize themselves with the products (67,6%) (http://publikacije.stat.gov.rs/G2018/Pdf/G201816013.pdf).

CONCLUSION

The power of consumers in the digital era of business, organizations should see it as a possibility that they will use to gain a competitive advantage in the market. The basics of positioning and differentiation in digital marketing, which focus are consumers or competitors have common creating value with customers and creating experience with online community and individuals. Marketing managers should provide customers high quality digital content, which will provide an adequate interaction with consumers, with the aim of winning their loyalty. Quality digital content represents the way in which companies do win a larger number of users, to better position and differentiate their products and services on the market, and thus create the conditions for creating a competitive advantage. When one company win the loyalty of their consumers have the task to continuously maintain communication with them, they hold their attention and constantly reminded of their products and services. Managers of successful companies have recognized this and are willing to invest resources and train their employees to take advantage of digital marketing communications to create loyal customers who are a key source of competitive advantage in the market.

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THE IMPACT OF PUBLIC RELATIONS ON BUSINESS PERFORMANCE

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ABSTRACT

Modern business requires constant communication with both consumers and business partners in order to better position themselves on the market. Public relations is an extremely important segment in business. By investing in a modern approach to the market, continuous improvement of business processes is achieved, and thus the efficiency and effectiveness of business are realized to a higher level. It strives for an innovative market approach. The research confirmed that there is an association between successful positioning in the market and a positive relationship between the consumer and the producer and also a positive relationship with business partners. This correlation has a positive impact on the overall business of the company.

Key words: Innovation, Efficiency, Market, Virtual business, Communication, Effective business, Successful business.

INTRODUCTION

Public relations is an important segment for the business of any successful company. The successful organization of business as well as the realization of a series of activities is necessary to achieve the royal goal, using lower factors, such as the type of management, the way of motivation, dynamism and flexibility, available funds and the like. However, the degree of success largely depends on the way ideas and information are presented and distributed, but also on the interactions between members of an organization. One of the most important factors on which business success depends is communication.

The term communication means the transfer or exchange of information, ideas or attitudes from one side to the other side. Depending on the number of participants and whether there is feedback, communication can be one-way or two-way. Also, the communication process can take place by transferring information from one person or group to another person or group. (Sajfert, Đorđević, & Bešlić, 2006). Communication is a process of disseminating information and in order to enable effective and efficient work in any organization, it is necessary to ensure good communication at all levels of the organization, which is the basis of good coordination within the organization. The information must be of high quality, ie. to contain necessary and useful information as well as to be accurate and timely. Each person spends on average about 75% of their life in communication, however, we must distinguish quality from quantity. The amount of time spent on communication does not guarantee that the communication process will be successful. (Tabs, 2013). If it is important to achieve successful communication with the market and to create the right image of the organization in society, it is necessary to adhere to certain rules. Primarily, it is necessary to determine and harmonize the goals of the organization and public relations, whether you want to present the organization or brand in a better light.

Virtual communication, ie the technology that enables the communication between people who are in different locations, has significantly increased the efficiency of the business, it has affected the speed and volume of information that is sent. In addition, it allowed the business not to be primarily limited by time, but to allow employees to communicate information or leave a message, which will later be the subject of discussion.

RESEARCH PROBLEM

The business segment related to public relations and its representation is increasingly present in theory. However, very little is known about its application in the real sector. The connection of the team as a whole, human resources inside and outside the company are very important. Although scientists claim the opposite in some parts of theoretical claims, teamwork requires giving certain forms of behavior, which is very difficult to implement in practice on a daily basis (Kolarić, 2012).The problem with this research is the existence of a small number of studies related to the impact of public relations, the success of companies conducted in the city of Zrenjanin, and the lack of much information about the presence of teamwork and the situation in this territory.

METHOD OD RESEARCH

It is emphasized that the successful implementation of public relations is the result of the successful operation of the organization. Many scientists believe that this type of work will progress in the future. The reasons for such claims are numerous (improved communication, improved interpersonal relationships, reduced costs, rational use of human resources, etc.). Team-oriented business with the adequate application of relations with the outside world results in successful business. The team consists of people who work on a common goal and who bear joint responsibility for all the successes and failures that accompany them on the way to that imagined goal. Well-designed teamwork improves the work and business of the organization, which is the basic goal of every company's business policy.

It is in the interest of every organization to achieve the best possible communication in order to achieve the best possible success. It is necessary to work on continuous improvement of all team members and on motivation and stimulation of employees to achieve the best possible results, it is necessary to create a team spirit in the organization itself.

Business results and image will be positive if the public relations in the company is seen as one of the most important factors in the management of the company. Hence the management process for public relations must be viewed as an inseparable part of the management of the company. Goals, strategies, plans, and certain actions of public relations must be in accordance with the goals, strategies, plans, and certain actions of the company's management (Bazić, 2016).

RESEARCH GOAL

Research on the impact of public relations on the business success of companies, the way of communication and the impact they can have on business success, is done from the aspect of the economy in order to better understand the relationship between success and communication and to find solutions to improve collegiality and improve interpersonal cooperation with other economic entities, external factors. It is believed that this research can contribute to raising awareness among people who have so far not attached much importance to the impact of public relations on the success of the company.

WAY OF RESEACH

Data collection was performed by distributing surveys to employees in the city of Zrenjanin, which included 63 respondents of different qualifications, ages, genders, and years of service. Respondents hold different positions in the organization and perform different tasks. This research work shows the situation on the territory of the city of Zrenjanin.

Table 1 Qualification structure of respondents

WORK EXPERIENCE	Number of respondents		
	7	2	Total
up to five years	7	5	12
from 6 to 10 years	5	10	15
from 11 to 15 years	4	4	8
from 16 to 20 years	5	2	7
from 21 to 25 years	0	0	0
Over 25 years	6	12	18
QUALIFICATIONS			
I Primary Education	0	0	0
II semi-skilled worker	0	0	0
III skilled worker	4	4	8
IV high school (four years)	6	4	10
V highly qualified worker	7	2	9
VI (VI1 i VI2) higher education (I degree of faculty)	5	12	17
VII1 high education	10	7	17
VII2 master's degree	2	2	4
VIII PhD	3	3	3

HYPOTHESIS

Main hypothesis: There is a connection between the positive attitude of employees on the application of public relations in small and medium enterprises.

Hypothesis 1. The application of public relations is highly positioned in small and medium enterprises. Hypothesis 2. Large companies are constantly entering the segment of public relations, the management of these companies emphasizes the exceptional importance of its implementation.

Analysis of research results: *Group 1 - employees Group 2 - company management*

Table 2: Response frequency structure

	I don't agree at all		I don't agree		I am indecisive		I agree		I totally agree	
Group	1	2	1	2	1	2	1	2	1	2
The importance of successful implementation of public relations	0%	0%	0%	0%	0%	0%	43%	63%	37%	47%
Cooperation with clients, associates and suppliers	0%	0%	0%	0%	34%	27%	33%	60%	33%	13%
Negotiation skills	0%	0%	7%	0%	7%	7%	53%	36%	30%	57%
Impact of communication	0%	0%	0%	0%	44%	30%	43%	53%	33%	5%

The structure of the frequency of answers to individual questions is shown in Table 1. The research included two groups of respondents. Respondents were divided into two groups in order to allow a comparison of attitudes between group 1, which consists of respondents and employees, while group 2

consisted of company managers. Companies are increasingly striving to keep their workforce balanced in terms of racial and ethnicity and gender, not because of legal obligations, but because of the personal economic interest they have become aware of" (Dessler, 2007).

When making a decision, it is important to listen to everyone's opinion. The research confirmed the initial assumption. There is a connection between the positive attitude of employees on the application of public relations in small and medium enterprises, where the hypothesis was confirmed by sub-hypotheses of the research. The average number of meetings has increased and business people are considered to spend 25 to 60 percent of their time in meetings of which up to 25 percent of meeting time is irrelevant and half of the time spent in meetings is considered unproductive (ABA Section of Business Law, 1998). The purpose of the meetings is to discuss various topics related to the work of the company, the problems that have arisen, the goals, the necessary actions to be taken to achieve the vision, etc. Precisely because the meetings discuss things of great importance for the future of every company, it is necessary that the meetings be well organized.

CONCLUSION

Based on the obtained results, we came to the conclusion that the respondents mostly agree with the fact that one of the most important characteristics is to achieve cooperation with all members in the company ... they believe that the application of public relations in companies is extremely important. The organization of event meetings is of great importance for the company. Respondents believe that it is necessary to spend as much time as possible talking to fellow business partners. It is an interesting fact that we came to this research that small companies invest a lot of money in the part of public relations.

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THE CONCEPT OF INTELLIGENT PACKAGING

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ABSTRACT

In order to increase the efficiency of product and information flow in the supply chain, there are numerous technological solutions that can be applied. Some of them are related to the packaging. Therefore, in the last few years, the concept of intelligent packaging emerged, bringing many benefits to all supply chain members, including the customers. Indicators, data carriers and sensors represent three main technological solutions that can be used within this concept. While indicators can be applied for monitoring certain product characteristics, such as temperature and freshness, the data carriers can be mainly used for the process of automatization and product tracking. The role of sensors is in detecting certain changes in product's biological or chemical structure. The implementation of intelligent packaging systems can be of a special importance in the processes of food supply and consumption.

Key words: Intelligent packaging, Indicators, Data carriers, Barcodes, Sensors.

INTRODUCTION

Changes in business environment, including more demanding customers, force companies to accommodate their activities to new market conditions. Among the others, their survival and business success, in a large extent, depend on the application of new technologies. With the use of innovative technological solutions, companies may try to increase their efficiency or/and to satisfy the wants and needs of customers. Hereby, all business processes, from supply to sale activities, can be improved, not only within a single company, but in the whole supply chain. Thus, the packaging, as an important part of business and marketing strategy, can also be enhanced in accordance to the contemporary technological systems. This is of a great importance, especially bearing in mind that packaging has an important place in supply and production processes, as well as in the fulfilment of customer demands. Because of its importance for the entire supply chain, the paper analyzes main technologies that can be implemented in the development of intelligent packaging.

The paper consists of two parts. In the first part, besides defining the packaging, the attention is dedicated to explaining its types, functions and goals. On the other hand, the second part of the paper deals with the concept of the intelligent packaging. Hence, several definitions and explications of this concept have been presented. Additionally, the emphasis was on its main types and their examples.

FUNCTIONS AND ELEMENTS OF PACKAGING

Many authors analyze packaging in the context of marketing mix, usually considering it as an important component of a product. It refers to the activities related to the design and production of the

container for a product (Kotler, 2002). On the other hand, the container itself represents the package, which usually has three levels: primary, secondary and shipping package (Kotler, 2002). For example, tuna fish can be packed in a can (primary package), which can be put in a cardboard box (secondary package), which can be transported on a pallet (shipping package).

There are also definitions of a packaging that refer to its functions. According to Kalpana et al. (2019, p. 145), it represents "an art, science, and technology, aiming to ensure quality, wholesomeness, integrity and safety of a product". For Ghaani et al. (2016), packaging is one of the main processes related to the preservation of product quality during its transportation, storage and final use. The same authors (2016) list its four basic functions:

- protection,
- convenience,
- containment and
- communication.

Packages are designed to protect products from any sort of potential physical damages, as well as from adulteration and theft (Kumar et al. 2018). The package should be accommodated to customer needs and lifestyle in a way to provide simple, easy and convenient manipulation and usage of a packaged product. It also needs to contain products of different size and shape, with the task of improving logistic efficiency (Ghaani et al. 2016). In regard to the fourth function, package is used as a communication tool, bearing in mind that it "stands" between the product and the customer.

In order to develop an effective package for a new product, Kotler (2002) points to the importance of several decisions. At the beginning, the packaging concept should be established, by defining the basis and the purpose of the package. After that, the attention should be dedicated to main packaging elements (such as colour, size, text, materials and shape), which needs to be in harmony, not only with one another, but in relation to other marketing elements as well. Next come different kinds of tests, including engineering, visual, dealer and at the end consumer tests.

- When considering elements of a good package design, Agariya et al. (2012) mention several goals that should be achieved. They are (Agariya et al. 2012):
- attraction of the buyer – with the adequate combination of packaging elements, the package can single out among competitive brands and draw the attention of the buyer;
- communication to the buyer – bearing in mind that package communicates with the buyer through its elements, the image presented through the package must correspond to the image that is expected for a product;
- creating a desire for the package – the package can have a significant role in convincing consumer that product can satisfy his need;
- selling the product – in addition to selling the product, package should also induce the repeat purchases (the application of reusable features, certain giveaways, etc.).

The realization of mentioned goals is increasingly difficult in today's conditions of fierce competition and demanding customers. Therefore, the implementation of innovative solutions is present in the packaging sphere as well. The innovative packaging concept that has emerged and developed in recent years is related to intelligent packaging.

INTELLIGENT PACKAGING

There are various definitions of the concept of intelligent packaging. In general, it can be defined "as a system which can make decisions to increase the shelf life, notify information, improve quality and report harms/spoilage by utilization of various intelligent techniques" (Kalpana et al. 2019, p. 146). For Jang and Won (2014), intelligent packaging relates to the activities of sensing, communicating and monitoring the conditions of packaged food, in order to provide information about product's safety, quality and history, during its storage and transportation (Kalpana et al. 2019). In regard to this

definition, six functions of intelligent packaging can be distinguished, i.e. this kind of packaging is able to monitor, detect, sense, record, track and communicate (Kalpana et al. 2019).

Müller and Schmid (2019) use the definition of the EFSA (European Food Safety Authority), according to which intelligent packaging materials are those materials and articles that are capable for monitoring the condition of packaged food or the environment that surrounds the food. The same authors (2019) also pointed that although those materials are able to monitor the product and communicate its condition, they have no interaction with it.

Yam et al. (2005, p. 2) define intelligent packaging "as a packaging system that is capable of carrying out intelligent functions (such as detecting, sensing, recording, tracing, communicating, and applying scientific logic) to facilitate decision making to extend shelf life, enhance safety, improve quality, provide information, and warn about possible problems". In accordance to this definition, the term "intelligent" can be used only if package is capable for tracking the product, sensing the environment, and communicating with humans. Intelligent packaging can also have a significant role in supporting both, material and information flows in the supply chain (Yam et al. 2005).

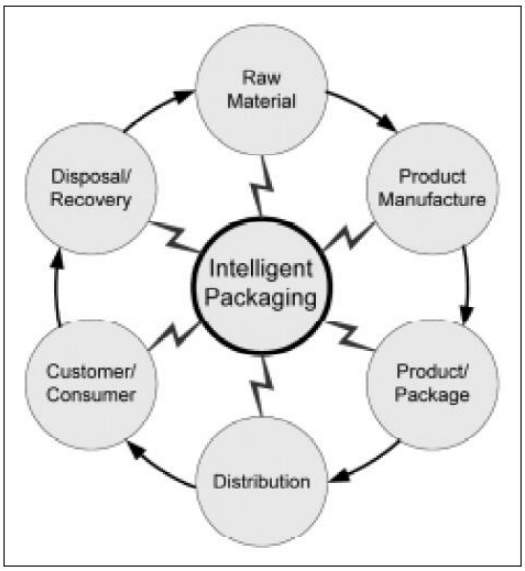

Figure 1: Material and information flow (Yam et al. 2005)

The outer circles in Figure 1, refer to the supply chain cycle, which starts with raw materials and ends with disposal (recovery). In different forms, the package is included in all presented phases. It facilitates the flow of materials through its main functions of protection and containment (Yam et al. 2005). In addition, the package can support the information flow in the supply chain. In a line with material flow, it can bear and communicate actual information, regardless of the cycle phase.

In order to improve product and information flows in the supply chain, different systems and devices have been introduced within the concept of intelligent packaging. Following Ghaani et al. (2016), there are three main technologies through which this system of packaging can be realized: indicators, data carriers and sensors.

Indicators represent devices which convey information to a consumer considering product quality, microbial activity and other properties (Kalpana et al. 2019). The emphasis is on "the presence or absence of a substance, the extent of a reaction between two or more substances, or the concentration of a specific substance or class of substances" (Ghaani et al. 2016, p. 2), whereby each information is usually followed by immediate colour change. Depending on their position, i.e. whether they are physically placed inside or outside the package, indicators can be classified as internal or external, respectively (Kalpana et al. 2019). Besides this categorization, all indicators can also be classified into several groups (Ghaani et al. 2016; Kalpana et al. 2019):

- temperature indicators – indicators that point to temperature changes of products or their packages when they are below or above reference values; some of them (time-temperature indicators) are able to monitor and record temperature changes along the entire supply chain;
- freshness indicators – indicators that can monitor the quality of products (such as seafood, fresh food and fruits), by examining chemical reactions related to microorganisms and their metabolites, responsible for food spoilage;
- leak (gas) indicators – indicators that monitor changes in gas concentration levels in the inside atmosphere (inside the package); they can point to the existence of leakages or package defects;
- pH indicators – indicators that convey pH variations, which can indicate certain product issues (for example food spoilage).

In Figure 2, the "ripeSense®" sensor is presented as an example of freshness indicator. Its colour is initially red, but as the days (at room temperature) go by, the fruit ripens, and the colour is changing into orange and finally yellow.

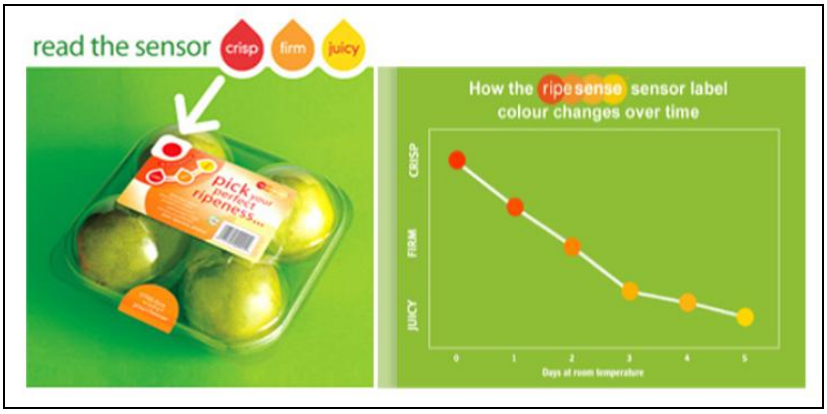

Figure 2: Freshness indicator - ripeSense® (http://www.ripesense.co.nz/)

Data carriers refer to devices that improve the efficiency of information flow within the supply chain (Müller and Schmid, 2019). Usually placed on tertiary packaging (such as pallets or shipping crates), they are used for traceability, automatization and for preventions of thefts and counterfeits (Ghaani et al. 2016). Two, in supply chain commonly applied data carriers are bar codes and RFID (Radio Frequency Identification) tags (Kalpana et al. 2019).

A barcode represents a "machine-readable storage database", based on the optical phenomenon (Kalpana et al. 2019). It can be one-dimensional (1D) and two-dimensional (2D). 1D barcode consists of black and white bars, which arrangement determents the coding data (Müller and Schmid, 2019). Contrary to 1D, 2D barcode can store larger amount of information and consists of spaces and dots, arranged in a matrix or an array (Ghaani et al. 2016). The Portable Data File (PDF) 417 and Quick Response (QR) are widely used two-dimensional barcodes (Figure 3).

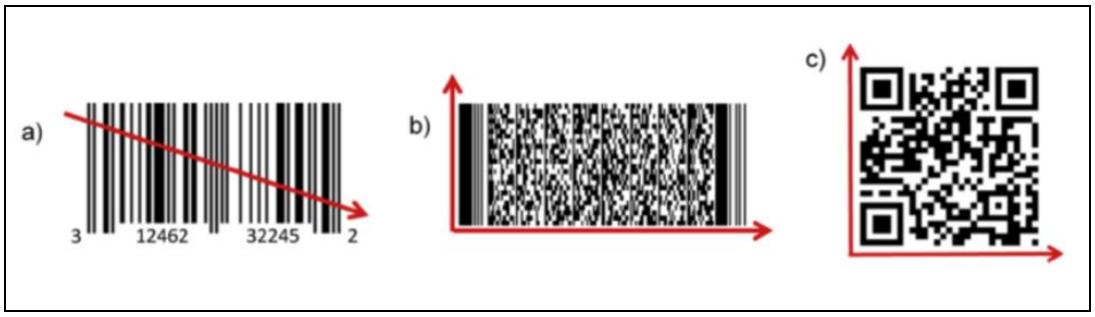

Figure 3: Barcodes: a) 1D, b) PDF 417 2D, c) QR 2D (Ghaani et al., 2016)

In comparison to barcodes, the RFID tag is the data carrier that has extremely larger capacity for storing different kind of information, including, for example, nutrition data, relative humidity and

temperature (Yam et al. 2005). The RFID system has three main components: a tag (small microchip), a reader (small component that emits radio waves and receives data from the tag) and middleware (web server, a local network, etc.), that connects enterprise applications with the RFID hardware (Ghaani et al. 2016). There are two types of RFID tags: active tags that are powered from their own batteries and tags without batteries (passive ones), that are powered from the reader (Yam et al. 2005).

A sensor can be defined as an electronic device, which is used for detecting and converting one form of signal to another by the use of a transducer (Kalpana et al. 2019). After detecting the presence, concentration, composition or activity of a certain physical or chemical property by the receptor, the same part of a sensor converts that information into a form of energy adjusted to the transducer, which converts the measured signal into a useful analytic one (Müller and Schmid, 2019).

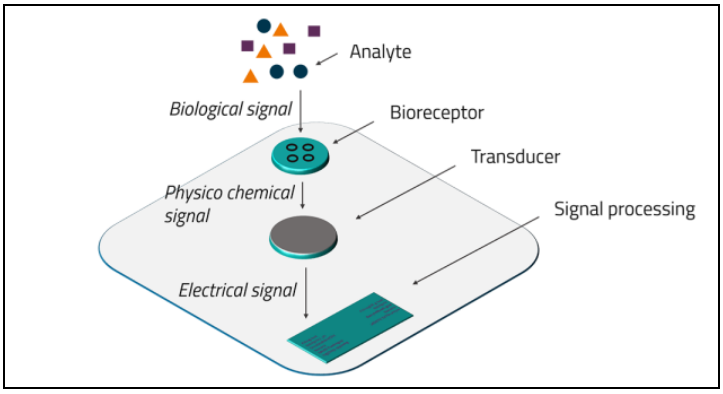

Figure 4: Structure of a biosensor (https://www.surfix.nl/applications/biosensors)

Depending on a type of a recognition layer, the difference can be made between biosensors and chemical sensors (Ghaani et al. 2016). In biosensor, the role of detection of a change belongs to a bioreceptor, made of a biological or organic material such as an antigen, enzyme, hormone, microbe, or nucleic acid (Pereira de Abreu et al. 2012). Hence, a biosensor of a Toxin Alert company, "Toxin Guard", is based on antibodies, and thus is able to detect pathogens such as E. coli, Listeria, Campylobacter and Salmonella (Müller and Schmid, 2019). On the other hand, in chemical sensors, the receptor is made of a chemical compound. For example, the taste sensor for orange juices is based on the polyaniline nanofiber (Kalpana et al. 2019). The implementation of nanofiber sensor enables the detection of changes in the concentration of citric acid in aqueous solutions of orange juices. This can be used for grouping similar orange juices or for separating the different ones, as well as for tracking the aging process.

Although the use of all types of intelligent packaging is rather costly, their application can bring many benefits, especially in food supply chain. Bearing in mind that intelligent packaging enables tracking and monitoring products (including their conditions), which to a large extent facilitates the decision-making process, its implementation can be essential for biosecurity and food safety (Yam et al. 2005). In addition, by providing certain information about products, especially those related to their use, intelligent packaging systems can enhance food quality and convenience (Yam et al. 2005).

CONCLUSION

Often analyzed in the context of a product, packaging has an important place in developing marketing strategy, especially since it represents one of the ways through which the communication with the customer can be realized. However, besides communication, packaging has other functions as well. Its first function is related to protection, i.e. packaging protects product from external influences and potential damages. Packaging should also be designed in a way to provide convenient manipulation and should be adjusted to product specifications.

The implementation of new technologies in the process of packaging development led to the creation of intelligent packaging. Depending on the used technology and potential functions, three main types of intelligent packaging can be distinguished: indicators, data carriers and sensors. Indicators are usually used for detecting and conveying information to customers regarding product quality. They can point to changes in temperature (temperature indicators), freshness (freshness indicators), gas leaks (leak indicators) and pH value (pH indicators). Data carriers, on the other hand, are usually used in the process of automatization and product tracking. Moreover, they can be of a great help in preventing thefts and counterfeits. Bar codes and RFID tags are carriers that are often used in supply chains. As well as indicators, sensors can also point to certain changes on a product. Hereby, they are developed for detecting biological or chemical changes. Because of that, there is a distinction between biosensors and chemical sensors.

The application of intelligent packages facilitates both, the information and product flows in the supply chain. However, in addition to the increase of efficiency of logistics activities, this type of packaging provides many benefits to customers, whereby its application can have a significant function in improving food safety and quality.

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HOW IMPORTANT IS BRAND WHEN BUYING NEW CLOTHES?

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ABSTRACT

In the fashion, industry brands are especially important, because the competition is high, and companies need to attract new customers and keep them. Successful branding requires a good knowledge of consumers and their purchasing processes. Brands play an important role in the fashion world, both for companies and for consumers. For consumers, the brand guarantees the quality and acquisition of a certain image and status in the company. A powerful brand brings profits to the company and encourages customers' demand. In addition, it enables the achievement of high prices and the expansion of product assortments and the introduction of new products. In the survey, we wanted to examine the behavior of customers in the clothing brands in the Slovenian market. We used a survey questionnaire to get the appropriate answers. The survey found that most respondents want to buy clothes in larger shopping centers and the Internet, most often during the sale after the season.

Key words: Brand, Fashion, Consumer's behavior, Fashion clothes.

INTRODUCTION

One effect of the economic crisis and changing consumer behavior in the Global North during the last nine years has been the huge availability of retail space. In high streets, shopping centers and derelict industrial spaces, this has led to opportunities for creative and cultural start-ups to experiment with new retail concepts (Overdiek 2018). Fashion marketing use of a number of techniques and business philosophy that focuses on actual and potential buyers of clothing and fashion accessories in order to achieve long-term goals of the organization (Easey 2008). The fashion industry, ranging from global discount retailers to exclusive luxury brands, drives a significant part of the global economy. Fashion is one of the most challenging fields, highly impacted by global economic uncertainty as well as distinct trends and industrial changes. In response to the pressure for growth and cost efficiency, many brands have started a series of initiatives to improve their speed to market and to implement sustainable innovation in their core product design, manufacturing and supply chain processes. (Roger 2018). Brands developed as a means of commercial distinction within the marketplace in the mid-to late-nineteenth century. The process of branding begins with the attachment of a name to a business, product, or a family of products, and involves the creation of an image for that business which sets it apart from its competitors. Brand image is usually disseminated through advertising, but the value of a brand generally resides in its reputation and the level of loyalty or desirability it can generate amongst consumers. In the fashion industry, a desirable brand name allows companies to bridge the gap between expensive, high-fashion garments and affordable mass-market goods such as perfumes, accessories, and ready-to-wear diffusion lines (Pavitt 2017). Brands across the fashion industry learned how to make and sell products at rock bottom prices. The cost of apparel has been spiraling downward for decades now. Fast-fashion labels like H&M and Zara set new lows for the industry with their model of selling inexpensive, on-trend items that consumers would only wear a few times before tossing out. And retailers like Walmart and Target have had to play into this model to keep up with customers' expectations. But when you consider the terrible environmental and human impact of manufacturing such cheap clothes, it's clear that the price tag only tells one small part of story. The main way to reduce the cost of manufacturing is to use cheap labor, which often means relying on factories in developing countries, where working conditions are often less regulated. Seventy million people around the world work in clothing manufacturing, the majority of whom are women. When

these workers are overseas, it can be very hard for brands to track whether they are paid a living wage, given reasonable hours or production targets, and allowed to work in a safe environment. Sometimes, brands themselves don't realize they were using child labor or even indentured labor to make products, because their factories are so far removed from the brand headquarters (Segran 2018). Developing and building a brand is a strategically oriented activity. Understanding relationships between users and their fashion brands is essential for the market, as these links significantly affect the profitability of the company (Ismail,&Spinelli 2012).

The clothing industry is dominant in fashion, which is why this industry is so specific and constantly under the influence of fashion culture. In the world, fashion and design are the leading European clothing industry. Thanks to its long tradition, diversity of products and continuous innovation, the European textile and clothing the public in superb design and fashion knows industry (Guercini,et.al, 2018;Surchi 2011). The trend of fashion development focuses on emphasizing comfort, focusing on light, breathable and warm materials adapted for the season. The advantage of today's fashion is the possibility of a comprehensive combination of clothing (Goworek 2010). Retailers establish indirect contact between manufacturers and end-users. Its task is to ensure the appropriate volume and structure of supplies at affordable locations, at the same time and at prices that are acceptable to the end consumer (Berman &Evans 2012, Burstiner 1991). Communication commerce takes a central place in the whole process of marketing communication of clothing products. In this regard, the size of the monopoly of trade should be taken into account, the compilation of existing opinions, the experience and the position of trade, the type of sales space and the social environment. The task of communication in the trade is cooperation with manufacturers in order to meet the needs of information users and inform producers about the needs of users.

THE RELATIONSHIP OF USERS TO THE PURCHASE OF CLOTHING BRANDS

A fundamental challenge for many fashion brands is that, increasingly, they lag behind consumers' expectations. The role of the consumer has shifted from one of passive observance to enabled dominance. They are no longer content with simply buying fashion products; exponential growth in the use of digital technologies has empowered them. They want to interact, belong, influence and be the brands from which they buy. Informed, selective, and in charge, they care about how they look in public and on social media, and about the perception of the goods they buy and own. The vast majority of consumers use digital channels before, during or after making their purchases. There is more information available than ever before about people's consumption habits, behaviours, trends and decision drivers. However, investment in Big Data and analytics is wasted if decision-makers receive erroneous insights, or do not have the skills or competencies to convert solid insights into business decisions. Unlocking this information is key to understanding what the mindset of the consumer is now, and is likely to be in the near future. Driven by the convergence of Big Data, the Internet of Things, and data science, fashion brands will be able to understand their customers better, respond to market trends and tailor their sales information and products. (Roger 2018).

Today's customer in the developed world does not always have more needs, but has more and more wishes, which are different, special and more demanding. Products, services and processes are becoming much more complex than they used to be. Buyers are becoming increasingly demanding and living in the time of the economy of desire and imagination, and not in the economy of needs. The desire of each designer is to form, the producer (both in the field of yarn, textiles and clothing) produce and the trader will only purchase such products that will be interesting for users. Experience, a comprehensive overview of events and changes in society and a good knowledge of the target group of users are needed to understand, anticipate and predict the wishes and needs of users.

With the rapid rising of living standard, people gradually developed higher shopping enthusiasm and increasing demand for garment. Nowadays, an increasing number of people pursue fashion. However, facing too many types of garment, consumers need to try them on repeatedly, which is somewhat time-

and energy-consuming. Besides, it is difficult for merchants to master the real-time demand of consumers.

In fashion sales, the recommendation technology, as an emerging technology, has attracted wide attention of scholars. As is widely known, the traditional garment recommendation depends on manual operation. To be specific, salesmen need to recommend garment to customers in order to arouse their interest in purchasing. However, it is very difficult for salesmen to understand customers' real thoughts and then recommend the targeted garment as there is no sufficient cohesiveness between customer information and merchants. Therefore, it is essential and meaningful to find a set of objective indicators, instead of subjective opinions, to evaluate the fashion level in the clothing recommendation technology (Zhang et.al. 2017).

EMPIRICAL FINDINGS

In order to find out what is the attitude of users to purchasing clothes and the role of brands in the purchase process, we conducted a primary survey in 2018. We surveyed 200 adult inhabitants of Slovenia, of which 90 men and 110 women. We will briefly present answers to individual questions

Table 1: Personal monthly income

Monthly income in euro	Number of answers in%
Less than 1000	39
From 1000 to 1500	45
From 1501 to 2100	11
From 2101 to 3000	4

Table 2: Time of shopping for clothing

Time to buy clothes	Number of answers in%
Only during the post-season sale	27
Equally throughout the year	26
Only when when I really need something	21
Where discounts are, but not on sale	18
As soon as when the new collection come to the market	8

On the next question, the respondents identified where they most often buy clothes. We got the following answers.

Table 3: Place of buying clothes

Place of buying clothes	Number of answers in%
Bigger shopping centers and department stores	34
In smaller stores in the city center	20
On the Internet	19
Abroad	16
In boutiques of Slovenian designers	6
On catalogue sales	5

Most of them buy clothes in larger shopping centers, because it is the easiest because all stores are in one place and the purchase is quicker. In particular, the younger ones also buy online, while the elderly still have a high level of mistrust when buying online. The smallest of them buy through catalogue sales and boutiques of Slovenian designers, as they are accessible only to a handful of users. We also wanted to know how fashion clothing brands are important by shopping.

Table 4: Importance of fashion clothing brands

Importance of fashion clothing brand	Number of answers in%
Important but not decisive	38
Very Important	35
Not important	27

Table 5: Domestic and foreign brands

Buying domestic and foreign brands	Number of answers in%
Buying domestic and foreign	45
Buying mostly foreign	33
Buying mostly domestic	12
It does not matter	10

The results showed that almost half of them buy domestic and foreign brands. Compared to whether or not they are buying more domestic or foreign brands, we see that foreign brands are in advantage because consumers more often buy them than domestic ones. This is because there are more and more foreign brands in Slovenia, few are homemade and are not well known to users, as companies invest too little money in marketing communications in order to gain greater visibility.

The table shows information on how the respondents answered the question about what they are interested in when purchasing a particular brand.

Table 6: When buying a particular brand, the user is first interested

Factor	Number of answers in %
Price	28
Brand Name	25
It is important that the clothes are suitable	25
Quality	15
Other	7

The results showed that users first look at the price, which is expected data in today's time and according to the structure of the personal monthly income of the respondents, since most of them belong to the lower income group. The quality is only in the fourth place, while the second one lists the packaging, the look of the product, and the image of the product, the colour of the clothing, the clothing material and the brand name

Table 7: The factor of attraction when purchasing particular clothes

Factor	Number of answers in %
Design	33
Brand Name	18
Quality	16
Need for a product	16
Price	11
Other	6

Most users responded that they first attracted the design of the product, which is understandable, as even before the customer sees the price and quality of the product, the clothes can be seen from afar and then look at the quality, price or brand name. The brand name is also very important, as it is the second most common answer. Under the other, the respondent stated the colour of the clothes, the clothing material and the fact that the clothes are displayed in the exhibition.

Table 8: Getting to know the brand of clothes

Getting to know the brand of clothes	Number of answers in%
On the Internet	28
From friends	21
In fashion shows	16
From clothing sellers	11
On television	10
From newspapers	5
From mail sent to home	5
Other	4

Table 9: Loyalty to Brand Name

Loyalty	Number of answers in%
Very loyal	35
Loyal until I find a better brand	35
I am not loyal because brands are not important to me	16
I am not loyal because I like to constantly change brands	14

The results showed that users are very much loyal to individual brands or are loyal at least as long as they do not find a better brand. It is therefore important that companies invest heavily in brand names and build a brand identity.

CONCLUSION

In the fashion industry, the understanding of the concept of fashion marketing is extremely important, as companies face a lot of competition with new products facing the challenge of how to attract new customers and retain them. It is important to know the modern user and his lifestyle. The domestic supply of clothing is relatively modest. The reason for this is that there are few Slovenian brands of average quality that would be available to most consumers, but there are more Slovenian designers who make clothing available to just a handful of people. Regarding the supply of foreign brands of clothing, respondents mostly answered that it was very good. The reason for this is also the fact that Slovenia has become a part of the European Union, which has also increased the share of foreign branded clothing. The problems faced by the Slovenian textile and clothing industry are still, despite the fact that this industry has undergone certain phases of restructuring, still more or less the same. These problems include particularly high labour costs, low levels of investment (leading to technological backwardness), fierce competition in the domestic and foreign markets (especially due to excessive costs compared to costs in cheaper labour countries) and insufficient marketing role.

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Session D: ECONOMY

Papers (pp. 169-200):

NATIONAL COMPETITIVENESS AND YOUTH ENTREPRENEURSHIP: RESEARCH FROM THE CENTRAL BANAT REGION

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ABSTRACT

National competitiveness integrates the effectiveness and successfulness of SMEs within a country. When comparing national competitiveness to other countries then it becomes international competitiveness. According to the available data, Serbia is not favorable ranked when it comes to its competitive ability. As entrepreneurship and youth entrepreneurship were found to increase competitiveness on a micro- as well as on macro-national level, this paper analyzes the potential of youth entrepreneurship as means for increasing the competitiveness of the domestic economy. The results indicate several critical points where Serbia lags behind developed countries when it comes to productivity, quality, innovation, and entrepreneurial climate. This paper provides a concise overview on national competitiveness and the competitiveness of domestic enterprise, youth entrepreneurship and presents the research results of a conducted research on youth's opinions on self-employment. The results indicate that there are several metrics which make it difficult for the youth to start their own business in Serbia. In sum, the paper provides solid basis for future research in this domain.

Key words: National competitiveness, SMEs, Youth entrepreneurship, Entrepreneurship.

INTRODUCTION

Entrepreneurship can be presented as a process which through creativity aims at creating and implementing innovation to a company. Its main function is to solve issues and problems which are faced by consumers and society as a whole (Ćoćkalo, Đorđević, Nikolić, Stanisavljev, Terek, & Bakator, 2019). Therefore, it can be noted that entrepreneurship has the potential to increase technological advancement due to the increasing need for innovation. Namely, customers are more eager for innovative products, hence there is room for innovative business models. This further indicates that entrepreneurship can positively affect innovation intensity on a broader level. Entrepreneurship aims at managing intellectual capital in applying modern technologies in business processes. Entrepreneurship integrates the process of creating value, creating innovation, creativity, risk acceptance and the responsibility towards each employee and members of the community. Entrepreneurship can emerge in the form on newly formed business, and within existing companies, too, which is referred to as corporate entrepreneurship. Now, entrepreneurial orientation and market orientation approaches have the potential to increase business performance, even more so in developing countries (Boso, Story, & Cadogan, 2013). Another important concept, a sub-domain of

entrepreneurship, is youth entrepreneurship. A large number of countries (developing and developed) struggle in their efforts to motivate the youth to start their own business (Bollingtoft, & Ulhoi, 2005). Further, youth entrepreneurship and entrepreneurship overall, positively affect national competitiveness. This is important as national competitiveness further reflects on the standard of living, new investments which enhance economic growth. National competitiveness integrates the successfulness and effectiveness of individual enterprises and when the national competitiveness of two countries is compared, then we refer to it as international competitiveness (Reut Institute, 2019). It is evident that it is a country's interest to create a motivating environment for its youth so the number of new enterprises would increase as they positively affect national competitiveness in the long-term.

In this paper the results of a conducted research in the Central Banat Region regarding youth entrepreneurship are discussed. In addition, the national competitiveness of Serbia and the competitiveness of domestic enterprises are analyzed. Further, youth unemployment trends are analyzed with the goal to argue the necessity for improving youth entrepreneurial activities. This paper is consisted of four main section (excluding the Introduction and Conclusion sections). The first section analyzed Serbia's national competitiveness and the competitive ability of domestic SMEs. Next, youth entrepreneurship and youth unemployment data is reviewed. Following this, the research data on youth's opinion on self-employment is discussed. Finally, suggestions for improving youth entrepreneurship are proposed.

NATIONAL COMEPTITIVENESS OF SERBIA AND DOMESTIC ENTERPRISES

Compared to the national competitiveness of EU countries, Serbia lags behind. The main reasons of low competitive ability are low productivity of domestic SMEs, low quality products, old manufacturing equipment and high maintenance costs, lack of modern management tools and techniques which further negatively affects employee motivation and employee productivity (Vukotic, Milivojevic, & Zakic, 2018). If modern business development models are not applied, and the quality of products and services can't compete with other products' quality, then low competitive ability is a certainty. With high manufacturing costs, products can't be sold for a competitive price. In addition, obsolete manufacturing equipment can't keep up with the dynamic changes which are brought by globalization and the fourth industrial revolution - Industry 4.0. Therefore, it can be argued that Serbian SMEs with their current state of conducting business can't achieve competitiveness within the frameworks of Industry 4.0. SMEs in Serbia have to focus on developing collaboration platforms in order to apply collective efforts in achieving competitiveness on the global market (Domazet, Zubović, & Lazić, 2018). In addition, Serbia is listed among the least socially sustainable developing economy, meaning that social development is not following industrial development (Cvetanović, Despotovic, & Nedic, 2017). Foreign investments are not technology focused but rather labor intensive, hence direct foreign investments don't majorly contribute to the national competitiveness of the country. Further, the competitiveness ranking of Serbia, and several other countries are presented in Table 1.

According to Table 1. Serbia has fallen from the 65th place in 2018 to the 72nd in 2019. Compared to the other noted countries in the table, only Albania (81st) and Bosnia and Hercegovina (92nd) are ranked lower than Serbia. Other neighboring countries are better ranked, while Austria (21st), Germany (7th), France (15th) and the UK (9th) are way higher ranked than any other of the noted countries. It is evident that Serbia needs to address a lot of competitiveness metrics in order to increase its competitiveness on the international level.

Table 1: Competitiveness rankings of countries for 2018-2019, (WEF, 2018; WEF, 2019)

	2018	2019
Serbia	65	72
Croatia	68	63
Slovenia	35	35
North Macedonia	84	82
Bosnia and Hercegovina	91	92
Montenegro	71	73
Romania	52	51
Bulgaria	51	49
Hungary	48	47
Albania	76	81
Austria	22	21
Germany	3	7
United Kingdom	8	9
France	17	15
Number of countries ranked	*140*	*141*

YOUTH UNEMPLOYMENT TRENDS AND THE NECESSITY FOR YOUTH ENTREPRENEURSHIP

Youth unemployment rates are an integral part of the labor market of any country. Namely, youth unemployment rates can be viewed as distinctive metric of economic growth potential. The main factors which affect youth unemployment/employment are social security issues; higher unemployment rates compared to adults; lack of readiness for marriage; formal education increase among the youth; labor markets for the youth have low recovery rates; and the emphasis on employing women. It is evident that youth unemployment trends depend on various factors and as such it is rather difficult to model the potential of youth entrepreneurship activities within a country. Compared to developed countries where the government is focused on new models for improving the environment in order to motivate the youth to start their own business, in Serbia there is still a bottleneck when it comes to regulating youth entrepreneurship. Current tax policies are not favorable for young entrepreneurs who start a new business. The Serbian government should view youth entrepreneurship as an important and necessary business concept as self-employment reduces unemployment rates and decreases poverty. This includes systematic changes in administration and taxation regulations. Given the circumstances of Serbian economy, the current outcomes for youth self-employment seem rather grim. A potential solution for increasing employment rates is important

Further, the importance of youth entrepreneurship is evident from the overview of youth unemployment trends. The data from 2008 to 2018 was acquired from the ILOSTAT website, (ILOSTAT, 2019), and the data for 2019 was obtained through the Trading Economic website (Trading Economic, 2019). These data estimates indicate a steady decline in youth unemployment rates (15 to 24 years old) across the observed countries. The data is presented on Figure 1.

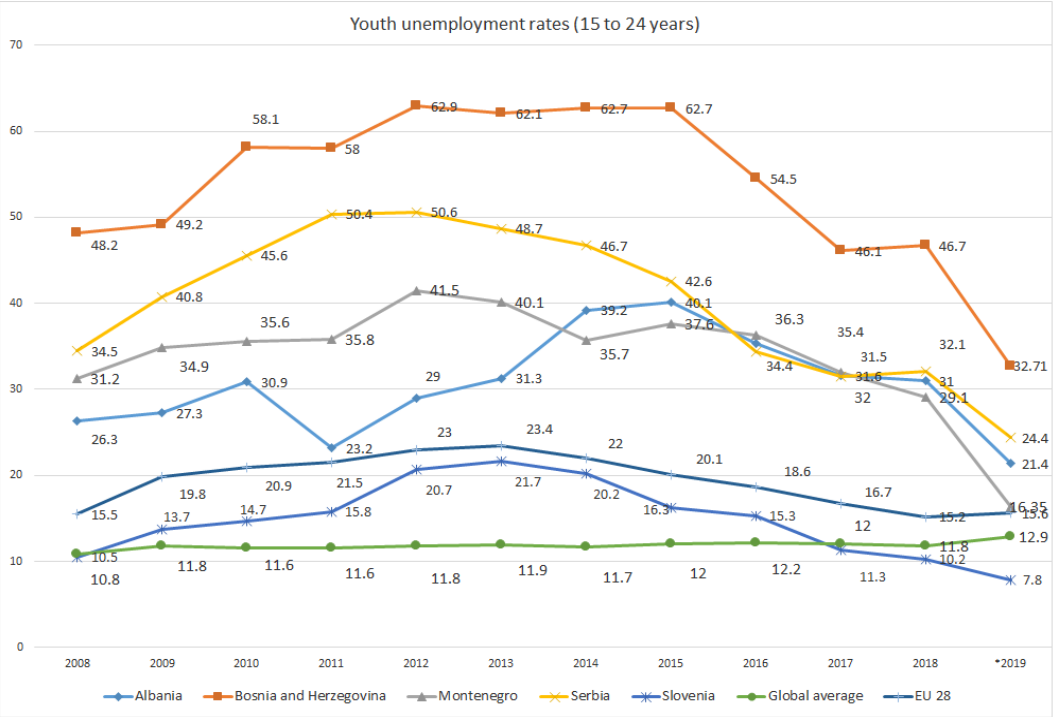

Figure 1: Youth unemployment rates in the Western Balkan and neighboring countries (ILOSTAT, 2019;Trading Economic, 2019)

According to the presented data on Figure 1. Serbia has a steady decline when it comes to unemployment rates, it peaked in 2012 with 50.60% and steadily decreased to 32.1% in 2018, and according to other data sources (Trading Economic, 2019) in 2019 youth unemployment rate fell to 24.4%. Compared to other countries Serbia has slightly higher unemployment rates. Only Bosnia and Herzegovina has a higher rate of youth unemployment rate of 32.71% in 2019. Even though there is a steady downtrend in youth unemployment trends in Serbia, this isn't enough compared to other neighboring countries and EU countries. Based on this metric it can be argued that Serbia is a on a good path in regards reducing youth unemployment rates. However, this "end-result" isn't fully the result of youth self-employment, thus it is still necessary to improve the entrepreneurial climate for young entrepreneurs.

YOUTH'S OPINION ON SELF-EMPLOYMENT

A research conducted in the Central Banat Region in 2018 analyzed youth's opinions on entrepreneurship and starting their own business. The research included 350 participants. The participants were students from Zrenjanin (300 students), and a small control group of 50 graduated students was also included. The results of research indicated that 80% of participants believe that there is no stimulating environment regarding entrepreneurial activities. Students found the following factors as limitations for starting their own business: unstable economic and political situation (16.29%); lack of financial resources (22.6%); lack of a good, innovative idea which would be successful on the market (22.62%).

Over 80% of the participants noted that the Serbian government should focus on improving the entrepreneurial climate. Further, 81.73% of the participants think that domestic enterprises lack behind other countries when it comes to competitive ability. Similarly, 775 of the participants noted that domestic enterprises lack innovation, and modern management methods and techniques were noted as an important element of achieving competitiveness by 35% of the participants.

When the data was compared with the control group, it was found that the participants in the control group didn't agree with the others when it comes to the notion that self-employment is more successful compared to other types of business models. Similarly, the control group disagreed with the opinions of the participants when it comes to the notion that people don't realize the full business potential of private enterprises. Further, disagreement was found when it comes to domestic enterprise innovativeness (the control group noted that levels of innovation are mainly adequate). Finally, the control group was less ready to use bank loans to start their own business. Based on these findings and the literature review, suggestions and guidelines are proposed in the next section.

SUGGESTIONS AND GUIDELINES FOR INCREASING YOUTH ENTREPRENEURSHIP POTENTIAL

In the previous sections the importance of youth entrepreneurship were highlighted in the process of improving national competitiveness. Therefore, based on this literature review and data analysis the following suggestions and guidelines for increasing youth entrepreneurship potential in Serbia are given:

- reducing the complexity of bureaucratic procedures for acquiring licenses for conducting business;
- the government should bring in laws that will regulate the markets and unloyal competition;
- initiating incentive programs for the youth to start their own business;
- reducing tax rates for entrepreneurs beginners;
- increasing financial and infrastructural support for entrepreneurs in every industry;
- developing online platforms for collaboration between young entrepreneurs who just started their business and;
- developing courses and involving SMEs in the education process of high school and faculty students.

In addition to the noted potential solutions to increase youth entrepreneurial activities, it is necessary to develop specific projects within local communities, schools and faculties. As mentioned previously, tax rates should be optimized for entrepreneurs as well as financial incentives should be provided for new business. This way a more motivating environment is achieved and the potential of youth entrepreneurship is increased.

CONCLUSION

Entrepreneurship has the potential to increase employment rates, reduce poverty and increase national competitiveness. Further, it was discussed that youth entrepreneurship may have an even stronger impact on national competitiveness as the number unemployed youth is higher in the majority of countries. Reducing youth unemployment rates is an important metric for increasing competitiveness on a national level. It can be concluded that entrepreneurial activities are an integral part of economic growth and development. In addition, it can be argued that entrepreneurship is tool which uses latent resources and create value for society. Thus, such tool is a significant asset for every country as it brings value not only for the entrepreneur and customers, but for the country as a whole, too. The noted conducted research in the Central Banat Region provided significant insights into the dynamics of how the youth perceives entrepreneurial activities.

The main limitation of this paper is the concise overview of the acquired data. However, the main goal of the paper was to concisely present the main issues of the domestic economy and the importance of youth entrepreneurship and entrepreneurship overall. Overall, this paper contributes to the existing body of literature and provides a solid basis for future research in this domain. For these future studies it is recommended to analyze additional data regarding youth entrepreneurship and the benefits of youth entrepreneurial activities for the domestic economy. Similarly, data from multiple studies can be

analyzed and meta-analysis conducted in order to obtain a thorough insight into the subject of the importance of youth entrepreneurship.

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TRENDS OF TAX FORMS IN THE REPUBLIC OF SERBIA

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ABSTRACT

Optimal structure and level of tax forms is one of the most important preconditions for economic growth. Tax burden has to be adequately designed in order to achieve positive implications to social welfare. The aim of this paper is to identify which tax forms are essential for tax structure in the Republic of Serbia. The subject of the paper is an analysis of personal income tax, corporate income tax, value added tax, excises, customs and social security contributions in the Republic of Serbia from 2005 to 2019. Results of the research have shown that tax revenues consist around 90% of public revenues in the Republic of Serbia, where value added tax and social security contributions are the most generous tax forms in the period 2005-2019.

Key words: taxes, structure, share, Republic of the Serbia

INTRODUCTION

Generation of public revenues is usually related to existence of the state, because every country need source to financing public needs. Bernardi and Chandler (2005) determine the basic purpose of tax as funds collection for financing public spendings. Taxes are the most generous source for covering public expenditures and their level and structure should be carefully defined by the government. Popa and Codreanu (2010) defined taxes as a key factor that effect the economy efficiency and with fiscal policy enable creating approapriate environment for rapidly economic growth. Đurović-Todorović and Đorđević (2010) argue that taxes allow the financing the public expenditures in the way that state gives contribution through the adequate allocation of economic resources in terms of optimality, equity and effectiveness. Accordingly, taxes should take an essential place in the economic policy of each government. The tax level must be properly defined so it would be in function of the economic growth (Kalaš et al. 2017). Stiglitz (2008) cite few principles of adequately tax system in terms of economic efficiency, flexibility and equity, as well as, political responsible system. The structure of this paper is as follows. After the introduction, there is a theoretical background about tax importance in the economy, as well as, analysis of tax trends in the Republic of Serbia from 2005 to 2019. The last segment inculdes summarizes and conclusion about tax trends in the Republic of Serbia.

THE IMPORTANCE OF TAXES IN THE ECONOMY

Taxes have a fundamental role and place in the economy of each country and they have to be defined at an optimum level in order to provide contribution and prosperity for the economy (Kalaš et al. 2018). To ensure an adequate level of tax revenue, fiscal sustainability is needed that excludes any kind of harmful volatility that could damage economic growth (Woo, 2009). There are many tax forms that are related to income, profit, ownership and value of property, turnover, consumption, as well as to imports and exports. Which tax type is more prevalent in a particular economy depends on the

economic development level. Boadway and Pestieau (2002) cite that income tax and consumption tax are main taxes in the world. Analyzing by tax ratio, Adelman and Morris (1997) classified tax system:

- countries with an average successful tax system: the share of tax revenues in the gross domestic product less than 15%, while the share of direct taxes in tax revenues is at least 20%,
- countries with limited successful tax system: the share of tax revenues in the gross domestic product less than 15%, while the share of direct taxes in tax revenues is at least 10%,
- countries with relatively successful tax system: the share of tax revenues in the gross domestic product varies between 10% and 14%, while the share of direct taxes in tax revenues is less than 10%,
- countries with an inefficient tax system: the share of tax revenues in the gross domestic product less than 10%.

Shinohara (2014) argue that tax structure has effect on economic growth. Research results are different in terms of tax effects which Pjesky (2006) has confirmed and cited that tax can have positive and negative impact on economic growth. Myles (2009) points out that every country can create economic growth that can depend on the political choice to adopt taxation or productive expenditures. Also, Bania et al. (2007) argue that rise in taxes contributes to an increase of real income per capita growth if funds are spent on public productive goods and services. To ensure an adequate level of tax revenue, fiscal sustainability is needed that excludes any kind of harmful volatility that could damage economic growth. Kalaš et al. (2017) argue that value added tax and social security contributions consist more than 60% of tax revenues in the period 2011-2016. Similarly, analyzing the impact of tax forms in Serbia from 2006 to 2015, Kalaš et al. (2017) found that personal income tax and corporate income tax are not significant for economic growth in Serbia, but value added tax has significant effect on gross domestic product.

TAX TRENDS IN THE REPUBLIC OF SERBIA

This chapter includes an analysis of tax system in the Republic of Serbia for the period 2005-2019. In order to determine tax structure, it is necessary to analyze tax revenues and their share in public revenues in the Republic of Serbia.

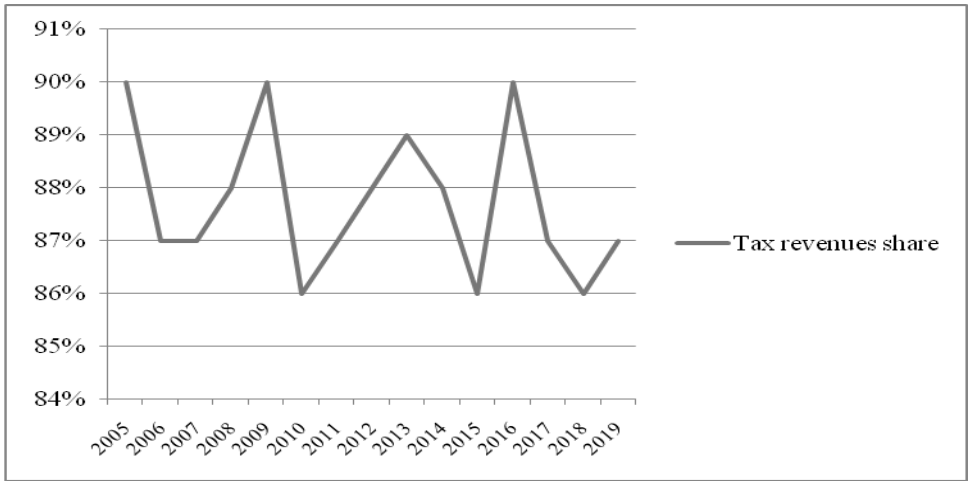

Figure 1: Tax revenues in the Republic of Serbia (% of public revenues)
Source: Authors based on https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/

Analyzing from 2005 to 2019, tax revenues consist around 90% of public revenues in the Republic of Serbia. It implies that revenues structure is dominantly focused on taxes and policy makers should take care about their level and rate.

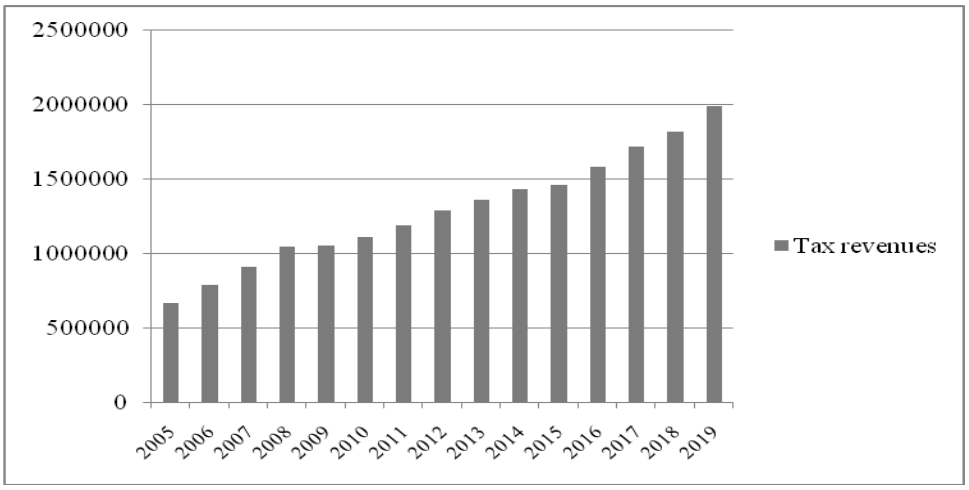

Figure 2. Tax revenues in the Republic of Serbia (mil. RSD)
Source: Authors based on https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/

Tax revenues have an upward trend in Serbia in the period 2005-2019, where their average level is 1.297.635 million RSD. Tax revenues were the highest in period 2006-2008, while average growth was 132.305 million RSD for analyzed period. Likewise, encourage fact is tax revenue growth from 2016 to 2019 when average growth rate has been 8.04%.

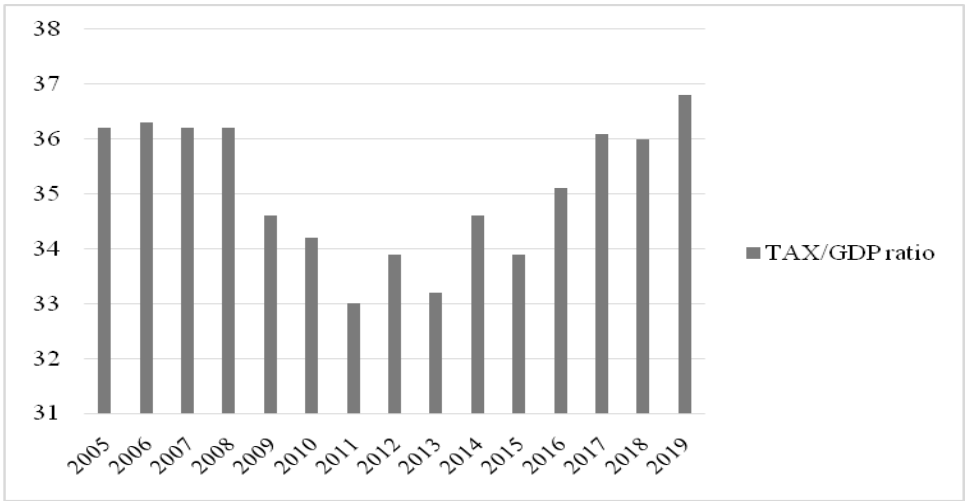

Figure 3. TAX/GDP ratio in the Republic of Serbia
Source: Authors based on https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/

Besley and Persson (2014) highlight that low-income countries collect taxes between 10% and 20% of the gross domestic product, while high-income countries collect around 40% of the gross domestic product. Analyzing tax burden trend in the Republic of Serbia, it can see that average value of this indicator is 35.09% for the period 2005-2019. Results of analysis show that tax burden is increased for 0.6% of GDP, while this indicator had relative growth of 1.65%. The smallest tax burden of 33% is identified in 2011, which is result of negative growth rate of GDP and slower economic activity in the Republic of Serbia. Since 2013, tax burden has increasingly trend where the maximum value 36.8% of GDP is realized at the end of 2019.

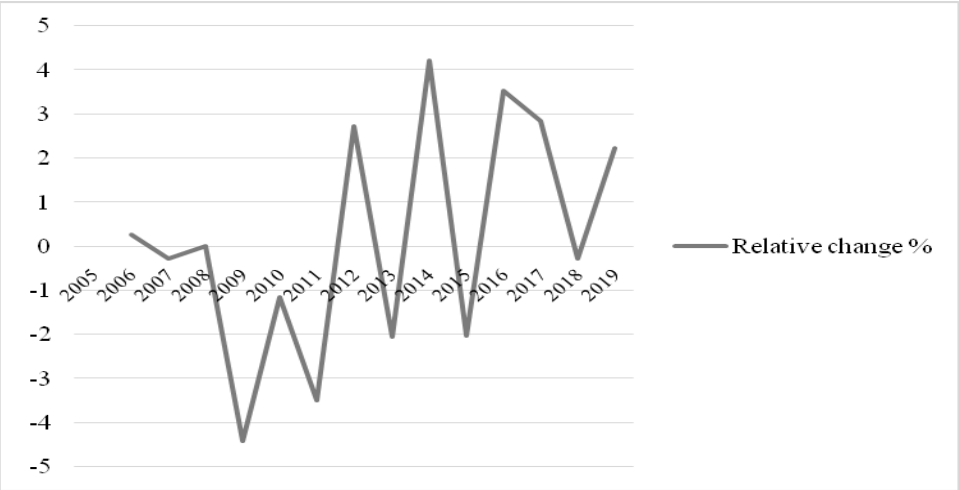

Figure 4. Relative change of TAX/GDP ratio in Serbia
Source: Authors based on https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/

In order to determine stability trend of TAX/GDP ratio, the paper has analyzed relative change of tax revenues from 2005 to 2019. Results show that indicator has negative rate in the period 2009-2013., when average fall was 1.68%. Also, this indicator has the greatest growth in 2014 when it was 4.22%. At the end of 2018, TAX/GDP ratio has increased for 2.22% which can be explained through intensive growth of tax revenues compared to economic growth in the Republic of Serbia.

Table 1: Tax forms in the Republic of Serbia (% share of GDP)

Year	PIT	CIT	VAT	EXC	CUS	SSC
2005	5.1	0.6	11.7	3.9	2.1	11.6
2006	5.4	0.8	10.3	4	2.1	12.3
2007	4.6	1.2	10.5	3.9	2.3	12.4
2008	4.7	1.3	10.4	3.8	2.2	12.5
2009	4.4	1	9.7	4.4	1.6	12.2
2010	4.3	1	9.8	4.7	1.4	11.6
2011	4.2	1	9.5	4.7	1.1	11.3
2012	4.3	1.4	9.6	4.8	0.9	11.7
2013	3.8	1.5	9.2	5	0.8	11.9
2014	3.5	1.7	9.8	5.1	0.7	12.2
2015	3.4	1.5	9.6	5.5	0.8	11.7
2016	3.4	1.8	10	5.9	0.8	11.7
2017	3.5	2.4	10.1	5.9	0.8	11.9
2018	3.5	2.2	9.9	5.7	0.9	12.2
2019	3.8	2.3	10.2	5.7	0.9	12.5

Source: Authors based on https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/

Table 1 reflects percentage share of tax forms in the gross domestic product in the Republic of Serbia for period 2005-2019. Analyzing by tax forms, value added tax and social security contributions have the greatest part of tax revenues. Average value of value added tax is 10.02% of GDP, while social security contributions consist 11.98% of GDP which is double higher than direct taxes such as personal income tax and corporate income tax. Further, shares of personal income tax and excises are similar and below 5% of GDP, while shares of corporate income tax and customs are below 1.5% of GDP in the Republic of Serbia.

In next table it is presented relative change trend of tax forms in the Republic of Serbia from 2005 to 2019. At personal income tax, the highest change is recorded in 2007 when share has decreased by 14.81%. On the other hand, the highest change of corporate income tax is identified in 2007, when share has increased by 50% compared to previous year. When it comes value added tax, the highest relative change is recorded in 2006, where share of this tax has declined by 11.97% of the gross

domestic product. Further, excise share is significantly increased in 2009 for 15.79% compared to 2008, while simultaneously share of customs has dramatically decreased for 27.27% of the gross domestic product. Finally, the highest relative change of social security contributions is identified in 2006 when heir share has increased for 6.08% of the gross domestic product.

Table 2: Relative change of tax forms in the Republic of Serbia

Year	PIT	CIT	VAT	EXC	CUS	SSC
2005	-	-	-	-	-	-
2006	5.88	33.33	-11.97	2.56	0	6.03
2007	-14.81	50	1.94	-2.5	9.52	0.81
2008	2.17	8.33	-0.95	-2.56	-4.34	0.80
2009	-6.38	-23.08	-6.73	15.79	-27.27	-2.4
2010	-2.27	0	1.03	6.81	-12.5	-4.92
2011	-2.33	0	-3.06	0	-21.43	-2.59
2012	2.38	40	1.05	2.13	-18.18	3.54
2013	-11.63	7.14	-4.17	4.17	-11.11	1.71
2014	-7.89	13.33	6.52	2	-12.5	2.52
2015	-2.86	-11.76	-2.04	7.84	14.28	-4.09
2016	0	20	4.17	7.27	0	0
2017	2.94	33.33	1	0	0	1.71
2018	0	-8.33	-1.98	-3.39	12.5	2.52
2019	8.57	4.54	3.03	0	0.	2.46

Source: Authors based on https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/

CONCLUSION

The paper has included an analysis of tax structure in the Republic of Serbia from 2005 to 2019 in terms of share of personal income tax, corporate income tax, value added tax, excises, customs and social security contributions. Tax revenues are the most generous revenues in public revenues, where average value is 132.305 million RSD for observed period. The average TAX/GDP ratio is 35.09% for the period 2005-2019, where results of analysis have shown that tax burden is increased for 0.6% of GDP, while this indicator had relative growth of 1.65% from 2005 to 2019. Analyzing by tax forms, value added tax and social security contributions have the greateast share in the gross domestic product, where these taxes consist more than 20% of GDP. It is far higher than other taxes such as personal income tax, corporate income tax, excises and customs. Namely, shares of personal income tax and excises are below 5% of GDP, as well as, shares of corporate income tax and customs are below 1.5% of GDP in the Republic of Serbia in the observed period. Corporate income tax and excises are only taxes which had positive relative change at average level, while other tax forms recorded negative relative change at average level for analyzed period.

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VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENT IN THE CEE REGION

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ABSTRACT

This paper analyses the activity of the venture capital and private equity investment in the CEE region in order to find similarity between the leading countries in the region and Serbia. For this purpose we are using hierarchical cluster analyses, using between groups linkage, by measuring the distance using Euclidean distance. The results of the study show that the structure of the investments in Serbia are the most similar to Hungary. Serbia should enhance the investment in SMEs in the ICT industry using the combination of state and private owned funds, to monitor the use of the given capital. The second suggestion is to enhance the investment in healing the companies in later stages of development, but to force the buy-back strategy, in order to remain domestic.

Key words: venture capital, private equity, SME, CEE region

INTRODUCTION

The venture capital and private equity industry is for decades present in the developed East European countries. The European private and venture capital industry laid its foundations in the 1970s. However, more intense development begins at the moment when the US continent enters the downward phase of the second investment cycle. Specifically, in the late 1970s, the United Kingdom and Northern Ireland emerged as the first countries in Europe to attract venture capital and private equity investors. Funds whose activity is recorded during this period occur in the form of affiliations of US companies but their investment activity is much smaller than that in the USA. In the continental Europe, the development of venture capital and private equity funds came later, in the 1980s. The funds were formed by large domicile banking institutions, more precisely as their affiliates.

In the early 1980s, several changes led to the transformation of the European market, which thus became attractive for venture capital and private equity investment. In November 1980, an unlisted securities market was formed in the United Kingdom as a secondary market for small and medium-sized enterprises. The example of the United Kingdom was followed later by the continental countries, Belgium, Denmark, France, the Netherlands, Norway, Spain, Sweden and West Germany. These countries formed their secondary securities market for small and medium-sized enterprises. By reducing marginal tax rates on capital gains, national governments have driven entrepreneurship growth and tax incentives to invest in starting new businesses. Also, a large number of privatizations of companies in this period contributed to the growth of awareness of owning private interests in companies. According to (Boquist & Dawson, 2004), the number of UK shareholders has increased from 7% of the total population in the early 1980s to 25% of the total population by the end of the decade.

The Central and Eastern European market was only just in the last three decades recognized as an attractive market for venture capital and private equity investment (Collins, Quinn, & Zhang, 2013;

Diaconu, 2017; Groh & Von Liechtenstein, 2009; Klonowski, 2012; Zinecker & Meluzín, 2011). The cause of the late recognition of this market is the relatively delayed exit from socialism and consequently the subsequent development of the private capital market. Venture capital and private equity investment in Serbia is at a very low level. However, the surrounding countries, which also belong to the same region, are recording higher investment amounts.

Whereas many studies (Bottazzi & Rin, 2002; Davila, Foster, & Gupta, 2003; Hall & Lerner, 2010; Hellmann & Puri, 2000; Milenković & Jakšić, 2018; Sykes, 1990) have confirmed the positive impact of venture capital and private equity investment on the success of small and medium sized enterprises, level of their innovation and economic development of the country in whole. Serbia should take measures to influence the increase the amount of VE and PE investment in domicile conditions to enhance growth and development of the SMEs and the country. In this way, it would also contribute to a better positioning of Serbia in relation to other countries in the region. The results of the paper should contribute to a definition of a model of investment that would be acceptable in domicile conditions and that would contribute to the growth of investment in the coming years. In order to do so, the aim of the paper is to define the investment structure of countries in the CEE region, which record higher investment amounts, in order to suggest an investment model to attract investors to invest in Serbia. Also, this paper analyzes in which sectors are mostly invested in the CEE region in order to identify priority sectors that could be interesting for investors in Serbia. The paper will use the deduction method, at the very beginning it will show and analyze the region, then individual countries, and the focus will shift to Serbia, in terms of opportunities and recommendations of the investment model. In the paper will be also clustering used to analyze the similarity of Serbia with other CEE countries. The aim of the paper is to analyze primarily the structure of investments, including investors of countries in the region, primary for defining the directions of potential investment in Serbia. The results of the paper should be a suggestion for an investment model whose implementation should contribute to improving Serbia's position in the region.

METODOLOGY

The paper uses a comparative analysis of countries in the region as well as descriptive statistical analysis. The inference process uses the deduction method, since it first analyzes the region of Central and Eastern Europe as a whole, and then analyses individual countries as an integral part of the region. Countries in the region will be taken as an area of individual analysis, with a particular focus on countries that are leading in venture capital and private equity investment in the region. For this we use cluster analyses to find a similarity between these countries and Serbia in the structure of their investment. The source of secondary data is the InvestEurope research database, which records investment activities in the field of venture capital and private equity and releases yearly reports.

Findings on the investment activities in the CEE region

Considering the investment of the venture capital and private equity in the CEE region, it is necessary to determine the position of the region in relation to other regions in Europe. This is needed in order to obtain a proportion of investment in the region and the position of individual countries in it. The following table shows the total investments of venture capital and private equity in Europe by regions as a percentage of all VC and PE investments in 2018.

Table 1: Regions in Europe in % of VCPE investment in 2018

European region	% of all VC&PE investment
France an d Benelux	30%
UK and Ireland	22%
DACH	18%
Southern Europe	17%
Nordix	10%
CEE	3%

Note: DACH-Germany, Austria and Switzerland; SOUTHERN EUROPE- Greece, Italy, Spain and Portugal; NORDICS- Denmark, Finland, Norway and Sweden; CEE- Central and Eastern Europe.
Source: Annual report InvestEurope for Europe, 2019

It can be seen from the previous table that the position of the region in relation to the rest of Europe is not enviable. Since in the region there are countries of the post-socialist regime, which belong to a group of developing countries and it is expected that the investment amounts in this region are lower. The region of Central and Eastern Europe is on the last place with a share of 3%. Then it is followed by Nordic countries Denmark, Finland and Norway with 10% share. Southern Europe has a share of 17%; Germany, Austria and Switzerland have 18% share; United Kingdom and Ireland are on the second position with a share of 22%, and on the first place in the European region is France with Benelux countries with a share of 30% of the total investment in Europe. Based on this, it can be observed that the countries where the forms of these investments first emerged (Gompers & Lerner, 2001) are leading in percentage share of total venture capital and private equity investments in Europe observed in 2018.

The following figure shows the total amount of the venture capital and private equity investment in the CEE region from 2003 to 2018.

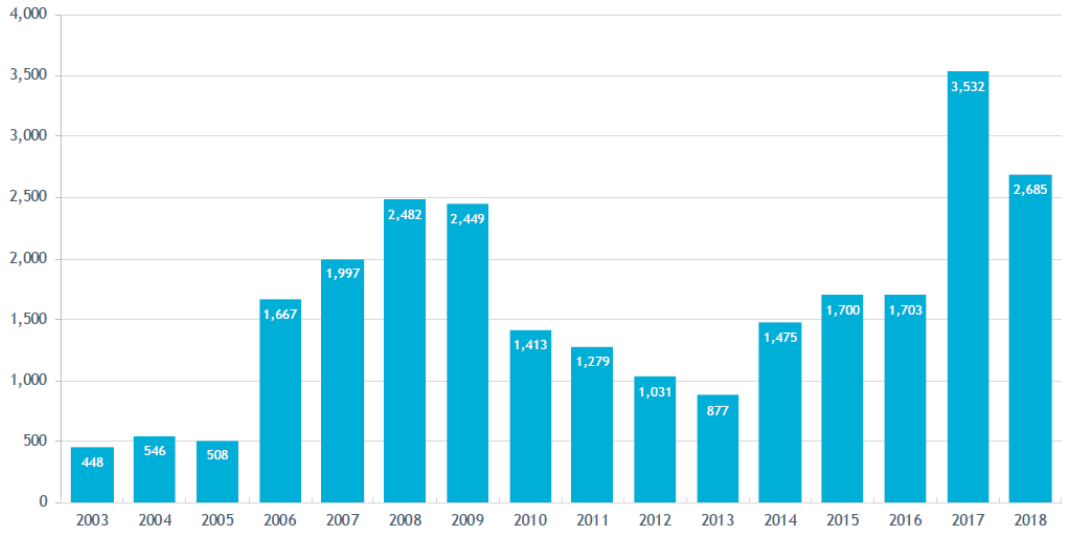

Figure 1: Venture Capital and Private Equity Investments in the CEE Region in 2003-2018 in millions of euros
Source: Annual report InvestEurope for CEE Region, 2019

The figure shows that the World Economic Crises hit the CEE market delayed in 2013, after that period the amount of the investment increased. The industry structure of the investment in the last two years is shown in the table below.

Based on the data in the Table 2, it can be observed that in absolute amount most of the investment in 2017 was in the Consumer goods and services with 74.1% of the total funds placed in the CEE region, while in 2018 the most of the funds was invested in Biotech and healthcare with 31.8% of the total invested funds. When it comes to the number of companies that have received financing through venture capital and private equity funds, the situation is less variable, both in 2017 and 2018. The largest share is held by companies from the ICT sector, with 35.3% and 37.7% share in the total number of companies that received funding, respectively. Based on this, it can be observed that the number of companies that received financial support from venture capital and private equity funds in the ICT sector is on the increase, bearing in mind that the total number of companies financed in this way has increased from 266 in 2017, to 398 in 2018. This situation of increase in the number of companies that have received investment in the CEE region, in addition to the increase in the absolute

amount of investment, gives a good forecast of the movement of venture capital and private equity investments in the CEE region. The total amount of the investment in these two years spreads like following by CEE countries.

Table 2: Industry structure of the investment in the CEE Region in 2017 and 2018

	2017				**2018**			
Industry	**Amount**	**%**	**Nr. comp.**	**%**	**Amount**	**%**	**Nr. comp.**	**%**
Agriculture	500	0	2	0.8	25,240	0.9	4	1
Biotech and healthcare	40,345	1.1	27	10.2	854,068	31.8	41	10.3
Business products and services	316,382	9	51	19.2	312,212	11.6	57	14.3
Chemicals and materials	292	0	3	1.1	1,999	0.1	3	0.8
Construction	6,432	0.2	2	1	20,125	0.7	5	1.3
Consumer goods and services	2,618,482	74.1	51	19.2	731,408	27.2	84	21.1
Energy and environment	79,605	2	16	6	32,669	1.2	14	3.5
Financial and insurance activities	48,756	1.4	11	4.1	154,712	5.8	17	4.3
ICT	396,503	11.2	94	35.3	407,321	15.2	150	37.7
Real estate	1,750	0	1	0.4	1,018	0	2	0.5
Transportation	22,971	0.7	8	3	101,437	3.8	16	4
Other	0	0	0	0	42,735	1.6	5	1.3
Total investment	3,532,018	100	266	100	2,684,943	100	398	100

Source: Annual report InvestEurope for CEE Region, 2019

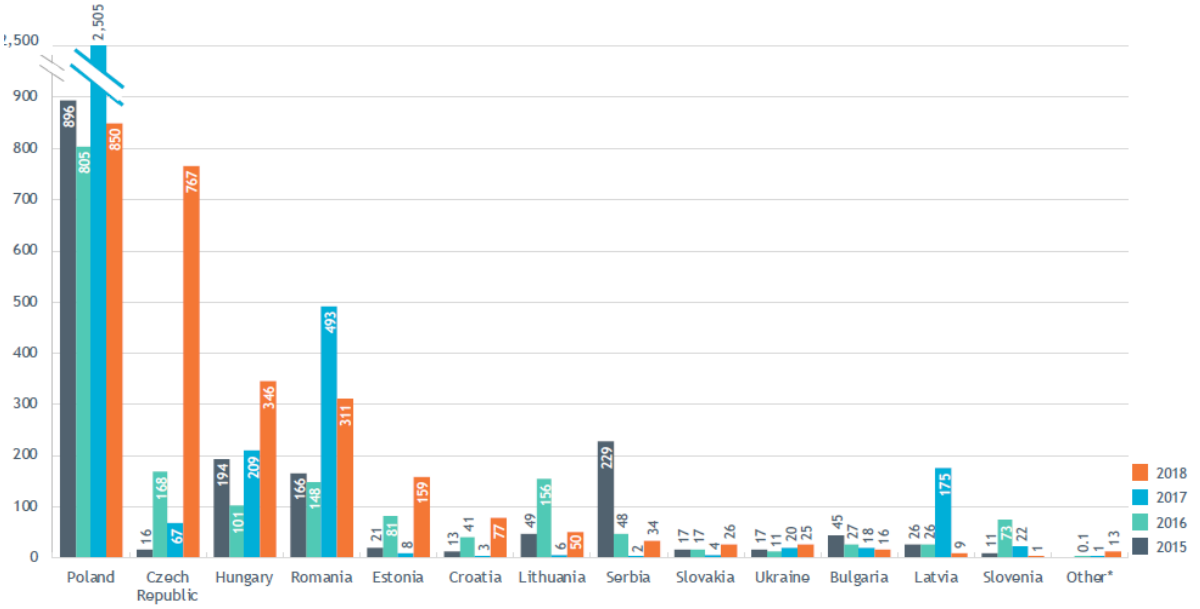

Figure 2: Amount of Venture Capital and Private Equity Investments in the CEE Region by country
**Other countries include Bosnia and Herzegovina, Montenegro, Moldova and Northern Macedonia*
Source: Annual report InvestEurope for CEE Region, 2019

The Figure shows that the leading countries with highest investment amounts in the CEE region are Poland, the Czech Republic, Hungary and Romania. Among these four countries, Poland stands out in particular, recording more than twice the amount of investment compared to the Czech Republic, Hungary and Romania. With regard to Serbia, a large amount of investment can be observed in 2015, and in the coming years the amount of investment is at an extremely low level. In order to define an investment attraction strategy for Serbia, it is necessary to analyze the investment structure of the countries that record the highest amounts of investment in the CEE region. For this reason a cluster analysis is performed by comparing Poland, Czech Republic, Hungary, Romania and Serbia to find the similarity between groups. The following figure shows the results of the custer analyses.

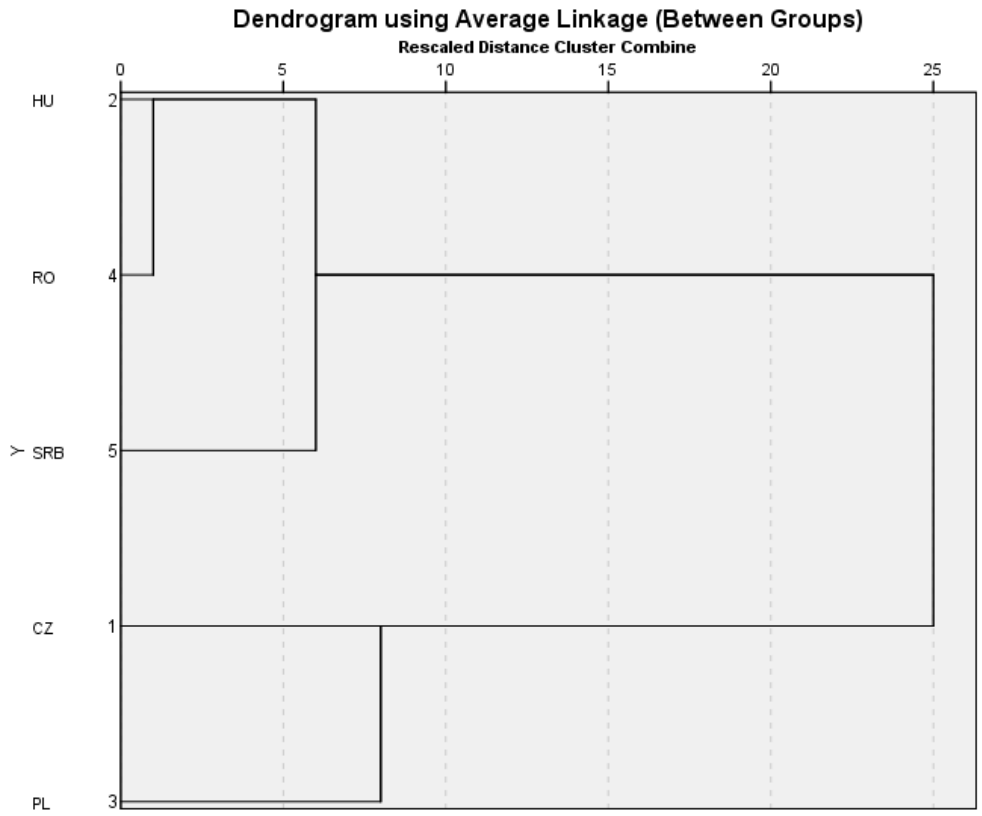

Figure 2: Cluster analyses based on the investment structure in 2018

As it can be seen from the figure, four clusters occurred. First, Hungary and Romania can be grouped, then Hungary and Serbia, and the third stage of clustering is showing that Czech Republic and Poland have similar paterns of investment. In the fourth stage of clustering there is a similarity between the Serbia and Hungary claster, and the structure of investment in the Czech Republic. It can be concluded that considering the structure of the investment Serbia has a similarity to the investment model of Hungary.

CONCLUDIONS

As the results of the analysis show Serbia has very low level of investment, opposite to more developed countries in the CEE region like Poland, the Czech Republic, Hungary and Romania. It is necessary to adopt to their model in order to encourage venture capital and private equity investment in Serbia, especially the model of investment in Hungary, which is shown in the cluster analysis to be the most similar to Serbia. The analysis of the last two years of investments in the CEE region has shown that the main investments are made in the sectors of Consumer goods and services and Biotech and healthcare sector, so the investments should be redirected into these sectors. On the other hand, companies in the field of ICT received the highest number of investments by number of companies. The investments in the ICT were smaller amounted but there were more rounds of investment. In the last few years, a large number of start-up centers have been opened in Serbia and it is evident that the development of the ICT sector is encouraged. Many state-owned funds in Serbia have been formed in the last two years to provide funding to young companies. However, the allocation model that would contribute to the improvement of Serbia's position is a combination of state and private funds, which would have a stake in the companies and control the spending of the obtained funds. This is extremely important in order to constitute a control mechanism. Another investment model that is suggested considering the structure of the investments in the leading countries in the region is investing in companies that are in the later stages of development. Large amounts of the investments in the region were directed towards the buyout of companies. A model that is suggested is to enhance investments

in companies with certain difficulties in doing business. Thus investing would encourage the elimination of deficiencies thanks to the management team that would be engaged in the day-to-day operations of the company. The benefits of such a company healing would be multiple. The most important would be the option to use the exit from the investment by buying back the shares by the initial owners from the PE fund in order to remain a domestically owned company.

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INVESTMENT DECISION MAKING METHODS

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ABSTRACT

The paper presents some of the most common methods for making investment decisions, that is, the method for choosing between multiple investment projects. These are the following methods: the return on investment method, the net present value method, the internal rate of return method, the profitability index method, and the MAPI method. The application of a particular method depends on the conditions in the given situation. Optimal choice of projects is often achieved by combining several methods. Although, undoubtedly, all methods have their significance and application, a slight advantage can be given to the method of internal rate of return, as well as to the method of net present value. These methods are particularly reliable indicators of the profitability of investment projects.

Key words: Investment decisions, Selection of investment projects, Investment decision making methods.

INTRODUCTION

Investment decision-making methods (methods of estimating the economic effectiveness of investments) are used in the selection and selection of investment projects. In doing so, different investment criteria are used, as an aspiration to achieve a certain effect (payback period, profit maximization, cost minimization per unit of product, maximization of total production, etc.).

Alternative projects may be mutually independent or interdependent. Independent projects are those where the acceptance or rejection of one project has no effect on the acceptance or rejection of another project. For example, purchasing a milling machine and purchasing office furniture represent two independent projects. Dependent projects have two types of dependencies: mutually exclusive projects and conditional projects. For mutually exclusive projects, choosing one alternative involves rejecting the others. For example, a company intends to buy one photocopier - when the right model is selected, the others are discarded. Projects are conditional if accepting one requires accepting the other. For example, purchasing a computer printer depends on the purchase of the computer, but the computer can be purchased without purchasing the printer.

When there are more than one project in one of these relationships, it is necessary to identify alternatives so that the choice is made only between mutually exclusive alternatives (the aim is to accept the best possible alternative and to reject the others). In order to form a set of mutually exclusive alternatives, it is necessary to enumerate all feasible combinations of the projects considered.

Below, we analyze some of the most common methods for making investment decisions, that is, choosing between multiple investment projects. These are: the payback period method, the net present value method, the internal rate of return method, the profitability index method, and the MAPI method (Dubonjić, Milanović, 1997). Of particular importance for the writing of this paper were references (Dubonjić, Milanović, 1997; Dondur, 2002; Nikolić, 2012).
2. Method of return on investment

The payback period method estimates the amount of time it takes to recover the amount invested, that is, to make a profit equal to an investment investment. The payback period is calculated according to the expression:

$$t = \frac{I}{P - T},$$

wherein:
I - total investment (total investment),
P - annual project revenue,
T - annual project cost.

Given that modern business is characterized by increasingly fierce competition and the shorter life cycles of technology, it is important that the period t be as short as possible. The quick return on investment brings greater security and liquidity to the investing company. It must be said that the time (number of years) of return on assets does not have to coincide with the life of the investment. Specifically, the life span of an investment is usually longer than the payback period.

The advantage of this method lies in its simplicity. As a result, this method is very popular and often used in practice. When two or more mutually exclusive investment projects are selected, then the one with the lowest payback period (the project with the least t) is the most favorable. It is clear that this method favors a project that returns the funds faster. In doing so, more attention is paid to the safety and liquidity of an investment project than its profitability.

Method of return on investment (ROI) is a static method of selection of investment projects, which results in the following disadvantages:

- Difference The difference between the present and future value of money is not taken into account.
- Results Investment results are not taken into account throughout the life of the investment, but only during the period until the return on investment.
- The interest rate is not taken into account, so accurate estimates of other possible investments are not given (interest does not appear as an opportunity cost here).

NET PRESENT VALUE METHOD

Net present value is an absolute measure of the profitability of the project. It is defined and calculated on the basis of the value of the net cash flow of the investment, which is the difference between the flow of total revenues (inflows) and the flow of total expenditures (outflows) of the project over its total economic life. In order to calculate the net present value, in addition to income and expense, it is necessary to determine the discount rate (k) at which the financial results projected for each year in the future life of the project are reduced to their present value. The final result of the ranking of investment projects largely depends on the reality of the discount rate chosen. The recommendation is that the discount rate reflects developments in the industry to which the project belongs. Given the complexity of this choice, it is considered to be easiest to use a fixed interest rate plus a few points for the discount rate. The opportunity cost, that is, the interest rate that can be realized through other investments of available funds, can be used as a discount rate.

The reduction of future annual values to the present value is done through the discount factor $1/(1+k)^n$, where: k - discount rate, n - economic life of the project (number of years). Therefore, the net present value is calculated by the form:

$$NSV(k) = \frac{P_1 - T_1}{1+k} + \frac{P_2 - T_2}{(1+k)^2} + ... + \frac{P_n - T_n}{(1+k)^n} = \sum_{t=1}^{n} \frac{P_t - T_t}{(1+k)^t} = \sum_{t=1}^{n} \frac{NP_t}{(1+k)^t},$$

Wherein:
P_t - flow of total project revenue (inflow),
T_t - flow of the total cost (outflow) of the project,
NP_t - net inflows or net cash flow of the project at the end of period t,
n - economic life of the project (number of years),
t - time for years: t = 1, 2, 3, ... n,
k - discount rate.

If it is assumed that revenues and "current" expenditures are dispersed over time and investment investments are one-off (project type "point input - continuous output"), then the net present value is calculated using the form:

$$NSV(k) = \sum_{t=1}^{n} \frac{P_t - T_t}{(1+k)^t} - I_0 = \sum_{t=1}^{n} \frac{NP_t}{(1+k)^t} - I_0,$$

Where are they:
I_0 - investments.

Based on the previous forms, it can be seen that NSV depends on:
- Total revenues by years in the period of exploitation of the investment,
- Total expenses by years in the period of exploitation of the investment,
- Economic life of the investment,
- Discount rate heights and
- The initial cost of the investment.

Three sizes of net present value are possible:
- NSV> 0. The net present value is positive. The flow of future income, reduced to its present value, exceeds the amount of expenditure. As a result, the investment project is acceptable.
- NAV = 0. The present value of future income equals the present value of future expenditure. As a result, the investment project can be accepted but also rejected. In this case, the investor is indifferent to the project.
- NSV <0. The net present value is negative. The present value of future revenues is less than the present value of future expenses. As a result, an investment project is not acceptable.

When choosing between two or more mutually exclusive investment projects, the one where the net present value is highest is most favorable. This is the case when alternative projects have the same lifespan and the same initial cost. However, if one chooses between projects that have different lifespan and / or different initial costs, the largest NSV may point to wrong conclusions.

INTERNAL RATE OF RETURN METHOD

The internal rate of return is defined as the discount rate for which the net present value of the investment project is zero. If there is a one-time investment, the internal rate of return represents a discount rate that equates the net present value with the investment (initial cost). This can be expressed by the equation:

$$NSV(k) = I_0,$$

respectively:

$$\sum_{t=1}^{n} \frac{NP_t}{(1+k^*)^t} = I_0,$$

wherein:
NP_t - net inflows or net cash flow of the project at the end of period t,
n - economic life of the project (number of years),
t - time for years: t = 1, 2, 3, ... n,
k^* - internal rate of return, that is, a discount rate that equates the net present value to zero (or to the initial cost if any),
I_0 - investment cost.

The method is to calculate the internal rate of return k^* from the previous equation. This is done by trial and error. The discount rate is assumed and the NSV is calculated. Then iterative calculations are made for higher discount rates until the NSV is less than zero. (As the discount rate increases, the net present value decreases). Then the interpolation gives an internal rate of return. Since the interest rate functions are not linear and the interpolation is linear, the result is all the more accurate if less NSV (small positive and small negative NSV) are used for the interpolation.

For a project to be acceptable, the calculated internal rate of return must be greater than some minimum acceptable rate of k_{min}. Most commonly, the minimum acceptable rate is the interest rate prevailing on the capital market or the interest rate that would be obtained if the funds were deposited with a bank or lent to other economic entities instead of investing. The interest in this case is the opportunity cost because it is the cost of the missed alternative because the money instead of being used for lending or depositing with the bank will be used to invest in the company.

The internal rate of return method has the following advantages:
- The need to determine the discount rate k in advance is eliminated.
- Ranking projects by this method avoids manipulating the choice of kmin.
- The internal rate represents the return (return) on the invested capital and therefore shows the maximum interest rate on the project loans, which the project can liquidally repay. This information cannot be obtained by applying other methods of evaluating investment projects.

The internal rate of return method has some drawbacks:
- In some cases, calculating the internal rate of return requires the application of higher order equations, which means that multiple solutions can be obtained. These are cases where extensive reinvestments occur during the economic life of the project and discounting is carried out at different discount rates. It may then happen that the NSV changes its sign more than once, so it may be unclear which solution should be adopted.
- The internal rate of return does not provide information about the size of the investment project and does not take into account the time preference.

PROFITABILITY INDEX METHOD

The profitability index is the ratio of the sum of all discounted revenues to the sum of all discounted costs over the life of the project. Accordingly, the profitability index is calculated using the expression:

$$IP = \frac{\sum_{t=1}^{n} \frac{P_t}{(1+k)^t}}{\sum_{t=1}^{n} \frac{T_t}{(1+k)^t}},$$

Wherein:
P_t - flow of total project revenue (inflow),
T_t - flow of the total cost (outflow) of the project,
n - economic life of the project (number of years),
t - time for years: t = 1, 2, 3, ... n,
k - discount rate.

There are three sizes of profitability index:
- IP> 1. The total discounted income of the project is higher than the total discounted cost, so the investment project is acceptable.
- IP = 1. The present value of total revenues is equal to the present value of total costs. As a result, the investment project can be accepted but also rejected. In this case, the investor is indifferent to the project.
- IP <1. The present value of total revenues is less than the present value of total costs. As a result, an investment project is not acceptable.

When choosing between two or more mutually exclusive investment projects, then the one with the highest profitability index is most favorable. In addition to the dynamic variant shown, this method has a static variant. The static variant is much simpler and involves calculating the profitability index based on the income-cost ratio of the project, but only in the first year of the project life. In doing so, it is assumed that income and expenses are constant over the life of the investment project.

MAPI PROJECT EVALUATION METHOD

The MAPI method was developed by the American economist George Terborgh. The abbreviation MAPI is derived from the name of *The **M**achinery and **A**llied **P**roduct **I**nstitute of America*. This method should enable a decision to be made as to whether to innovate an existing technical system or replace it with a new technical system. In addition, the MAPI method is applicable in other cases where different investment variants are considered.

The MAPI method allows an objective choice between two variants: 1. the existing system needs to be innovated or 2. the existing technical system needs to be replaced by a new one. The situation described here is characterized by the following problem: if the replacement is made before the expiry of the old technical system, then the old technical system increases the cost of the new technical system by a fraction of its non-depreciated value (the old technical system could have been used for some time). In order to avoid this, it is necessary to determine the so-called "MAPI" method. the "opposite minimum" factor. The opposite minimum factor depends on three elements:
- The useful life of the technical system (fixed asset),
- Average inferiority of the technical system (fixed asset),
- Annual capital services (investment costs)

The essence of the MAPI method is to calculate the opposite minimum of the old technical system (S_{ms}) and the opposite minimum of the new technical system (S_{mn}), and the decision is made based on a comparison of the two values. There are two options:
- $\mathbf{S_{ms} < S_{mn}}$ innovate the old technical system (no new technical system yet to be purchased).
- $\mathbf{S_{ms} > S_{mn}}$ Replacing the old technical system with a new technical system.

Before calculating the value of S_{ms}, it is necessary to determine the working inferiority of the old technical system with respect to the new one. The working inferiority of the old R_{inf} technical system is obtained as a difference of the overall advantages of the new and old technical system:

$$R_{inf} = UP_n - UP_s ,$$

wherein:
UP_n - total advantage of new technical system (fixed asset),
UP_s - the total advantage of the old technical system (fixed asset).

The opposite minimum of the old technical system is calculated by the form:

$$S_{ms} = R_{inf} + \frac{I_s - L_s}{n_s} + (I_s - L_s) \cdot k ,$$

Wherein:
R_{inf} - the working inferiority of the old technical system to the new,
I_s - value of the old technical system at the time of comparison,
L_s - the liquidation value of the old technical system at the end of its useful life,
n_s - number of years at the end of the service life of an old technical system
k - current interest rate.

The opposite minimum of the new technical system is calculated by the form:

$$S_{mn} = \sqrt{2 \cdot (I_n - L_n) \cdot g} + \frac{(I_n - L_n) \cdot k - g}{2} ,$$

Wherein:
I_n - the investment cost of the new technical system,
L_n - the liquidation value of the new technical system at the end of its useful life,
g - annual slope of the inferiority of the old technical system (gradient of increasing inferiority of the existing technical system from year to year),
k - current interest rate.

In cases where it is not possible to estimate the annual slope of the inferiority of the old technical system (g), Terborgh provides the following formula for the opposite minimum of the new technical system:

$$S_{mn} = I_n \cdot \frac{(2 \cdot n - 1)}{n^2} + \frac{k}{1{,}4} ,$$

Wherein:
n - estimated exploitation period of the new technical system

CONCLUSION

It is difficult to talk about which of these methods is best. The application of a particular method depends, first of all, on the conditions in the given situation. Optimal choice of projects is often achieved by combining several methods. However, despite these shortcomings, the internal rate of return method, together with the net present value method, is a particularly good and reliable indicator of the profitability of an investment project. Therefore, it can be concluded that the two methods have a slight advantage over the other methods for economic analysis and project selection.

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ANALYSIS OF PUBLIC REVENUES IN THE REPUBLIC OF SERBIA

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ABSTRACT

Adequate fiscal and monetary policies are the basis for the functioning of each country's economy and economic system. In the last decade, especially after the global economic crisis, many countries, including Serbia, have experienced large increases in public expenditures. High public spending and inadequate public sector in Serbia have caused a budget deficit for years. In order for a state to make large-scale public expenditures, it must have an adequate amount of public revenue. Moreover, public revenues represent transactions that influence the increase of the state's net assets at all levels of government, formed through the system of distribution and redistribution of national income. The aim of the paper is to point out the importance of public revenues for the smooth and stable functioning of public finances in the Republic of Serbia. The subject of this paper is to point out the structure of public revenues of Serbia, emphasizing the analysis and significance of revenues based on tax forms in the Republic of Serbia in the period from 2014 to 2018.

Key words: Public revenues, taxes, public finances, Republic of Serbia.

INTRODUCTION

Financing of public needs involves the provision of funds and their use for specific purposes, with public revenues and public expenditures being the most significant components of each country's financial activities. Public authorities and institutions for financing public needs dispose of public revenues, which are most often forced. A very small proportion of public revenue is generated in a non-coercive way (Radičić & Raičević, 2011). In doing so, the tax system of the country, as one of the key systems, must enable the achievement of the set fiscal goals, which is to collect sufficient amounts of money to finance public expenditures, maintain stable prices, ensure full employment, balance of payments and sustainability of economic growth. A large number of tax forms are incorporated into the tax system, which differ in each system. This system is a set of institutes and instruments at the disposal of the tax authority to achieve certain fiscal, economic, social and political goals within a given economic system (Kovacevic, Ilic & Damajnovic, 2017).

Each country should establish such a system where its functioning will be solely in the service of the state and in accordance with its needs. An inadequately defined tax system and an inadequately established tax policy can only harm the functioning of the state. If the country adequately regulates the tax system and through it indicates to its citizens where their money goes, chances are better that all citizens will settle all their tax obligations in a timely manner. One of the key tools at the disposal of state authorities in creating adequate economic conditions and in conducting the overall macroeconomic policy is tax policy. By changing the ratio of relative prices in the economy, taxes affect the behavior of businesses, and directly affect macroeconomic conditions while stimulating or disincentivising certain macroeconomic aggregates (Altiparmakov, 2010). In the global business environment, fiscal policy is of utmost importance in stimulating intense and dynamic economic growth in all market economies (Kalash & Milosevic, 2015).

It is characteristic of the fiscal policy of the Republic of Serbia that the non-economic impacts outweighed the economic impacts, primarily due to the economic and political developments of the 1990s. In doing so, the structure of each country's tax systems depends on the economic, political

situation in the country, and social arrangements. Accordingly, the structure of tax systems differs significantly in developed and developing countries. The most frequent changes in the tax system of Serbia occurred after some political changes, with almost all changes in the tax system basically being a redistribution of the tax burden between the population and the economy. In doing so, there are two key reasons for public sector reform. The first is the low efficiency of the public sector, that is, the high level of costs in relation to the quality and volume of services provided by that sector, so the overriding objective of the reforms is to reduce public sector costs while improving the quality of public services. Another important reason is to ensure the long-term sustainability of the country's public finances (Arsić, 2010).

In the Republic of Serbia, according to the Public Financial Management Reform Program, a key objective is to achieve a sustainable budget and a lower debt-to-GDP ratio. Achieving this objective is through support for fiscal and macroeconomic stability, the development of an adequate system and practice of managing public finances, increasing efficiency in managing public resources and improving the efficiency of service delivery, as well as greater transparency of public funds and accountability (Kalash, Pjanic, & Andrasic, 2016). As noted above, the tax systems of modern countries differ from each other, with individual economists pointing to the importance of direct taxes in transition countries, while personal income tax is a basic element of modern tax systems in developed countries (Randelovic, 2008).

Taxes are one of the most important tools of any economy and represent a key component of today's modern business, with their importance manifested through stability and predictability (Kalas, Mirovic, & Milenkovic, 2018). Each country regulates and adapts its economic system to the impacts on the public and private sectors. By a large number of measures and regulations, the state affects all market participants, with the public sector being a part of every national economy that comprises the institutional system of economic involvement of the state (Vigvari, Raicevic, & Brnjac, 2003). In each tax system, the three basic objects of taxation are consumption, income and assets. Consumption is subject to the following taxes: VAT as a general consumption tax, excise taxes as a consumption tax on certain goods, and a tax on non-life insurance premiums. The following taxes are related to income: corporate income tax, personal income tax. The following taxes are attached to the property: property taxes, inheritance and gift taxes, taxes on the transfer of absolute rights, taxes on the use, holding and carrying of goods (taxes on the use of motor vehicles, taxes on the use of vessels, taxes on the use of aircraft and taxes on registered weapons) (Radicic, & Raicevic, 2011).

Compulsory social security contributions are paid into compulsory social security funds, which represent the type of public revenues and tax expense of the taxpayer in the broad sense. Considering the fact that in our country there are only three forms of indirect taxes such as: value added tax, excise duties and customs duties, it can be said that all other forms of tax are direct. Most of the public revenues are generated through direct taxes, while indirect ones are mostly budgeted. A key feature of our tax system is the dominant share of direct or indirect taxes, which constantly participate in the formation of public revenues by over 70%, while indirect revenues participate in the formation of budget revenues by over 78%, because it is separate from general consumption.

ANALYSIS OF TAX REVENUE IN SERBIA

Public revenues are funds collected by the state to finance public expenditures. Therefore, public revenue is a defined purpose asset that is to cover or fund public functions. Which means that these are the means that serve the general and shared social needs. Public revenues are generated by compulsory payment of taxpayers, natural and legal persons using a certain public good or service, as well as all other revenues generated by users of budget funds and compulsory social security organizations. A key feature of tax revenue is the liability and the absence of any direct counterpart in the payment of taxes. The state collects taxes and finances certain state functions from the collected funds, but the benefits of a particular function cannot be directly linked to the individual who paid the tax. Tax

revenues include: personal income tax, corporate income tax, value added tax, excise duties, customs duties, contributions and other tax revenues (Trklja, Dašić, & Trklja, 2015).

A serious problem in the current tax system is the fact that indirect taxation dominates in Serbia, which is contrary to the prevailing practice in the most developed European countries. Emphasis is placed on value added tax, which taxes consumption, excise duties and customs duties, and these types of indirect taxes largely fill the budget (Aleksic, 2019). The role of policymakers is often reflected in revenue-side interventions through the introduction of new tax forms, the growth of existing tax forms, as well as through borrowing (Kalash, Jaksic, & Mijić, 2018).

The research part of the paper is based on the analysis of the structure of tax forms in the Republic of Serbia from 2014. to 2019. The focus of the work is on analyzing key fiscal indicators such as: personal income tax, corporate income tax, value added tax, excise duties, customs duties, contributions and other tax revenues.

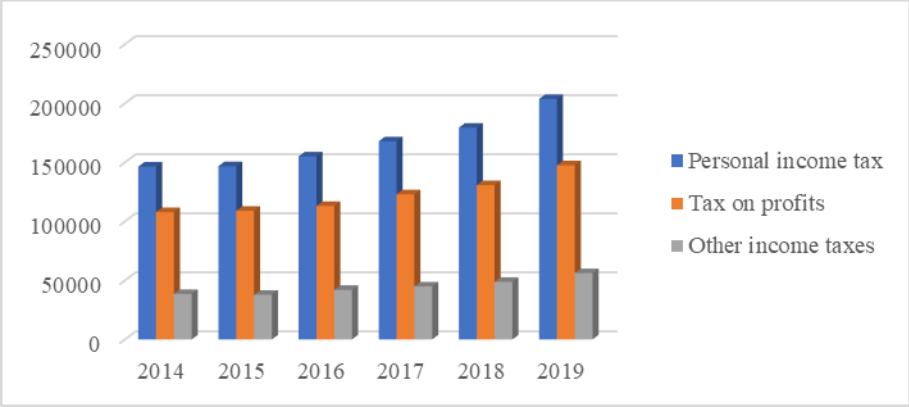

Figure 1: Personal income tax
Source: Ministry of Finance of the Pepublic of Serbia

Based on the graph presented, it can be concluded that tax revenues show that the income of citizens in the whole observed period has increased. At the end of 2014., they amounted to 146.484 million dinars and at the end of 2019., 203.739 million dinars. Income tax revenue plays a dominant role in the total personal income tax in the observed period.

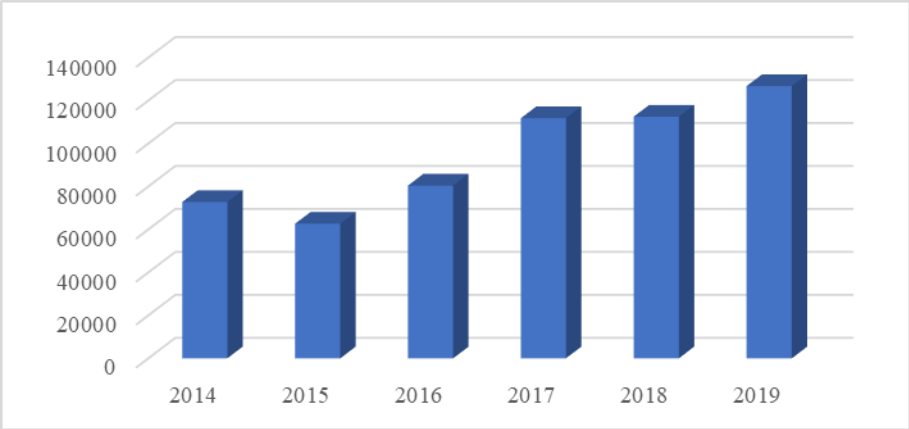

Figure 2: Corporate income tax
Source: Ministry of Finance of the Pepublic of Serbia

Personal income tax is paid by all legal entities established for the purpose of doing business for profit. The chart above shows that corporate income tax revenues have a variable trend, with an increase from 2016., to 126.719 million dinars at the end of 2019.

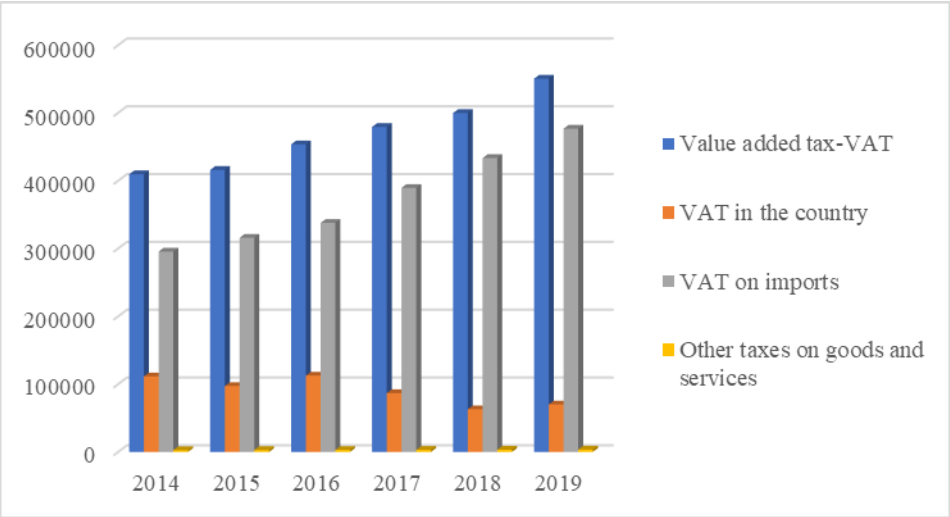

Figure 3: Value added tax-VAT
Source: Ministry of Finance of the Pepublic of Serbia

Value added tax-VAT as a general consumption tax, in addition to contributions, has the largest share in total public revenue and is a very important category for the functioning of the entire country. The tax given has a growth trend over the entire observed period. Of that, VAT from imports has the largest share in total value added tax revenues, with steady growth over the observed period and at the end of 2019., amounting to 476.815 million dinars. When looking at the VAT in the country, it can be concluded that the given tax had a variable movement, in 2014., it amounted to 111.454 million dinars and at the end of 2019., it amounted to 70.092 million dinars.

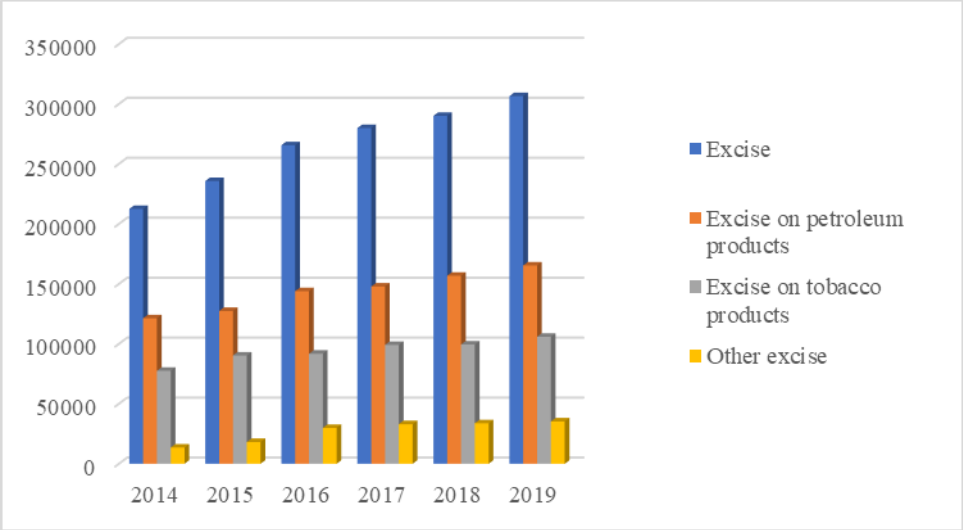

Figure 4: Excise
Source: Ministry of Finance of the Pepublic of Serbia

Excise tax, as one of the most significant tax forms after contributions and value added tax, has the largest share in the total public revenues of our country, and has a steady upward trend over the observed period. Excise duties on petroleum products account for the largest share of total excise tax revenue with constant growth. In 2014., they amounted to 121, 331 million dinars and at the end of 2019., 165, 326 million dinars. The same is the situation with excise taxes on tobacco products, at the end of 2014., revenues amounted to 77, 569 million dinars and at the end of 2019., 105, 932 million dinars.

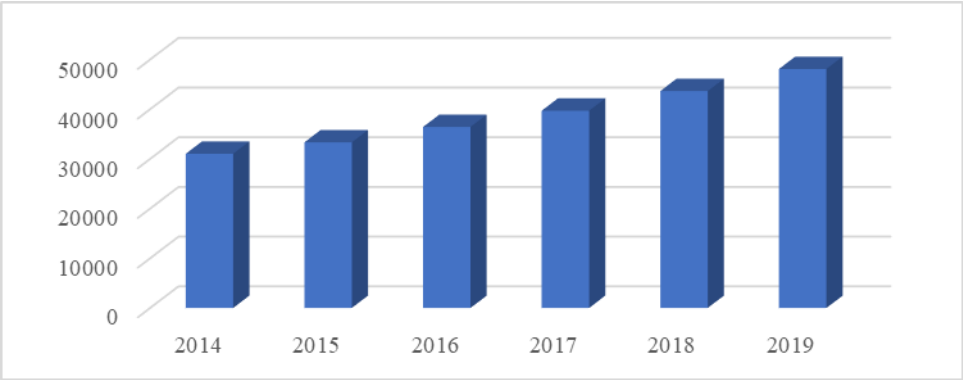

Figure 5: Customs
Source: Ministry of Finance of the Pepublic of Serbia

Customs duties as a type of indirect tax imply an obligation on the importer-exporter to pay the prescribed amount of money to the state budget at the moment when the goods cross the national border. Customs throughout the observed period has a growth trend. In 2014., customs revenues amounted to 31, 025 million dinars, and at the end of 2019., 48, 093 million dinars.

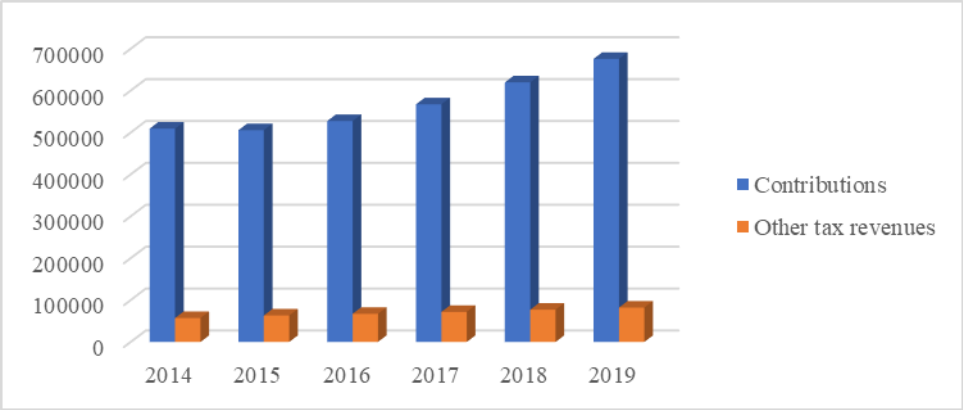

Figure 6: Contributions and other tax revenues
Source: Ministry of Finance of the Pepublic of Serbia

Contributions providing funds for compulsory social security financing in 2015., declined compared to 2014., after which they grew until the end of the observed period and at the end of 2019., contribution revenues amounted to 675.875 million dinars. Other tax revenues have a constant trend of growth throughout the observed period, at the end of 2014., they amounted to 57, 313 million dinars and at the end of 2019., to 82, 140 million dinars.

CONCLUSION

The conducted research indicates that over 85% of public funds in the country are generated through taxes in the Republic of Serbia. Certain public sector reforms have produced significant results. Due to the reform of the Tax Administration, there was an increase in collection of revenues and exceeding the planned fiscal results in the observed period. The primary aim is to establish a tax structure for multiple tax forms, so that the state does not depend solely on one or two tax forms. Analyzing the structure of public revenues, it can be concluded that public revenues in the Republic of Serbia are dependent on tax revenues. In addition to these tax forms, excise taxes and value added tax make a great contribution to completing our country's budget. The fiscal consolidation that has taken place has produced significant results and has had a positive impact on economic growth. Privatization of other public companies is also necessary, as well as encouraging the development of the private sector by reducing tax burdens.

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Session E: IT MANAGEMENT

Papers (pp. 203-222):

TOWARDS AN AGILE ARCHITECTURE BASED ON SERVICE ORIENTATION AND MICROSERVICES

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ABSTRACT

The expansion of digital technologies and innovative ways of their usage, new business models, digital strategies and digital transformation are demanding ever-faster response from enterprises to change. Microservices, along with agile techniques, cloud technologies, DevOps culture, CI/CD practices, are becoming a key link for rapid delivery of functional software solutions, faster feedback and user experience-based learning. However, in addition to the challenges intrinsic to the development of distributed software systems, microservices bring new challenges, requiring additional effort to maintain evolution and security, and balance flexibility and complexity of software systems. As existing agile methods are not sufficient to meet these challenges, there is a need for a synergistic approach for implementing agile architecture based on service orientation and microservices. This paper shows PhD thesis proposal research results, with a focus on the implementation of agile architecture based on service orientation and microservices. The initial research contribution is better understanding the challenges and problems of individual approaches in implementing agile architecture by (1) combining SOA and agile approach, (2) combining SOA and microservices, and (3) developing microservices using an agile approach, as well as the importance of combining SOA, microservices and an agile approach for development of business software systems.

Key words: agile architecture, service orientation, microservices, SOA, agile approach

INTRODUCTION

The digital era brings new challenges related to the increasing complexity of distributed, always available, cloud-based software systems that are constantly developing and evolving. In this regard, software architecture is again gaining importance in order to find better solutions to growing problems and new challenges, with the pendulum of software architectures shifting from traditional, to agile and continuous practices (Erder & Pureur, 2015, 2016; Woods, 2016). The result of this shift is the emergence of a new approach, agile architecture - an agile way to iteratively build software architecture, which is a comprehensive, evolutionary, flexible, and is also resistant to change, in order to support a continuous flow of value for the users in the long term (Madison, 2010; Kruchten, 2013). In such an environment, deployability - the possibility of independent and fast, even multiple daily deployments, has become one of the key quality attribute. This has led to the emergence of microservices and increased focus on software architecture, cloud infrastructure, DevOps and agile CI/CD practices (Bellomo et al., 2015; Zimmermann, 2016). However, there is no wide agreement on the definition of microservices, the methodology of the development of microservices, nor the scope of their implementation. Given that SOA evolves in different ways, this further complicates a better understanding of the similarities and differences between microservices and SOA, since some researchers see microservices as a new architectural style, and the other as another approach in implementing SOA, ie. SOA done right (Newman, 2015; Pahl & Jamshidi, 2016; Zimmermann, 2016; Ford et al., 2017; Taibi et al., 2017; Dragičević & Bošnjak, 2019). In this regard, different approaches have been noticed in the literature and practice related to the implementation of agile architecture in the context of the development of distributed software systems. The first involves combining SOA and

agile approach; the second combining microservices and SOA with the use of APIs, and third is based on a broad agreement that agile approach is appropriate for the development of microservices. The identified open issues, as well as the problems and challenges of the existing approaches in the implementation of agile architecture, indicate the need for a broader, synergistic way that involves combining SOA, microservices and agile approach. This paper shows the results of PhD thesis proposal research project entitled "Model of Agile Architecture for Development of Business Software Systems based on Service Orientation and Microservices". PhD thesis research project aims to explore key aspects of agile architecture implementation based on service orientation and microservices, particularly in the context of the complex business software systems, in order to determine the conditions for the development of a suitable architecture-methodology framework.

RESEARCH OBJECTIVES

There is not an appropriate architecture-methodology framework that supports the implementation of agile architecture based on SOA, microservices and agile approach, by allowing faster development and delivery of functionality, long-term evolution, security and balancing flexibility and complexity, in the context of business software systems development. Accordingly, the defining conditions for the development of an architecture-methodology framework based on service orientation, microservices, and agile approach is the main problem of the PhD research project. Based on this, the following research questions are defined:

- RQ-1: How does agile approach affect the positive transformation of service-oriented methodology?
- RQ-2: How to achieve synergy of microservice integration and service-based approach in SOA implementation?
- RQ-3: How to apply agile approach to the development and implementation of microservices?

Addressing RQ-1, based on relevant literature and engineering practice, and bearing in mind that SOA initiatives support organization-level agility, agile methods, principles and practices suitable for implementing agile architecture will be identified and analyzed. Their integration with SOA methodology that supports service-based approach in the implementation of SOA should positively affect the speed of development and delivery while maintaining the security, stability, and quality of business software systems. Addressing RQ-2, based on relevant literature and engineering practice, the advantages and disadvantages of microservices and service-based approach in SOA implementation will be identified and analyzed, with particular reference to the issues of defining external and internal system boundaries, a granularity of (micro)services, reuse potential, resource sharing and (micro)services interdependence strategies, to take advantage of both approaches and to have a positive impact on evolution and security, with a balance of flexibility and complexity. Addressing RQ-3, based on relevant literature and engineering practice, will identify and analyze methodological and other aspects of agile approach that are critical to the development, delivery, and management of microservices in the implementation of agile architecture. The synergy of SOA, microservices and agile approach in software systems development should enable fast and continuous delivery of value to the user, in the short and long term. Accordingly, the overall objective of the PhD research project is to develop an architecture-methodology framework based on the positive impact and synergy of service orientation, microservices and agile approach.

PROPOSED SOLUTION

This section describes the research plan, current progress, and planned steps to address research questions and achieve research goals. Considering the defined research problem, research questions and goals, the process of realization of the PhD research project is divided into several phases, whereby a combination of theoretical and empirical research, quantitative and qualitative research, as well as different scientific research methods and techniques, will be applied.

A. Preliminary results

The research problem was first addressed by a systematic literature review (SLR) through research into existing attitudes and achievements related to research issues. The SLR was implemented to provide research questions related to three aspects: 1) transformation of SOA methodology using agile approach, 2)

integration of microservices and service-based approach, and 3) development of microservices using agile approach. Addressing research issues, SLR has identified multiple motivating factors as well as ways to combine agile approach and SOA, with the identification of different agile principles, methods, and practices applicable to the implementation of SOA initiatives (RQ-1). The SLR also identifies significant comparative perspectives on microservices and SOA, their key differences and limitations, as well as existing approaches for integrating microservices and SOA (RQ-2). Finally, SLR identifies existing approaches to implementing the microservice architecture, guidelines for the various phases/activities of microservice implementation, as well as the agile principles, methods, and practices that are applied in the implementation of microservices (RQ-3).

B. Ongoing research

Based on the results obtained in SLR, the second phase explores in detail the advantages, disadvantages and practical problems of applying a traditional SOA methodology and a service-based approach to developing a complex business software system, in order to identify suitable places for integrating microservices and agile practices in such a context (RQ-1, RQ-2, and RQ-3). An empirical method of exploratory case study is applied, with a qualitative-quantitative approach to the research.

C. Planned steps

In the third phase, a comparative method will be applied to analyze the results of theoretical and empirical research from the first two phases, and the result of the analysis will be used to propose a model of agile architecture and architecture-methodology framework for the development of business software systems based on service orientation, microservices, and agile approach. In the fourth phase, the results from the third phase will be subjected to double-check and evaluation. First, an evaluation case study will be applied, as an example of a business software system development based on the proposed agile architecture model and architecture-methodology framework. Second, an evaluation will be performed by experts using the survey method.

RESEARCH CONTRIBUTION

Given the need to combine SOA, microservices and agile approach to overcome the disadvantages and problems of microservices and SOA, as well as the disadvantages of existing agile methods, a key contribution of PhD research project for the industry will be the increased use of SOA, microservices and agile approaches for development of business software systems, including addressing significant architectural and methodological challenges in implementing agile architecture based on SOA, microservices, and agile approach. The results of the research will contribute to the increase of knowledge in the field of research, with a better understanding of the differences between SOA and microservices, about what there is still some confusion, and a better understanding of problems and disadvantages of microservices, because there is no research that has dealt with the interaction of SOA methodology and service-based architecture with microservices and agile approach.

RELATED WORK

There are different, conflicting views in the relevant literature regarding the implementation of agile architecture (1) by combining SOA methodology and agile approach, (2) combining SOA and microservices and (3) developing microservices using agile approach.

(1) Traditional SOA methodologies do not support the agile software development process. Therefore, various transformation options, that is, the agilization of SOA methodologies have been explored. While Krogdahl et al. (2005) view the service model as the central site of SOA that enables agile development and is a key tool for continuous refactoring, Yaghoubi & Babanezhad (2013) argue that agile methods, by their nature, do not fit into SOA. Nevertheless, both agree that LSD principles make it possible to combine SOA and agile approach. The meet-in-the-middle approach to service development (Yuan et al., 2008), as well as individual XP practices, either for change management (Ivanyukovich et al., 2005), seems to be particularly

suitable for more efficient and effective communication and collaboration within the team and between the team and users (Roy & Debnath, 2010) or to implement XP guidelines and practices in the construction phase (Carvalho & Azevedo, 2013). Bruno (2011) views SOA and the agile process as a whole, with SOA providing a controlled environment and framework in which changes are adapted to agile processes, where quality, efficiency, and productivity are enhanced by the application of design patterns, standards, and management procedures, while agile methods allow the life cycle to be incremental and iterative, with quick feedback to and from IT. Farroha D. & Farroha B. (2011), on the other hand, believe that these two philosophies are contradictory and that agile service-based framework is required to deliver functionality by implementing a just-in-time development model. That is because service-based approach requires interface stability, while agile approach focuses on flexibility and tolerance for change. Shahrbanoo (2012), using agile principles, creates the so-called Core Architecture to embrace change while maintaining software quality through SOA. Schramm & Daneva (2016), as a result of combining these two paradigms, identify key best practices: continuous integration, collaboration, governance, and continuous improvement, as well as key challenges: non-functional requirements, compliance and up-front evaluation of architecture. Gamal et al. (2016) propose the implementation of SOA using agile methods by identifying small, isolated goals and then designing the number of services required to achieve those goals. Abdelouhab et al. (2018) propose a framework for incorporating a user perspective into service-oriented development using agile process.

(2) For Ouertani (2015) microservices are one of the interpretations of SOA, which uses a set of specific principles and practices that are considered to support agility. Clark (2016) finds it difficult to directly compare SOA and microservices because the concept of SOA is present in modern architectures, but has evolved in several ways. New application architectures, including MSA, provide a better focus for software engineers on business logic. The combination of SOA, APIs and microservices enables software solutions to be implemented in a much more agile way and to reach a new level when it comes to elastic scalability and resiliency. Therefore, Xiao et al. (2016) argue that SOA and microservices may be considered allies rather than rivals. Given the complexity that characterizes business, it is necessary to combine these two paradigms by simply integrating APIs and SOA styles for service design and delivery, using an appropriate service model incorporating both service styles and articulates their relationships. Zimmermann (2016) claims that the complexity and misconceptions about distributed computing cannot be ignored or eliminated. Therefore, for the successful implementation of microservices-based software, SOA principles and design patterns, must be combined with agile software engineering practices. Richards (2016) sees microservices and SOA on opposite sides of the service-oriented spectrum, with microservices targeting small and medium-sized web-based applications, while SOA focuses on large, complex business information systems Cerny et al. (2017) note the growing trend of deploying microservices with concerning SOA and identify the ability to independently deliver microservice and elastic scalability as major reasons. Although microservices seem to emerge victoriously, there are still multiple architectural challenges, and, as the evolution process has moved from integrating heterogeneous systems through SOAs to microservices, the question is: Can we expect a step back towards SOA in the near future? Watts (2017) sees SOA and MSA as the same set of standards, used at different levels in the enterprise, with MSA being a subset of SOA. Considers SOA more suitable for large, complex business applications that require integration with other heterogeneous applications, while microservices are more suitable for small and well-segmented web-based systems, and that it is possible to combine the two approaches, e.g. at an early stage of business development, microservices can be a good choice, while later, as a business expands, they can be replaced with SOA.

(3) While there is consensus that agile approach is suitable for the development of microservices, Pahl & Jamshidi (2016) note the lack of appropriate methods. For Zimmermann (2016), microservices have the potential to overcome the problems of earlier SOA implementation approaches, and Richardson (2016) particularly emphasizes the need for a sufficient level of application decomposition to allow agile development and delivery. The benefits of implementing microservices are a highly modular and decomposed easy-to-maintain system, rapid microservice delivery to production, simpler code and fewer errors (O'Connor et al., 2016) while eliminating architecture-related bottlenecks (McLarty, 2016). Microservices enable team structuring according to Conway's Law, working together and focused on a specific bounded context in which to make the necessary decisions (Cerny et al., 2017), while together with agile delivery process and deployments reduce the complexity of tasks such as releases and replication (Sampaio et al., 2017). However, Zimmermann (2015) recalls the challenges inherent in the design,

development, and testing of distributed systems, which require more knowledge and additional effort, while Mišić et al. (2017) find that in practice, some aspects of agility, e.g. speed of development, scalability, reuse or modularity, are limited or reduced, due to the design of the software products itself or due to the misuse of technology. Also, the use of microservices increases the number of interdependent components in an application, which leads to consistency issues and brings challenges regarding the evolvability and security (Sampaio et al., 2017).

CONCLUSIONS

This paper shows PhD thesis proposal research results, which focuses on the implementation of agile architecture based on service orientation and microservices, as well as the initial results of the first phase of the PhD research project related to the problems of particular approaches in the implementation of agile architecture. To determine the conditions for the integration of SOA, microservices, and agile approach, a comprehensive understanding is needed of how each individual concept - agile architecture, SOA, microservices, and agile approach; as well as mutual influence and the ability to combine them. The results of the PhD research project to date include defining concepts, systematizing governing attitudes and past accomplishments. Initial results also include identified motivational factors and ways to combine agile approach and SOA, a better understanding of similarities and differences between SOA and microservices, and identified existing approaches and guidelines for microservice development using agile approach. The future PhD research will address the impact of agile approach on the transformation of SOA methodology in order to provide a methodological framework to answer which agile methods, principles and practices are suitable for developing SOA-based business software systems. The research will also address the open issues and problems of defining the external and internal boundaries of the system, granularity, reuse potential, resource sharing, and interdependence strategies, and provide an architectural framework in response to the question of how to integrate SOA and microservices. Methodological and other aspects of agile approach, particularly relevant to the development, delivery and management of microservices, will be highlighted and appropriate guidelines, principles and practices will be proposed. As a sublimation of the aforementioned results, the main PhD research project result will be a model of agile architecture and an appropriate architecture-methodology framework based on service orientation, microservices and agile approach for the development of business software systems.

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EVALUATION OF MODEL FOR RSSI BASED DISTANCE ESTIMATION USING BLUETOOTH LOW ENERGY DEVICES

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ABSTRACT

The indoor localization systems, which are also known as indoor positioning systems (IPS), are used to determine location in places where classical outdoor navigation systems, such as GPS, GLONNOS, etc. cannot be used. Those systems find their place in variety of applications and in different areas, e.g. in the area of resource management and location tracking, safety management, material, construction and inventory management, etc. One of the most important fields of its application is human and object tracking and this can be technologically challenging task. This paper is based on methods which use RSSI (Received Signal Strength Indicator) to assess distance. In this paper is presented the approach in usage of Bluetooth Low Energy technology for indoor localization and tool for distance estimation model creation. The results of the experiment as well as the discussion of applicability of the approach are presented in the paper as well.

Key words: RSSI, Indoor localization, Resource management, Distance estimation, Bluetooth Low Energy

INTRODUCTION

The indoor location systems are used to locate objects in places where classical outdoor navigation systems (GPS, GLONNOS) cannot be used due its inaccuracy. The satellite signals cannot penetrate the walls of the buildings so different technologies should be used in order to estimate indoor location. There is variety of indoor positioning systems (IPS) that use different approaches, technologies and methods. Those systems find their place in variety of applications and in different areas such as resource management, location tracking, safety management, etc. The application of those systems can be in the warehouse management for tracking warehouse vehicles in order to improve organization of work and tasks in warehouses. Also, those systems give information about product in warehouse which is useful for item picking and stock tracking. One of the possible areas of application is for tracking clinical patients, their workflow analysis and infectious disease modelling. Additionally, those systems can have appliance in the coal mine industry, for tracking and localization of miners and so on.

The common positioning technologies for indoor localization systems can be: IEEE 802.11a/b/g/n, Bluetooth, Bluetooth Low Energy (BLE), ZigBee, Ultra-wideband (UWB), Field strength systems, Radio Frequency Identification (RFID), infrared technologies, etc. Those systems use different methods for assessing distance such as Received Signal Strength Indicator (RSSI), Time of Arrival (ToA), Time Difference of Arrival (TDoA), Angle of Arrival (AoA), and Direction of Arrival (DoA). ToA and TDoA are based on signal propagation time, and on the other hand AoA and DoA measured angle between the propagation direction of an incident wave and some reference direction (Brchan, Zhao, Wu, Williams, & Pérez, 2012; Deak, Curran, & Condell, 2012). There a number of methods that

use additional signal parameters such as: Time of Flight (ToF), RToF (Roundtrip Time of Flight), PoA (Phase of Arrival), and PDoA (Phase Difference of Arrival) (De San Bernabe, Martinez-de Dios, & Oller, 2017; C. Liu,Scott, Wu, & Hoffman, 2007; Nikitin et al. 2010; Mao, Fidan, & Anderson, 2007).

This paper presents the model for distance estimation based on RSSI of BLE nodes. In this paper is presented the approach in usage of Bluetooth Low Energy technology for indoor localization together with distance estimation model created with Microsoft Excel and its curve fitting tool. The Microsoft Excel is chosen because it is a frequently used tool well-known for a large population of users. The results of the experiment, the method of using Excel and the discussion of model applicability are presented as well. This paper is structured as follows: after the introduction, the related work is presented. In this section the BLE technology, as well as, the short description of existing IPS systems based on BLE and similar technologies are presented. In the next section, the experiment is briefly presented together with the method for model creation. In the results section the accuracy of proposed methodology is discussed. At the end, in the conclusion section, the results of this paper are summarized as well as future research directions.

RELATED WORK

BLE technology

The Bluetooth technology is developed in 1994 in Ericson labs. In February 1998 Bluetooth Special Interest Group (Bluetooth SIG) was founded by five founding members: Ericsson, Intel, IBM, Nokia, and Toshiba. Bluetooth SIG does not manufacture or sell Bluetooth products, but it is responsible for development of Bluetooth standards and the licensing of the Bluetooth technologies and trademarks to manufacturers. The Bluetooth technology uses frequencies from 2,400 MHz to 2,483.5 MHz, the license-free ISM band which can be used by other devices such as Wi-Fi, ZigBee, 6LoWPAN, remote control toys, etc. This technology uses a pseudo-random pattern to change transmission rapidly from one frequency to another. The Bluetooth technology uses Gaussian Frequency Shift Keying (GFSK) modulation with maximum output power in a range from 1mW to 100mW (transmit power up to 20 dBm). The receivers have receive sensitivity of about -70 dBm at 0.1% Bit Error Rate and the transmission range is from 10 m to 100 m. Bluetooth devices are organized in piconets (ad-hot networks) with maximum 8 devices per network, with one master and up to seven slave devices. More than two connected piconets create scatternet. The security in Bluetooth uses a 128-bit authentication key for encryption. (Toulson, R. & Wilmshurst, T., 2017; Gupta, N., 2016)

BLE used two types of channels: advertising channels and data channels. Advertising channels are used for devices discovery, connection establishment and broadcast transmission, whereas data channels are used for bidirectional communication between connected devices. The Link Layer is combination of hardware and software components. This layer defines two types of device roles: the master and the slave (Gomez et al., 2012).

Basically, there are three types of devices of the Bluetooth technology. The first type is BR/EDR and this type supports earlier specifications whit maximum data rate of 724 kbps for BR (Basic Rate) and 2.1 Mbps for EDR (Enhanced Date Rate). LE systems are the second type of devices with 4.0 Bluetooth specifications. Those devices use 40 channels numbered from 0 to 39, comparing to 79 channels in older standards of Bluetooth. Data transmission uses channels from 0 to 36, and channel advertisements uses channels from 37 to 39 with the data range of 800 Kbps. The third type of devices represents dual-mode devices which supports both BR/EDR and LE specifications.

Bluetooth is ubiquitous in today's everyday life, since it is widely used in laptops, mobile devices, keyboards, and many other consumers electronic as wire replacement. Bluetooth Low Energy (BLE) is ideal for applications requiring infrequent or periodic transfers of small amount of data; thus, it can be applied in a wide range of medical, industrial, and consumer applications (Paek et al., 2016). Due it

frequency hopping and relatively short ranges it can be ideal for using a large number devices in a small space such as classrooms, offices etc.

The BLE protocol stack has three main blocks: Application, Host and Controller. Each block includes layers, and each layer incorporates lower layers. The HCI is the interface that manages the communication between the Controller and the Host. The different layers of the protocol are ordered in a stack, which starts from the bottom, with the PHY layer, and ends at the higher level, the APP layer (Tosi J. Et al., 2017).

Indoor Positioning Systems

In paper (Paek et al., 2016) iBeacon is used to allow mobile devices to detect signals of iBeacon station. Each iBeacon transmits periodically short identification frames that are received by mobile BLE devices to estimate the distance between the mobile BLE device and the iBeacon using received signals strength indicator. Based on the detection of proximity, iBeacons provide automatic and location specific triggering of services on the mobile device such as advertising, coupons, or route guidance. The extensive set of experiments to quantify the impact of various indoor obstacles on the BLE signal variance is conducted. Specifically, the research shows that different iBeacon devices from different vendors along with the paired mobile device platform (e.g., iOS or Android) can have significant impact on the RSSI measurements.

Paper (Mohsin et al., 2019) is about importance of indoor localization and possible usage of several technologies such as ultrasound and vision for that purpose. Paper also discuss about popularity of RF-based location systems and their availability with the widely spread infrastructure of wireless communications. This paper is based on analysis of one of the main factors, e.g. fading in a non-reflective and noise-free environment, in order to mitigate these effects and improve the relationship between signal strength and distance.

METHODOLOGY

Experiment

The experiment took place in institutional building. The detailed description of experiment (device description, device location, measurement methodology) can be found in (Dobrilović et al., 2018a; Dobrilović et al., 2018b). The Android smartphone with the third-party software is used to measure RSSI, BLE scanning and logging. During the test the BLE stations were configured as master devices. Total of 5 static BLE master devices are used. The RSSI of packets sent from BLE stations are logged on Android smartphone together with MAC address of BLE station, receiving time, etc. The logged data are later used for model creation and analyses.

Distance estimation model in Excel

The model presented in this paper is created in Microsoft Excel (Microsoft Corporation, 2018). Microsoft Excel is widely used spreadsheet software with variety of features such as calculation, graphing tools, pivot tables, and support for macro programming language. The software has embedded features that allow finding of fitting equations for selected data sets such as: linear, exponential, polynomial, logarithmic and power model. The variety of other tools can be used for distance estimation as it is discussed in (Dobrilović et al., 2020). While the other tools such as R, Python and Matlab/Octave offer more features, like implementation of other fitting formulas besides embedded ones, Excel is a good tool for the basic fittings because it is well known for the large population of users.

The process of finding the best fitting equation for selected data set is possible with the usage of *Scatter graph* and *Add Trendline* options. *Add Trendline* option can be activated with right click on the

data presented on *Scatter graph*. The fitting equation can be displayed with *Display Equation* option. Following four fitting formulas (Fitting model #1) are obtained by fitting experimental data from 22 locations.

Polynomial order 2:

$$d_{Pol2} = 0.0145 \cdot x^2 + 1.8663 \cdot x + 64.06 \quad (1)$$

Polynomial order 3:

$$d_{Pol3} = 0.0001 \cdot x^3 + 0.047 \cdot x^2 + 4.5062 \cdot x + 135.36 \quad (2)$$

Exponential:

$$d_{Exp} = 0.0627 \cdot e^{-0.06x} \quad (3)$$

And linear:

$$d_{Lin} = -0.543 \cdot x - 35.355 \quad (4)$$

In order to achieve more accurate fitting, the reduced set of 18 measurements (locations) is used. In this case, the 4 measurements results with extreme values are removed from the original data set. The Fitting model #2 formulas are as follows:

Polynomial order 2:

$$d_{Pol2} = 0.0242 \cdot x^2 + 3.4268 \cdot x + 126 \quad (5)$$

Polynomial order 3:

$$d_{Pol3} = 0.00008 \cdot x^3 + 0.0429 \cdot x^2 + 4.9463 \cdot x + 167.05 \quad (6)$$

Exponential:

$$d_{Exp} = 0.0456 \cdot e^{-0.063x} \quad (7)$$

And linear:

$$d_{Lin} = -0.5835 \cdot x - 39.007 \quad (8)$$

RESULTS

The data analyses are made in Octave (Eaton et al., 2018). The graphs presenting the measured data and fitting model are shown in three figures. All figures present model matching of four formulas (polynomial 2nd order, polynomial 3rd order, exponential and linear) with measured data. In Fig. 1 fitting model #1 compared with 22 location measurements is presented. Fig. 2 presents same model (fitting model #1), compared with 40 location measurements. Finally, Fig. 3 presents fitting model #2 compared with 40 locations.

From the figures it can be seen that polynomial 3rd order fitting model calculated from 22 measurements data set is highly inaccurate. The accuracy of other models can be compared by calculating Root Mean Square Error (RMSE).

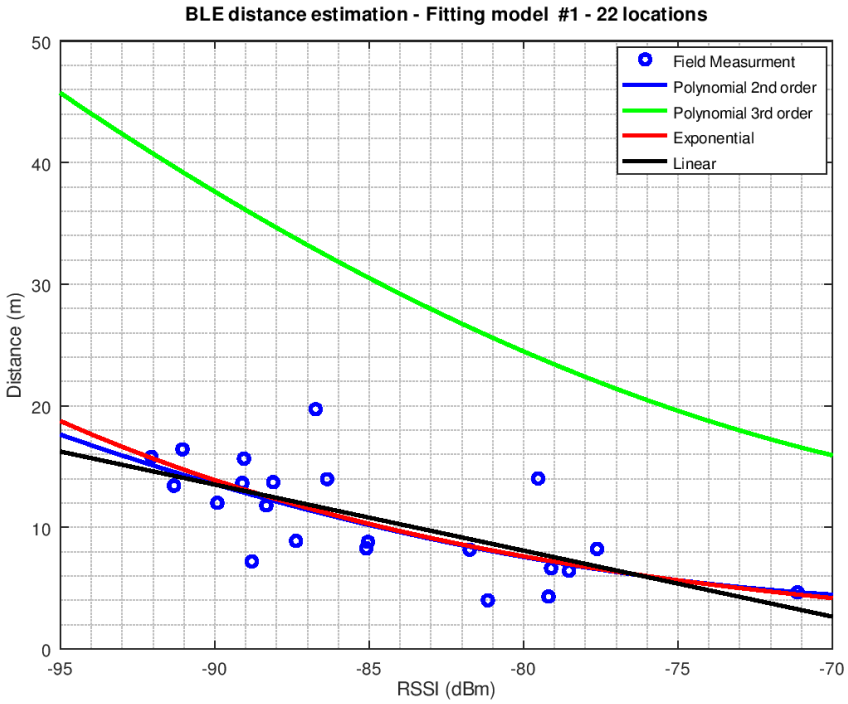

Figure 1: BLE distance estimation with Fitting model #1 - 22 locations

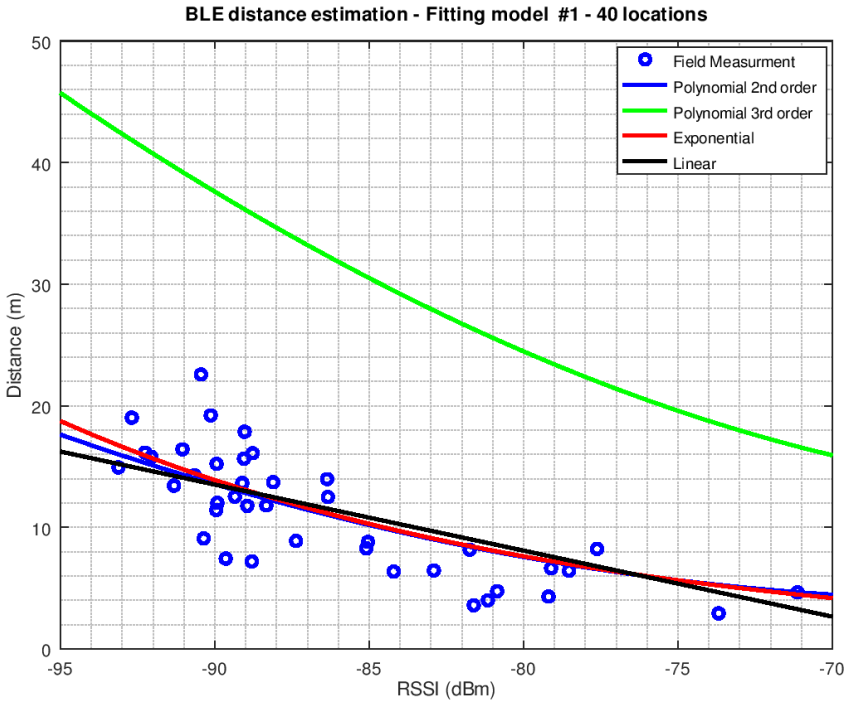

Figure 2: BLE distance estimation with Fitting model #1 - 40 locations

Root Mean Square Error (RMSE) is a frequently used measure of the differences between values predicted by a model or an estimator and the values observed. The RMSE comparison of models and three data sets are presented in Table 1. The Table 1 shows that the Fitting model #2 is slightly more accurate comparing to Fitting model #1 and that the most accurate is Polynomial 2nd order model of Fitting model #2. The most inaccurate model is Polynomial 3rd order model (Fitting formula #1). This high inaccuracy can lead to the conclusion that Excel as a tool cannot be efficiently used with the data sets containing extreme values. The results show that the efficiency of the fitting can be increased in Excel with elimination of up to 20 percents of extreme values from data sets. Despite the fact that

Excel does not offer implementation of other fitting formulas besides the embedded ones, such as R, Python and Matlab/Octave, the combination of fitting accuracy and easiness of its implementation, makes Excel a good choice for certain groups of users.

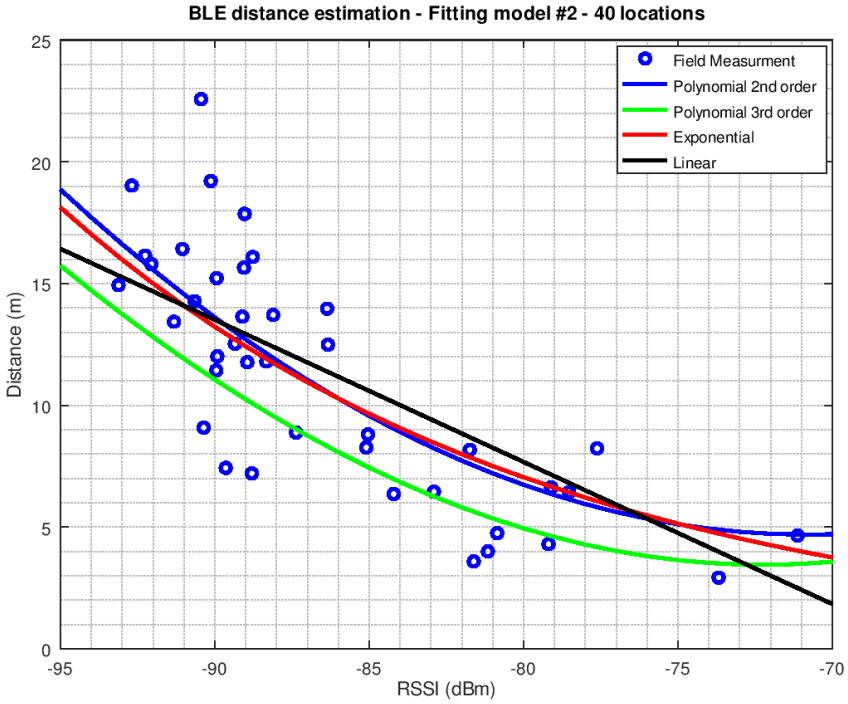

Figure 3: BLE distance estimation with Fitting model #2 - 40 locations

The problem with the presented data is relatively high distance estimation error (around 3 meters). This estimation error on relatively short distances (up to 22 meters) is too high for accurate indoor positioning systems. The conclusion is that high inaccuracy is in connection with data and experiment issues (e.g. devices used in experiment, the position of BLE devices, environment configuration and obstacles, etc.) and not in connection with the model creation methodology itself. In order to make this dilemma clear, new set of experiments should be conducted in the future.

Table 1: Comparative view of Root Mean Square Error (RMSE) in meters

Model	**RMSE [m] Fit 1 - 22 locations**	**RMSE [m] Fit 1 - 40 locations**	**RMSE [m] Fit 2 - 40 locations**
Polynomial Order 2	3.1329	3.0838	2.9523
Polynomial Order 3	20.770	22.178	3.7569
Exponential	3.1305	3.0677	3.0308
Linear	3.1606	3.2359	3.1661

CONCLUSION

In this paper is presented the method of using Microsoft Excel as a tool for distance estimation model based on Bluetooth Low Energy RSSI measurements. The model is developed for the possible usage in indoor positioning systems. The accuracy of the model is evaluated using RMSE. The experiment, model development and data analyses clearly show that Microsoft Excel can be used for distance estimation model development, and that its usage can be more accurate with using the reduced data sets for fitting (data sets with exclusion of extreme values).

This research reveal the problem with high distance estimation error (around 3 meters) on relatively short distances (up to 22 meters) as it is in this experiment. The error is too high for accurate indoor

position and it is not in connection with the model creation methodology itself. The new set of experiments should be conducted in the future in order to resolve this issue.

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WEBBOARD REAL TIME COLLABORATION WHITEBOARD

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ABSTRACT

WebBoard is a web whiteboard application made for meetings, teaching and drawing. An online tool for instructors, teachers, managers, developers and designers for real time collaboration.

Key words: Advertising, print media, older consumers, older generation, consumer behaviour

INTRODUCTION

WebBoard is an online whiteboard internet application which is designed for instructor based e-learning and to help share ideas among students, designers, managers and programmers in real time.
It represents a secure, cross-device and touch-friendly solution for communication among distributed teams, online instructors, managers, developers and designers. WebBoard enables the creation of collaboration rooms with unlimited drawing space where people can brainstorm, share ideas, hold lectures and draw sketches, store them and use at will.

Figure 1. WebBoard application

STRATEGY

The business goals of the application are to offer a revolutionary new internet platform for instructor based e-learning which does not require installation or updates of any kind by the end user. To offer a platform which is simple to use through a simple user interface and to offer a consistent look and feel.
The main purpose of WebBoard is to enable people to communicate and collaborate from long distances, to save money and time for its users and to make money for its managers, designers and developers. The first tactical goal of WebBoard's team was to engage at least a 100 users in the first year after launch and to redesign and redevelop the application based on their wants and needs. So far WebBoard's team has managed to engage 500 users in the first year of productivity. First, we were interested in how much attention the respondents paid to the print media.

BRANDING DESIGN

The branding of the web application is accomplished through logos, fonts and colors. The logos were made in a white and blue variant for usage in different settings. As it can be seen in the image above, a "B" in the logo is silent to give a better estetic feel. The font used throughout the application is the Hero typeface which is applicable for any type of graphic design, be it web, print or motion graphics. The colors used in the application are dark gray and white for texts, and variants of blue, gray and white for backgrounds.

USAGE

The WebBoard application is launched and runs directly in a web browser such as Google Chrome or Mozilla Firefox. Accessing it requires navigating to the following internet address: https://www.web-whiteboard.io

After logging in, users can make their boards private or public, allowing them to invite others to participate.

Along with enabling users to draw freely and draw various geometrical shapes, WebBoard also enables users to write text, upload files, keep tabs on drawings and much more.

One of the main ideas of WebBoard is reusability so it's made in a way that all shared and drawn content is stored. Which removes the difficulties of always having to reshare the same files for different teams and/or classes. Boards can be reused for repetition of the same lectures or meeting topics.
Along with all of the drawing capabilities users can hold video conferences, and also share and record their screens, share files and send text messages.

Whole teams can be invited no matter where they are to participate in virtual meeting rooms and have their ideas safely saved in one place.

FEATURES

WebBoard has a vast number of features which can make collaborating within teams seamless. The following is a list of features which are enabled within the application.

Responsive layout enables viewing of boards on any device. No matter if the user is on a desktop, mobile or TV device, this allows keeping track of the board states in real time easily.

Figure 2. Mobile and desktop layout

The touch friendly interface enables drawing with a mouse, finger, touch pad, or touch pen on any device. It does not matter whether the user is working on a laptop, smartphone, tablet or TV. Users can always draw in the way it suits them.

Advanced drawing tools enable users to draw amazing sketches, which can help convey ideas easily. WebBoard enables pen, shape and text tools as well as image, video and PDF uploads.

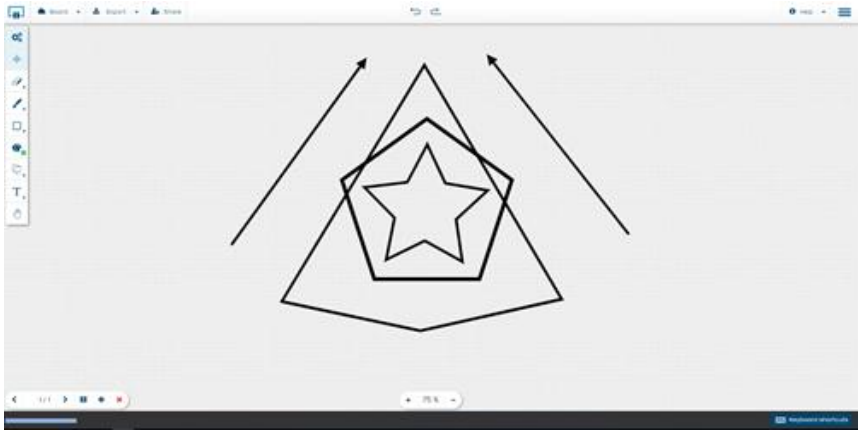

Figure 3. Advanced drawing tools

Audio, video and text chat features can help users communicate ideas with their teams seamlessly. Lectures or meetings can be held where people can communicate in real time if they were in the same room.

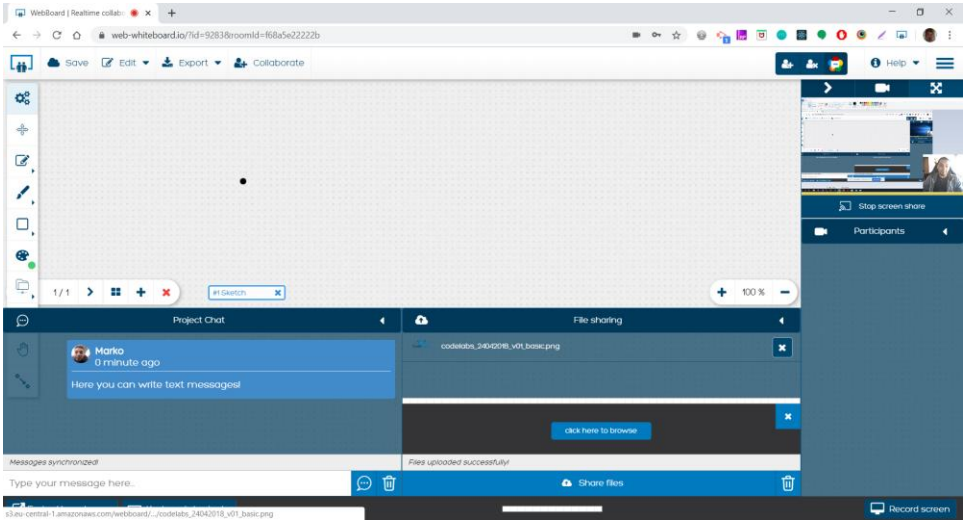

Figure 4. Full conference

File sharing enables users to share multiple files with multiple users simultaneously. Before sharing, files are saved in WebBoard's in-app storage, which allows you to reuse entire boards for different teams without having to re-share your files.

The screen sharing feature is a tool used to capture a user's screen and cast it to team members, allowing them to showcase any kind of material.

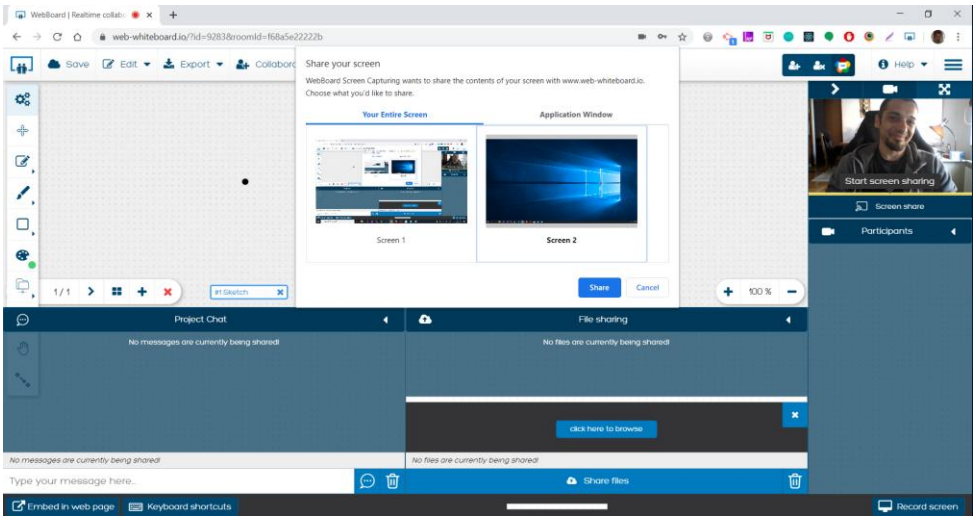

Figure 5. Screen sharing

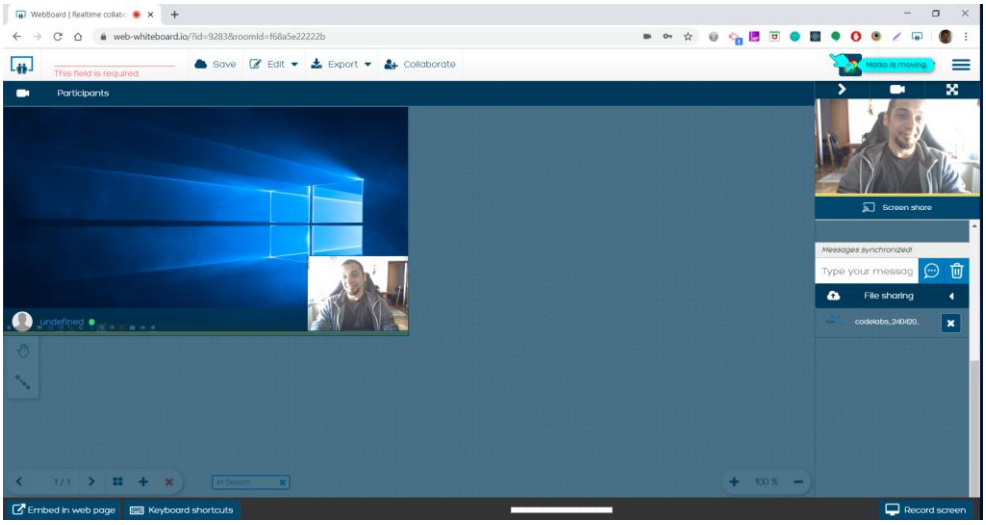

Figure 6. Full screen layout with screen share

The screen recording feature is a tool that enables users to capture any area of their screen and record it, after which it is saved to their in-app storage, where they can review, share, edit, delete or download it later.

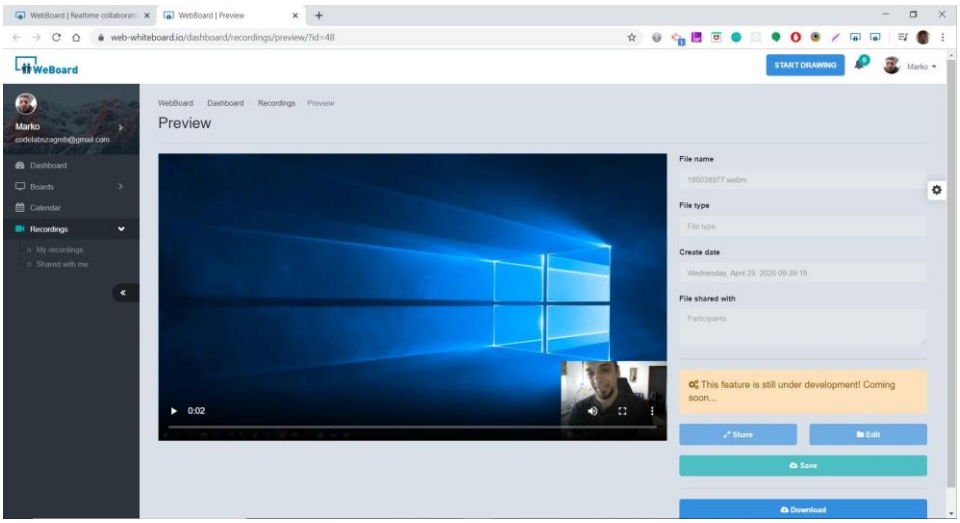

Figure 7. Screen recording preview

WebBoard's collaboration mode enables users to share their ideas in real time with their class or team while enabling everyone included to draw and edit the board simultaneously.

Presenter mode allows board administrators to hold lectures and meetings where only they can edit the board and share their camera, microphone and screen, while other participants can only view, text chat and download files.

REAL WORLD APPLICATIONS

WebBoard is used for holding meetings or lectures as well as collaborating on visual projects such as diagraming, sketching and wireframing.

Project managers can use the application for standup meetings and full visual conferences. While teachers, instructors and professors can use it for holding lectures and presentations. It can also be used for casual communication.

Since WebBoard is an internet application, users' physical locations don't matter as it can be accessed from anywhere around the globe.

WebBoard can be used for the following purposes:
- Access with any device with an internet connection, including mobile devices
- Easily write, save, reuse and share ideas when on the go
- Draw with a mouse, touchscreen or touchpad
- Draw with pen and shape tools
- Upload images, videos and PDFs to your boards
- Write plain text or post-it notes
- Select and modify any board content
- Undo or redo your moves
- Draw and share ideas on a canvas with lots of space to move and draw
- Create unlimited pages on single boards
- Collaborate with participants on separate pages while drawing simultaneously
- Zoom or pan boards to view them from a bird's eye perspective
- Video/audio and text chat with your team
- Share files of any type
- Share screen so to encompass any sort of material
- Record screen recordings and store them for later reviews and sharing
- Post notes on a board
- Hold meetings or lectures from the comfort of your home
- Attend meetings or lectures while on the move
- Invite as many people as necessary to participate on your boards
- Reuse material as you see fit without having to draw or share it multiple times

REMOTE WORK

In the last decade, the concept of work has changed, and while the traditional office work environment was the standard for decades, a lot has changed with the rapid development of the information and communication technology. Companies and working individuals have started to utilize modern technology to change how they work, and where they work. It is no longer necessary to be physically present at the working place to get work done. Instead, work can be done remotely.

Remote work is a working style that allows individuals to work outside of the traditional office environment. It uses the means of modern communication and information technology. It can be done

via different devices such as personal computers or mobile devices. The Internet is used globally for remote communication and it has changed our lives significantly, so it is no surprise that it has impacted the business world profoundly. Today there are many online tools designed specifically for remote working to maximize productivity and make the collaboration easier. Remote work can be done in different ways. It can be done from home or any other place with internet access. People who work remotely can choose to work in a way that's most suited for them. One thing is consistent – remote work brings a multitude of benefits.

THE BENEFITS

Today, more and more workers tend to use the ability to work remotely. It is no wonder that this style of working is becoming more popular because it has a host of benefits for the workers and for the companies as well.

It saves time
We all know that travelling to work can be a hassle, especially if you are not fortunate enough to live close to your workplace. People spend a significant amount of their precious time every day by getting to work and getting home from work. It is quite obvious that working remotely from your home can eliminate that waste of time completely. This means you get more time in your day to use as you please. Whether you use it to get more sleep, exercise, or to spend time with your loved ones, having more time in a day to use it for the things you really need to do, instead of spending it on traveling to work is undoubtedly a huge benefit.

It saves money
As stated above, working remotely eliminates the hassle of having to travel to work, which will save you not only time but money as well! It will reduce or completely eliminate costs such as gas, car maintenance, parking fees, professional wardrobe, lunches bought out, and child care.

It saves the environment
Remote commuting helps the environment in different ways. It reduces greenhouse gas emissions by taking off a great number of vehicles from roads and reduces oil spending. Remote workers can also opt to use less paper and optimize the use of air conditioning, heating and lighting which will reduce energy consumption.

It increases productivity
Working from home can reduce the number of distractions and make you more productive. You have more time to work and you can work peacefully without the distracting office chatter. You can also stop worrying about your wardrobe and dress more casually and comfortably. You will essentially have a personalized office space that you can arrange to your likings.

It makes people happier and healthier
Working remotely can really impact the way you feel about work. It can help you achieve a better work-life balance by allowing you to organize your time better. Many remote works come with more flexible schedules which means you have much more control over your working process. This is extremely valuable when you are trying to attend all the needs of your personal life. The way you communicate with your superiors and co-workers changes as well with remote communication and it can get more effective and positive without the distractions and politics that come along with the traditional office work environment.

Working from home can lead to better health as well. You will have more time for physical activity, the ability to eat healthier and recover from illness at home, be less exposed to possible causes of illness and have the ability to improve your working space ergonomically.

It is obvious that remote working has a whole list of benefits that will positively impact the worker, the company and the environment. It will save you time, money, increase your productivity, help you make healthier choices and save the environment.

TESTING

So far, the application has been tested for various purposes, such as long distance communication, on-line lectures and meetings. The testing was done between people in Croatia, Poland, Bangladesh, Germany, Holland and Columbia.

In the beginning, the User Experience of the application seemed to be a problem for some testing participants but was quickly handled by giving them usage manuals, instructions and video tutorials as well as redesigning of the WebBoard's user interface.

Although some users didn't immediately grasp the layout of the user interface, all features functioned smoothly, no matter the physical distance between participants. There were some connection problems while holding meetings but they were not related to the WebBoard application. The problems occurred when users didn't have a stable internet connection. In those cases all that the users needed to do was refresh their browser window and everything ran smoothly again.

CONCLUSION

WebBoard is a project which represents a revolutionary idea to encompass all features of classic desktop collaboration applications in an internet browser. To remove all the difficulties of installation and updates of desktop applications and to bring people together no matter their physical location and economical status.

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Session F: ABSTRACTS

Abstracts (pp. 225-228):

THE IMPORTANCE OF HUMAN RESOURCES MANAGEMENT IN HOSPITALITY

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ABSTRACT

Human resource management is a very complex process that must be implemented in all spheres of modern business. Hotel management is a specific activity in which human potential occupies the most important place. Namely, human resource management is an irreplaceable factor when it comes to successful business in the hotel industry and positioning hotels in the market. When we talk about this concept as a paradigm of business management of the hotel sector, we can conclude that it is crucial both for improving the quality of the hotel offer, and for better listing of hotels in the tourism market. In order for a hotel company to achieve a competitive advantage that enables a better position in the tourism market, it must focus its activities on the human resources sector, because human resources play a decisive role in providing quality service and achieving guest satisfaction.

Key words: Human resources, HRM, Hospitality, Competitiveness.

INTRODUCTION

Human resources, as carriers of new knowledge and skills, are one of the key elements for evaluating the quality of the hotel business and service offer. For the successful operation of the company, it is important to have an appropriate organizational structure that is an integral part of every company. For the current and future business of the hotel company, it is necessary to have a quality human resource management system that will provide the company with employees with the necessary knowledge, skills and talents, which will achieve long-term success of the company. "Modern business in the hotel industry means adapting catering products to the needs and wishes of tourists. This can be achieved only with quality and professional staff and adequate business organization. Therefore, culture and education of human resources in the field of tourism and catering are imperative for further development of tourism" (Tomka, 2003).

Human resource management (HRM) refers to the practices and policies needed to perform managerial tasks related to personnel matters, and in particular with the employment, training, evaluation and rewarding of employees in the hotel company and providing a safe, ethically acceptable and fair environment for them (Dessler, 2007). The role of human resource management is reflected in the proper organization of the company's activities, to hire the right people in the right place, that employees have the opportunity for training and progress, to be motivated and rewarded and that by properly coordinating all activities, they do their job the best they can and achieve the best results for the company (Đorđević-Boljanović, 2009). Effective management of this resource requires certain theoretical knowledge, as well as specific methods to guide the development of human resources. Having in mind the fact that about 30% of world trade in services is realized through tourism, then we can point out the importance of applying human resource management, which is a decisive factor in creating this economic activity, which provides over 200 million jobs worldwide.

The behavior of the hotel staff is crucial at all times, as the hotel staff (from the housekeeper to the top management) is in direct contact with each guest. The employees of the hotel company occupy a dominant position because they are ready to constantly learn and apply their knowledge in practice, in

order to lead to better results. Hotel employees have a great influence on the perception and satisfaction of guests. Employees need to have certain potentials (intellectual, biological and physiological) in order for the quality of their work process to take place. Efficient business results are the result of quality service, and they come from satisfied and loyal guests. Conditions in the tourism market impose managers to inspire employees to do their job more productively, those that will motivate them and reward their every good idea. As a result, hotel companies are undergoing many activities in the human resources sector in order to gain a competitive advantage and thus take a good position in the tourism market.

One of the basic characteristics of human resource management is the focus on the future, education, providing staff with appropriate knowledge and skills and the development of people in accordance with the future competitive position. Investing in human resource development is the basis for gaining a competitive position and achieving efficient business results in the long run. The success of a hotel business depends on the speed of decision-making, and in order to survive in the tourism market, it is necessary to meet the needs of current and future users of hotel services. With quality human potential, hotel companies can achieve good business results and take a position in the tourism market. In order for hotel companies to achieve and maintain a competitive advantage, they need to invest in the education of employees, to employ quality staff, to work on improving labor productivity and knowledge, and to establish a system of rewarding and improving quality staff.

CONCLUSION

Tourism is an economic activity in which human resources play a major role in market positioning. Given that the quality staff of the hotel company guarantees success and good business results, attention should be paid to this sector, through the process of human resource management. Motivation, rewarding and investing in employee education are one of the characteristics of this process, which in the long run affects the acquisition of a competitive position and high positioning in today's turbulent market. Competitiveness in the tourism market depends on the employees in this activity, ie. the quality and efficiency of their work. Therefore, awareness should be raised about the importance of investing in the education of all employees in the hospitality industry, because those who do not invest in the human resources sector will not be competitive in the market.

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STRATEGIC ANALYSIS OF ZALAEGERSZEG PROVING GROUND

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ABSTRACT

The investment of the Zalaegerszeg Proving Ground was finalized by a government decree - nr. 1292/2016. (VI. 13.) – which was a final result of a 2-year-long teamwork on the overall preparation, resource management and other return analysis calculations. The construction began in 2017, after which the first phase was finished in 2018 - as it was previously planned - while the final date for development is scheduled for the end of 2020. The current paper will outline the future alternatives for the proving ground in the field of the possible operation and return on investment performance from the strategic side. The most important goal of the analysis was to explore the potential outputs of the investment, which gives us a better insight into the economic, social and other effects of the test track.

Key words: Automotive; Proving ground; Strategy.

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A SMARTPHONE-BASED POST-OCCUPANCY EVALUATION FOR SPORT BUILDINGS FOR TURKEY

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ABSTRACT

In the last few decades, psychological elements, including a perceived influence of the indoor environment, have become widely recognized as essential to holistic comfort and satisfaction evaluations for building occupants. Nevertheless, post-occupancy assessments appear, despite of overwhelming evidence, to concentrate on gathering quantitative data, which indicate that subtle quality factors can have a significant impact on the quality and comfort of the occupants. In this article, we present the development and demonstrator of a new, simultaneously gathered smartphone survey: 1) subjective assessment of the usability and comfort of spaces by the sport building users, 2) electronic and mechanical photographs taken from participants to increase the convenience of the occupants, and 3) open questions regarding photos uploaded. The main focus of this paper is on the methodological aspects of the post-occupancy photographic smartphone assessment, while presenting select findings from a pilot study involving 20 Turkey participants. The photos provide greater clarification and background for quantitative data, although with considerable effort and reduced sample size.

Key words: Post-occupancy evaluation, Buildings, Adaptive comfort, Photographs.

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