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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 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 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 are presented all accepted papers received for VIII International Symposium Engineering Management and Competitiveness (EMC 2018). This year at the symposium we have 45 papers and 6 abstracts. The authors come from 15 countries: Bosnia and Herzegovina, Croatia, France, Greece, Hungary, Iran, Israel, Montenegro, Nigeria, Pakistan, Russia, Slovenia, Turkey, USA and Serbia. The papers are divided into eight sessions: Plenary session, Session A: Management, B: Operation management, Session C: Human resource management, Session D: Marketing and marketing management, Session E: Economy and financial management, Session F: IT management, Session G: Other.

We wish to thank 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 sixth Symposium EMC.

Symposium EMC 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, IX International Symposium Engineering Management and Competitiveness (EMC 2019) become better in organizational and program sense.

President of the Programming Committee
Associate professor Dragan Ćoćkalo, Ph.D.

Zrenjanin, June 2018.

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CONTENTS

VIII International Symposium Engineering Management and Competitiveness 2018 (EMC 2018)
22-23rd June, Zrenjanin, Serbia

Plenary session

Papers (pp. 3-40):

REVIEW ON PROJECT MANAGER SELECTION CRITERIA AND METHODS

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ABSTRACT

The success of a project depends on several critical success factors. One important factor is supervision by a competent project manager with proven leadership skills. Therefore, the selection of the appropriate project manager is a key factor for the success of the project. Selecting the best project manager among many candidates is a multi criteria decision making (MCDM) problem. This study reviewed the corresponding methods in different stages of multi-criteria decision-making for project manager selection. Also, it provides an overview on various criteria used. This paper provides useful insights into the MCDM methods for project manger selection and suggests a framework for future attempts in this area for academic researchers and practitioners.

Key words: Multi Criteria Decision Making (MCDM), Project Manager Selection, Project Management.

INTRODUCTION

Recruiting the right project manager is an important challenge for organizations. The project manager is the person responsible for accomplishing project objectives. The project manager manages the project through identifying project requirements; establishing clear and achievable objectives; balancing the competing demands for quality, scope, time and cost; adapting plans and approaches to the different concerns and expectations of the various stakeholders; and managing projects in response to uncertainty. It is widely acknowledged that the final outcome of the project depends mainly on the project manager; therefore, the selection of the project manager is one of the two or three most important decisions concerning the project (Ahsan, Ho, & Khan, 2013). Traditionally, an expert interviews the candidates for positions and after analyzing each person's capabilities selects the best. The statistical techniques approach supports the engaging decision through the arrangement of test scores and the measure of accomplishment for the candidate. However, the process is often ambiguous, biased and lacking in accuracy (Shahhosseini & Sebt, 2011). This literature review was undertaken to identify articles in high-ranking journals that provide the most valuable information to researchers and practitioners studying live issues concerning the project manager selection method. With this scope in mind, we conducted an extensive search for "Project manager selection" in the title, abstract, and keywords of scholarly papers. We particularly targeted library databases: Elsevier, Springer, Taylor and Francis, Emerald, John Wiley, IEEExplore and EBSCO, covering major journals in operation research and management sciences.

CRITERIA SELECTION

Project managers are responsible for the leadership role in projects (Müller & Turner, 2010). Therefore, selecting a competent project manager which has the necessary skills for project leadership

can be lead to improve the excellence level of project. Here, an important question is that what criteria or skills are needed for project managers to perform projects successfully (Sadeghi, Mousakhani, Yazdani, & Delavari, 2014). In the last two decades, many researchers have been exploring the general skills that a project manager should possess, as well as those needed to succeed, and the criteria for the selection of project managers.

In the 1990s, several researchers detailed skills of project managers and proposed several frameworks. Thamhain (1991) presented three categories of project managers' skills, which are leadership, technical, and administrative, while Pettersen (1991) proposed five categories: problem solving, administration, supervision and team management, interpersonal relations, and some other personal qualities of project managers. Technical skills, conceptual skills and human skills are considered by Goodwin (1993), as the main four skills project managers cannot do without. According to Goodwin (1993), conceptual, technical, negotiation, and human resource skills are the four main skills that a project manager should possess. Berger highlighted the growing need for civil engineers with management skills and, perhaps, advanced degrees in engineering management. Perini listed the primary qualities of a successful construction project manager as follows: a high level of technical skill; diligence; and the ability to manage the executive team, communicate effectively, pay attention to the client's demands, prioritize, perform under pressure, ask the right questions, and take responsibility and the necessary risks to achieve goals (Liao, 2007). Collins (Collins, 1998) takes a holistic view on the project manager candidates, which also includes the addition of any selection criterion deemed relevant to a specific project. The results are scored and, in case of a close score between candidates, the candidates' availability could help swing the decision. While this has some merit, it must be noted that using the criteria in the table could result in selecting a project manager for the wrong reasons. Collins (1998) states: "The process focuses on the premise that a successful project manager must master two primary skill sets: the project manager's technical skills and leadership skills." Meredith et al. (2011) classified the skills required by a project manager into six distinct groups: communication, organizational, teambuilding, leadership, coping, and technological.

Ogunlana et al. (2002) believed that conceptual, human resource, negotiation, and technical skills are the most essential skills for a project manager. Sunindijo et al. (2007) studied emotional intelligence (EI) in the context of project manager selection. The results of these studies revealed that EI is beneficial to both the individual and the organization. Pheng and Chuan (2006) identified the factors that effectively influence the performance of a project manager in the private and public sectors. Dolfi and Andrews (2007) studied the personality characteristics of project manager and formulated a conclusive understanding of the motivations of project managers, especially concerning their work environment.

The recent studies have attempted to centralize the competency concept and focused more on classifying the competencies according to the different natures of projects. Crawford (2005) provided further insight towards enabling a more in-depth understanding of the potential dimensions of the term competency by proposing three interesting classifications, namely input competencies, personal competencies, and output competencies. Input competencies as defined by Crawford refer to the knowledge and skills that a person brings to a job. Personal competencies are the core attributes underlying a person's capability to execute a job. Output competencies relate to the demonstrable performance that a person exhibits at the job place. Suikki et al. (2006) emphasized the administrative, leadership, and business skills of project managers.

Wu and Lee (2007) combined fuzzy logic and decision making trial and evaluation laboratory (DEMATEL) to segment required competencies for better promoting the competency development of global managers. Ahadzie et al. (2008) studied the construction projects and developed competency-based measures for evaluating the project managers in mass house building projects. Patanakul and Milosevic (2008) studied the multi-project environments and proposed a list of competencies that multiple-project managers should possess. Liu et al. (2010) examined the relationship between competency and success in the information systems project environment. They modeled the link between general task completion competency and performance of development teams with two crucial antecedents built by other stakeholders, the contribution of users and controls established by management. Müller and Turner (2010) focused on the leadership competency profiles of successful project managers in different types of projects. They prepared a Leadership Development Questionnaire (LDQ) and sent it to various experts and received 400 responses. The obtained results were used to profile the intellectual, managerial, and emotional competencies for project managers. Shahhosseini and Sebt (2011) proposed a competency-based model for the selection and assignment of construction project personnel, which are classified into four types: Project Manager, Engineer, Technician, and Laborer. By consideration of main personnel competency, they developed a two-stage

model representing complete project staff evaluations. The model was trained with a number of actual data taken with a series of interviews.

MULTI CRITERIA PROJECT MANAGER SELECTION MODELS

Multi criteria decision making (MCDM) has been used in selecting project manager. For example, Chen and Cheng (2005) developed a fuzzy MCDM method for information system project manager selection. They combined Group decision support system (GDSS) with MCDM in fuzzy environment to solve the personnel selection problem. Their method used for information system project manager selection. The assessment of candidate and the important weights of criteria are given in linguistic terms and then transfer to triangular fuzzy numbers (TFNs) .They proposed a new approach to rank fuzzy numbers by metric distance. They gave two examples to compare with other methods for showing their method has a good ranking method. A computer based group decision support system, FMCGDSS, to increase the recruiting productivity and to easily compare their method with other fuzzy number ranking methods.

Lau (2006) has defined a set of project manager selection criteria and developed an AHP-based project manager selection model. Xing and Zhang (2006)analyzed the significance of choosing an eligible project manager in their study. They tried to quantitatively assess the ability and quality of a project manager by implementing fuzzy analytical hierarchy process which was based on triangular fuzzy numbers.

Baykasoglu et al. (2007) combined Fuzzy multiple objective mathematical programming with simulated annealing for project team selection problem. They used fuzzy concept like triangular fuzzy numbers and linguistic variables. In this fuzzy multiple objective optimization model, they considered fuzzy objectives and crisp constraints. To solve the proposed fuzzy optimization model, a simulated annealing algorithm was developed and software based on C++ programming language presented. The team selection criteria described by four skills: Oral communication skills, technical expertise, problem solving ability, and decision making skills.

Zhao et al. (2008) tried to demonstrate a suitable competency based framework. Hui et al. [39] tried to demonstrate a suitable competency based framework. The rationality of this paper is examined in the methodology section which was constructed by principle component analysis. All these efforts make this study prominently valuable and referential in project manager selection.

Zavadskas et al. (2008) developed a multi criteria methodology for project manager selection based on grey criteria. They investigated a number of criteria and sub criteria relate to the match of managers to construction projects. They identified criteria and sub criteria based literature review and interviews of experts. They suggested a multiple criteria method of complex proportional assessment of alternatives with grey relations (COPRAS-G) for analysis. The selection of construction project manager presented as a case study. Six criteria were identified for construction project manager selection based on the review of literature and managers' questionnaires include: Personal skills, Project Management skills, Business skills, Technical skills, Quality skills, and Time of decision making.

Zaho et al. (2009) has established an extensive assessment model of project manager candidates by implementing principles of fuzzy mathematics. Liqin et al. (2009) adopted fuzzy comprehensive evaluation methods in the selection of a project manager.

Rashidi et al. (2011) for choosing a qualified project manager, amalgamated fuzzy systems, ANNs, and Genetic algorithm. They identified the important criteria in selecting a project manager, on the basis of the opinions of experienced construction company managers, through presenting a fuzzy system. The proposed fuzzy system is based on IF-THEN rules; a genetic algorithm improves the overall accuracy as well as the functions used by the fuzzy system to make initial estimates of the cluster centers for fuzzy c-means clustering. Moreover, a back-propagation neutral network method was used to train the system. Torfi and Rashidi (2011), stated that the possibility of human error presents itself in every rational decision. Because the selection of a project manager involves evaluation of persons on several criteria, the Analytic Hierarchy Process (AHP) has also been employed for gauging the abilities of candidates by this study. This method allows for a pair wise comparison of candidates that expressed the degree of preference of one candidate over another.

Shahhosseini and Sebt (2011) proposed a competency-based model for the selection and assignment of construction project personnel, which are classified into four types: Project Manager, Engineer, Technician, and

Laborer. By consideration of main personnel competency, they developed a two-stage model representing complete project staff evaluations. The model was trained with a number of actual data taken with a series of interviews.

Safarzadegan et al. (2012) proposed the computing with words approach based on the specific architecture of perceptual computer and the linguistic weighted average for competency based selection of human resources in construction firms. Afshari et al. (2012) developed a decision model-based Fuzzy Simple Additive Weighing (FSAW) approach to select construction project managers. Zavadskas et al. (2012) applied AHP method for determining managers skill weights.

Afshari et al. (2013) modeled the quantitative assessment of project managers through the application of fuzzy linguistic variables. The linguistic judgments were converted into crisp values for the weighting of criteria and the rating of candidates in the form of triangular fuzzy numbers. A fuzzy integral method was used to obtain a final score for candidates. This model was a variation of the one previously done by the same authors in which the evaluation criteria and linguistics were the same, but a simple additive weighting method was used for aggregating the final candidate score (Afshari et al., 2012). Hadad et al. (2013) propose a model based on Data Envelopment Analysis to select candidates according to past performance. They proposed a decision making support system (DMSS) module for selecting project manager and demonstrated its implementation. The selection method was based on their past performance in the relative projects.

An automated procedure for selecting project managers in construction firms proposed by Jazebi and Rashidi (2013). The proposed model was developed on the basis of data accumulated from a number of interviews conducted in a number of major construction firms. They focused on the selection of a project manager from a set of potential candidates for construction firms and suggested an automated procedure which is required only information for 15 numbers of the most important criteria. Whereas proposed procedure in their study is required only information for 15 numbers of the most important criteria, the same previous study by Rashidi et al. (2011) needs information for 23 criteria. They suggested a precise fuzzy system to accurately determine the most suitable person in pair-wise comparisons. They considered two factors and presented an optimal fuzzy system, in which the least number of criteria is considered for selection process in construction firms. They identified all possible criteria for the selection of a project manager and developed an initial fuzzy expert system based on these criteria. They obtained the required database from a number of interviews conducted by the senior managers of a number of major construction firms in Iran. The fuzzy curves method is used to determine the importance of each criterion. Moreover, they validated the developed model by a 62 data from the available dataset, and used this model in a real case study.

Varajão and Cruz-Cunha (2013) also propose to use a gerund of the ICB and AHP approach selecting project managers. Keren et al. (2014) proposed a method that uses the DEA and AHP methodologies, together with the ranking method, for selecting the best candidate for managing a project. This paper is an expansion of the decision-making support system (DMSS) that was proposed by Hadad et al., (2013). The DMSS of Hadad et al., (2013) used only objective criteria in order to rank a group of candidates. This paper proposes to use the scores that each project obtains by the previous DMSS, as an input to a revised DMSS, and to use those results in combination with other qualitative and subjective criteria to obtain a full rank of the candidates. The proposed method allows calculating the weighted score and the rank of each candidate according to quantitative and qualitative criteria.

Dodangeh et al. (2014) developed a fuzzy MCDM model for linguistic reasoning under new fuzzy group decision making that new linguistic reasoning for group decision making is able to aggregate subjective evaluation of the decision makers and hence create an opportunity to perform more robust project manager selection procedures. A two-step fuzzy-DEMATEL and Fuzzy-VIKOR methodology is structured by Chaghooshi, Arab, and Dehshiri (2015) that FVIKOR uses FDEMATEL result weights as input weights. Then a real case study in zarrin balan shomal firm presented to show applicability and performance of the methodology.

Cloud Theory which uses a bell-shaped membership function, and which is an amalgamation of Fuzzy Set Theory and Probability Theory, is used by Cassar and Martin (2016) for choosing project manager, to account for both fuzzy and random uncertainties. A case study on a construction firm illustrated the hiring exercise and details how the preferences of decision makers are applied to the model. Sadatrasool et al. (2016) developed a model in order to select a project manager for petroleum industry. The proposed model was based on multi criteria decision making and a statistical method named principle component analysis (PCA). The methodology considered all of the important criteria

and benefit from an experienced expert panel in order to extract the weights of the criteria. Also a numerical example demonstrated the function of the model and is verified by VIKOR method.

CONCLUSIONS AND DIRECTIONS FOR FURTHER RESEARCH

After this critical literature review, some drawbacks were found in previous researches:

1. Possible dependency between the criteria in the project manager selection model is being neglected in most of the existing studies. Project manager selection model should not assume that each criterion is independent of other criteria, because in the real world, there is a relationship between criteria for project manager selection. Any criteria in the model could be related to, or dependent on other criteria. In project manager selection model, evaluating the dependencies between criteria should contribute to the objectivity of decisions. Considering dependency in MCDM can improve the quality of decision making process.
2. Group decision making (GDM) is a very important factor for a comprehensive solving of the problem. But it was not considered the group environment in the majority of the reviewed studies. The approach that considers one single decision maker does not have completeness while multi criteria decision making techniques are used. One of the critical tasks for an organization is project manager selection; therefore, more rational decisions are made by a group of people rather than by a single person.

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AN EXPLORATORY STUDY OF RELATIONSHIP BETWEEN ENTREPRENEURSHIP AND ECONOMIC DEVELOPMENT – CENTRAL BANAT REGION RESEARCH RESULTS

UDC: 005.511:330.34(497.113)

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ABSTRACT

Changes that have happened in the modern business, as a result of the global economic crisis, have influenced companies to change their business philosophies. Those companies were forced to accept the development model whose framework is entrepreneurial behavior. The model implies stronger initiative in the field of innovation, as well as flexibility. More and more companies, regardless of their size, financial strength or property relations, are applying the basis of entrepreneurial behavior. According to the experience of developed countries, young people who are starting their own business for the first time, represent a very important category for the development of the entrepreneurship climate at the national economy level. Young entrepreneurs in the European Union receive significant incentives through support programs that have an impact on the increase of their self-esteem when starting their own business. Regarding this field, Serbia is not following the trends, but we are not the only country in the Western Balkan Region to do so. In this paper, economic development is observed from the point of view of developing innovation and competitiveness, as well as encouraging and developing entrepreneurship, especially among younger population (aged 15-24). As an illustration, the analysis is backed up by statistic indicators of the research results about the opinions of young people towards entrepreneurship and starting their own business and towards competitiveness and innovativeness of domestic companies.

Key words: entrepreneurship, economic development, young entrepreneurs, Serbia, Central Banat Region.

INTRODUCTION

Entrepreneurship represents a continuous creative process whose main goal is to implement innovation in the organization, in the function of successful managing and solving problems of consumers and the society. Successful business in the 21st century depends on the way companies deal with the growing need for knowledge and application of the most recent technological achievements in managing companies, as well as on the ability to transfer information towards the target group of consumers and customers in the fastest, most understanding and most efficient way. Modern organization has to base its business on the entrepreneurial concept of behavior, which emphasizes the strategic approach based on accepting risks, creativity, innovation and responsibility of each individual for managing the organization. Special emphasis here is put on innovation, because of the fact that our society is based on knowledge. Companies have to apply the entrepreneurial concept consciously and in an organized way, to follow that behavioral concept, as well as to constantly initiate the innovating process. In order for an existing company to be able to make innovations systematically, it has to create an appropriate organizational structure which allows employees to behave in the entrepreneurial way. Company must establish a kind of system of connections and relations which will allow focusing on the entrepreneurial behavior.

Development of entrepreneurial behavior among young people is a complex field, but it is practically limited to several factors which all together represent a suitable ambiance for their encouragement. Special attention is dedicated to gaining knowledge in the field of entrepreneurship among young people, with the purpose of their advanced training. There is a great number of previous studies that are dealing with motivation (e.g. Abbey, 2002, etc.), intentions (e.g. Thompson, 2009, etc.) – all the elements that influence development of entrepreneurial behavior and starting business in different ways (e.g. McKenzie et al., 2007; Wilson et al., 2007; Franco et al., 2010, etc.), in other words, entrepreneurial behavior of young people.

NEW MODELS OF DEVELOPING ENTREPRENEURSHIP

In modern economy, the basis of successful business, especially on a global level, is creating suitable climate inside the organization which potentiates entrepreneurial behavior, innovation and flexibility. According to modern believes, an entrepreneur does not have to be anymore just the owner of the business, but can also be a regular employee who has the features characteristic for entrepreneurial behavior. According to Drucker (2003, p. 122), all the business in the organization, no matter the size, must be managed in an entrepreneurial way, in order for the company to become an entrepreneurial organization. More and more companies, regardless of their size, financial strenght or property relations, are starting to behave in an entrepreneurial way, adopting and using the main postulates of entrepreneurial business and management.

Entrepreneurial behavior in a modern organization is not linked exclusively to one person and his/her skills and experience, but is relying more and more on team work. In that sense, a model of corporate entrepreneurship is developed that is focused on team work and whose members are motivated to work on achieving success and accepting risks. Large companies must encourage entrepreneurship in order to surpass the difficulties they are facing with, while learning how to collaborate with partners and allies. Those companies are creating a unit in their organizational structure that is behaving completely differently from the rest of the organization.

Drucker (2005) believes that every large company must be able to do three important things simultaneously – to improve, to expand and to innovate. He also emphasizes the fact that he is still not aware of such a company, but that there are a lot of them that are going in the right direction.

Entrepreneurship is all about hard work and effort. Companies have to apply the entrepreneurial concept consciously and in an organized way, to follow that behavioral concept, as well as to constantly initiate the innovating process. In order for an existing company to be able to take innovations systematically, it has to create an appropriate organizational structure which allows employees to behave in the entrepreneurial way. Company must establish such system of connections and relations which will allow focusing on the entrepreneurial behavior. In modern business, entrepreneurship is more matter of the organization's behavior, defining business policy and applying suitable business practice, than it is matter of personality. Company which wants to succeed in this turbulent and complex business environment must integrate entrepreneurial management in its organizational structure. It has to adopt such business policy that will make the organization capable of innovation.

The issue of applying entrepreneurship is of great significance for the companies coming from transition countries. Rounding up the process of transition, i.e. of changing the economic structure of the society – privatization, market economy, liberalization of economic relations with foreign countries, etc., represents the main precondition for the successful inclusion in the international economic flows. The transition process should allow the economic entities in transition countries to be trained for an independent market appearance, healthy competitive battle and for managing business on international level. This implies significant changes both in the organizational structure of the business entity and in the way managers and employees in organizations think. Executive management and domestic capital owners play the key role in this process, as they have to establish healthy market foundation for business, based on constant development of knowledge of all employees and work productivity.

UNEMPLOYMENT TRENDS AMONG YOUNG PEOPLE

Most of economically developed countries in the world have following principles in common, related to the functioning of the labor market, especially in the case of young people and their employment:

1. unemployment of young people is higher than the one of adults and the rates are at least double the size;
2. the level of formal education among young people is increasing significantly and this trend is going to continue in the future;
3. young people are afraid of marriage, because of the issue of social security and that is why they are deciding to get married when they are older;
4. participation of women in employing is getting more and more emphasized;
5. labor market programs for young people in general have a low recovery rate.

State administrations of developed countries are trying to find new solutions regarding the employment of young people, with most emphasis on creating entrepreneurial skills. Self-employment represents a possibility for individuals to define their own model of business and development. Governments of developed countries consider self-employment as a measurement which enables solving the issue of poverty and employment of young people, so in that sense, it also encourages small business development. Confirmation of these actions is usually based on numerous potential benefits and the ones that stand out are:

- entrepreneurship and starting a business has a direct impact on employment increase, on the basis of creating new jobs at the very beginning or in the near future,
- new small firms are increasing the level of competitiveness on the national economy level, creating benefit for consumers,
- young entrepreneurs can answer to market demands in a flexible way, especially from the point of view of applying new technologies and following market trends,
- higher employment rate among young people enables higher self-esteem, as well as social welfare.

Between 2007 and 2010, after the period of rapid growth, the global unemployment rate among young people has mantained on 13% for the period between 2012 and 2014. The number of young people who are unemployed dropped for 3.3 million at the crisis peak: 76.6 million of them were unemployed in 2009 in comparison to the estimated 73.3 million in 2014.

Share of young people in the total unemployment rate is slowly decreasing. In 2014, 36.7% of youngsters was unemployed on a global level. Ten years after, in 2004, the share of young people in the total unemployment rate was 41.5%. Although the indicator shows improvement over time, it should be mentioned that young people in 2004 made only one sixth of the world population (UN, 2014) and that is why they were present among the unemployed too much.

The total unemployment rate (in regard to the active population, 15-74 years of age) for EU countries (28 countries) moves in the range of 10.8% in 2013, when it was also the highest for the observed period 2010-2016, and 8.6% in 2016 (Eurostat). If we analyze the unemployment rate among young people (15-24) in certain European countries in the period between 2010 and 2016, we can notice a big difference in percentages of unemployment among young people. In some countries, like for example Greece, the rate is increased for almost 77% of the lowest value. The unemployment rate in Estonia is decreased nearly 2.5 times in 2016 in comparison to the initial year of the observed period. The most stable unemployment rate among young population in the analyzed period is maintained in Germany and France – in the first on a relatively average level of 8.0% and in the other on a relatively high level - 23,8%. Spain is a country which had the highest total unemployment rate of young people in the given period (49.3%), which makes it an absolute infamous recorder in that sense.

Total unemployment rate (in regard to the active population, 15-74 years of age) in Western Balkan countries is pretty high. The closest to the European average is Slovenia, where the total unemployment rate for the period 2010-2016 was between 8.6% and 10.8%. Total unemployment rate in Serbia has been significantly decreased compared to 2012 and amounts 15.3% in 2016. The highest total unemployment rate in the region in the observed period is present in Bosnia and Herzegovina (more or less on a constant level of 20%), as well as in Macedonia which records a decrease of the unemployment rate in the analyzed period (near 32%). Young population (15-24) is the least active age category of the population. The unemployment rate of young population (15-24) compared to the total active population for Western Balkan countries, in the period 2010-2016, is on average around 40%. In 2016, the highest unemployment rate in this sense was present in BiH (54%), while the lowest was in Slovenia (15.2%). In the observed sense and period, Serbia has the unemployment rate of young population slightly above region average (48.5%), while the unemployment rate for 2016 was 39.9%.

OPINIONS OF YOUNG PEOPLE IN THE EUROPEAN UNION ABOUT SELF-EMPLOYMENT

Special report that is focused on entrepreneurship among young people and is backed up by data of the Global Entrepreneurship Monitor (GEM) from 2013, shows that, in the EU (in comparison to the other regions around the world), younger population (aged from 18 to 34) is afraid of failure and that is mostly keeping them from starting their own business – 46.7% of them expressed this opinion (Kev et al., 2013). Factors that can affect the number of young people who will engage in entrepreneurship include: family and/or life role models, entrepreneurial skills and experience, financial means and market barriers (OECD and European Commission, 2014). Flash Eurobarometer from 2012 (European Commission, 2012) about entrepreneurship shows that young people (15-24) will most often indicate the lack of necessary skills as one of the main reasons why they are not starting their own business, while, for comparison, the ones in the next age group (25-39) will mostly point out the lack of capital and financial means for self-employment (Table 1). The lack of capital is a dominant problem for all age categories, excluding the 55+ one.

Table 1: Biggest limitations for self-employment in the observed age groups (in %)

	15–24	25–39	40–54	55+ years
Not enough capital	26	35	27	10
Current economic climate is not good for a start-up	12	16	15	8
Not enough skills to be self-employed	18	9	7	5
No business idea	8	11	9	4
Difficult to reconcile with family commitments	4	9	7	6
Risk of failure and legal and social consequences are too big	3	8	7	3

Source: European Commission, 2012

Despite numerous obstacles connected to entrepreneurship, there is proof that the perception about entrepreneurship is positive, especially among young people. Eurobarometer data shows higher willingness of young population to get involved in the entrepreneurial activities (European Commission, 2012). Younger examinees in the EU, between 15 and 24 (45%), are more prone to self-employment than the ones that are older (between 35% and 37%). Younger age groups (15-24 and 25-39) are also expressing higher level of trust in the fact that self-employment would be possible for them (41% and 44% respectively) in the next five years. The numbers were lower with older examinees, aged 40-54 (33%) and over 55 (16%).

OPINIONS OF YOUNG PEOPLE IN SERBIA ABOUT SELF-EMPLOYMENT

The research "Analysis of young people's opinions and thoughts about starting their own company and applying socially responsible business", for its main goals has to determine opinions and thoughts of examinees about starting businesses, as well as about the success of business practice in Serbian companies. Participants in the research are students from universities and higher schools in Serbia, profiled towards business and management. This type of research has been carried out since 2010 in 16 places, during November and December through an anonymous, structured questionnaire. Until now, over 4.500 examinees have been questioned, while the research from 2017 included 592 participants.

The research from 2017 showed that the majority of examinees, 83.1% of them, wishes to start their own business. Private business is for them "risk and uncertainty" (19.9%), but even more a "challenge" (24.2%). Reasons for not starting your own business are given in the Table 3. Significant matching with the research which results are given in the Table 1 are noticable, especially when it comes to financial means, current climate, political and economic situation, as well as knowledge and experience necessary for self-employment.

As an outlet of the mentioned research in Serbia, a similar research has been carried out since 2016 in the Central Banat Region, financed by AP Vojvodina and with the goal of improving and developing entrepreneurship in that region. The sample of the research was consisted of 350 examinees – 300 active students from Zrenjanin and 50 people of the appropriate age, who finished their studies, acting as a control group. The control group was consisted of people who are currently unemployed and the ones employed in companies, thanks to the support of the local MSP (around half of them).

Almost 73% of examinees (in the year 2017) believes that private business is more successful than working in other types of property, while 41% of them considers working conditions in private companies as better than the ones in other types of companies. Only 22% of examinees thinks that private business is insecure and unprofitable, while more than two thirds of the sample (75.9%) believe that people are still not aware of real business posibilities of private companies. Higher number of examinees demonstrate readiness to start their own business (76.9%), while the ones who do not consider it as an option, as the most common reason state: lack of the real idea (24.3%), lack of financial means (13.6%), insecure political and economic situation (5.9%) and indifference (5.8%).

Table 2: Reasons for not starting your own business

	% od ukupnog broja
I do not have the right idea	20.1%
Insufficient financial means	18.4%
I do not have enough knowledge	13.3%
Insecure political and economic situation	12.0%
I am not interested	11.6%
Lack of good partners to start the business with	10.3%
Little experience in company management	9.9%
Insecure about your own skills	2.6%

Most examinees estimate that the start-up loans of business banks are not affordable for young people (55.1%) and as main reasons they state high interest rates (45.8%), as well as long-term process of receiving the funds (7.3%). According to that, 61.1% of participants would choose to use their own means when starting a business over the bank loans (only 7.4% of them). More than half of examinees (63.4%) are not familiar with the existing incentive means for starting a business and they would not choose to use them (52.7%).

According to the data, 77.6% of participants from the region believes that in Serbia does not exist an appropriate ambiance which stimulates young people to start their own business and their biggest limitations are insufficient financial means (38.9%) and unstable political and economic situation (8.7%). Among additional limitations, 2.8% of examinees still states coruption, big companies' monopol, lack of stimulation of domestic entrepreneurs by the government, paper work and political background. Although 87.1% of participants believes that the government should have a key role in motivating young people to start their own business, more than half of them (54%) did not mention in which way should the government be involved. The rest of examinees, as key ways of governmental support, listed more affordable loans (27.5%) and education (14.2%).

It was especially important to notice how young population evaluates competitiveness of companies and their innovativeness, as elements of the economic development level. Namely, the competitiveness of domestic companies, compared to the international environment, was evaluated as unsatisfactory by 85.6% of examinees. Regarding the estimation of necessary elements for the development of competitive ability of domestic companies, the biggest number of participants single out the application of modern management methods and techniques (36.1%), followed by purchase of modern technological solutions and equipment (31.2%) and finally, significant investments in marketing (28.4%). Examinees' answers are shown graphically in the Figure 1. Furthermore, 82.9% of participants agrees that the innovation level of domestic companies is below satisfactory and as the most important factors that are missing in the development of domestic companies' competitiveness, they mostly point out to financial support (44.8%), new technologies (46.8%), education (38.2%) and employee motivation (37.1%).

CONCLUSIONS

Entrepreneurial economy represents a reality in the global economy where the number of competitors is increasing every day. Global economy assumes uncertainty, but it also offers possibilities to organizations and individuals who are brave and agile enough to adapt to global market demands and sudden changes in the business environment. Encouraging entrepreneurial spirit is one of the main strategic directions of all national economies and especially the ones in transition.

The data collected in the survey was provided by the students of management and business, so it was expected that the majority of examinees in this sample wanted to start their own business. The results point at the fact that the situation in entire Serbia is not stimulating and that attention must be paid to creating conditions and encouraging entrepreneurship among young population. All negative factors that hinder the

examinees from starting their own business are the results of the absence of an adequate ambience for encouraging entrepreneurship among the young.

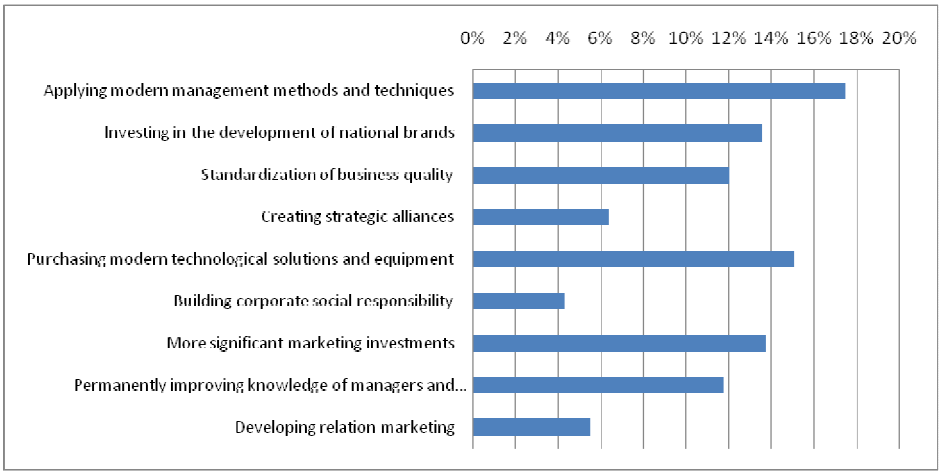

Figure 1: Necessary elements for developing competitive ability of domestic companies

Based on the presented results, it can be concluded that young population, in this case represented by students in the field of management, is very aware of the fact that the competitiveness of domestic companies and the degree of innovation are at a very low level. Creating a business environment and acquiring new technologies represents a strategic framework for establishing competitiveness of Serbian enterprises.

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TRANSFERRING STRUCTURED DATA BETWEEN VESSEL AND OFFICE AND APPLYING BUSINESS PROCESSES IN REMOTE ENVIRONMENTS ON "MARINEINFO PLATFORM"

UDC: 004.6:005

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ABSTRACT

The purpose of this paper is a presentation of a fully implemented platform (MarineInfo), that has been installed in more than 100 Vessels. The described platform serves and facilitates the structured data transferring between the Operational Vessel's unstable environment and the Office one. In addition, it can apply business processes not only to office side but also to Vessel's remote environment. "MarineInfo" platform is multipurpose and can interface with multiple components and modules of any ERP, CRM or other structured platform that the organization uses in both sides (vessels and/or Office). We are using the "MarineInfo" platform for various implementations. The platform is composed of two main modules, e-Forms (e-Applications) and e-SMS (e-Documents). All gathered data, apart the operation usage, have been also used for further analysis. We have used the produced information of the above data in combination with other information from other resources such as Internet of Vessels Platform (IoT). Our vision and primary goal is to provide as much information as possible, from multiple sources to support decision systems or to an alerting system, back to the Maritime Company that manages Vessels.

Key words: Shipping, Maritime, Vessel, Structured Data, Workflow, e-SMS, GIS, Decision Support Systems, MIS, e-Forms, e-Documents, e-Applications, IoT, ERP systems.

INTRODUCTION

It is very well experienced that there are several particularities and limitations to Vessel's environment. Those limitations can be gathered to the below:

A. Network availability and performance
B. Vessel infrastructure maintenance / Change management
C. Concurrency updates
D. Limited master data available on vessels

All the above problems straightened by the use of common architecture applications and platforms (e.g. 2-tier application), with big and stiff databases, make more difficult to synchronize the data with the central database using common synchronization tools or technics. In addition, there are lots of incidents that there was no integrity or consistency in synchronized data. In some cases we are also facing data loss.

LIMITATION / PROBLEMS

A. *Network availability and performance*. Network connectivity on vessels is most of the times limited,not stable and poor in bandwidth. Multiple protocols and channels are used to connect a vessel to the rest of the world, but this is not always feasible and in most of cases, it is expensive.

Having the above limitations, enforcing business rules – designed and maintained at the office side – on the vessel at any time, is a typical issue.

B. *Vessel infrastructure maintenance – Change management.* Application maintenance on vessels is a common nightmare for maritime companies, mainly since network connectivity is poor. Moreover, it is often difficult to have downtime on workstations and servers on vessel side. Change management on applications and infrastructure on vessels is not an option most of the times. The procedure is difficult to standardize and automate since it may involve many applications, system software, different versions of software, operating systems, etc. Moreover, limited connectivity makes it more difficult since deploying the updates and connecting remotely is a costly (in terms of time and money).

C. *Concurrency updates.* Another issue is that vessel-office applications, should be considered as disconnected systems that need to exchange data in a way that it guarantees the integrity of the transferred information but at the same time, allows the flexibility of the constantly changing rules that must be enforced in the maritime industry. At the time a piece of information changes at either side (vessel or office), depending on the nature of the data, the system should behave as if it was connected. This cannot be implemented without compromises, but it is an issue which must be handled with care.

D. *Limited master data available on vessel.* The need to create application that exchange structured data between vessels and office departments, brings the immediate need to have tons of master/reference data on the vessel side. Although in many cases, some of the required data is available in core systems that reside on the vessel infrastructure, a flexible approach should be used to feed and synchronize master data from office to vessel. The approach must be as flexible as possible, with the minimum impact on vessel and no maintenance cost.

IMPLEMENTATION /APPROACH

Our approach could be summarized in the Figure 1. that explains the main concept of the platform.

How to overcome network limitations

Exchange actual data using traditional methods and existing infrastructure (File transfers) Email and file transfer, is usually a solved problem for most, if not all, maritime companies. The best way to send and receive structured data between office and vessel, is to use the existing channels. So, a critical decision is to pack data in a format that can be delivered using simple file transfers. The way to accomplish this, is to add a metadata layer above the core information. In most cases, the core information is JSON format which contains the main data values and a lot of metadata, used to persist, synchronize, enforce rules, etc. When submitting a piece of information to or from a vessel, the data is wrapped with additional metadata that:

- Help the sync engine to identify different types of information.
- Validate information quality.
- Allow the orchestration of rules to be available on both sides.

For example, a form would be serialized as the following JSON string:

```
{
    Author: “User 1”,
    Created: “2017-01-01 13:21:45”.
    Status: “Pending for Approval”,
    Owner: “Marine Personnel Department”,
    FormData: {
        Vessel: “01”,
        SubmittionDate: “2017-01-02
    14:00:12”,
        VesselPosition: “”,
        Port: “PORT A”,
        Comments: “”
    }
}
```

In order to send this form, the wrapper includes additional metadata like the following:

```
{
    FileCreated: “2017-01-03 22:45:34”,
    FileSize: “23kb”,
    FileParts: 12,
    FileSizePart: “2kb”,
    HashValue: “ABCDEFGH0987654321”,
    Priority: “High”
    EXISTING-FORM-DATA…
}
```

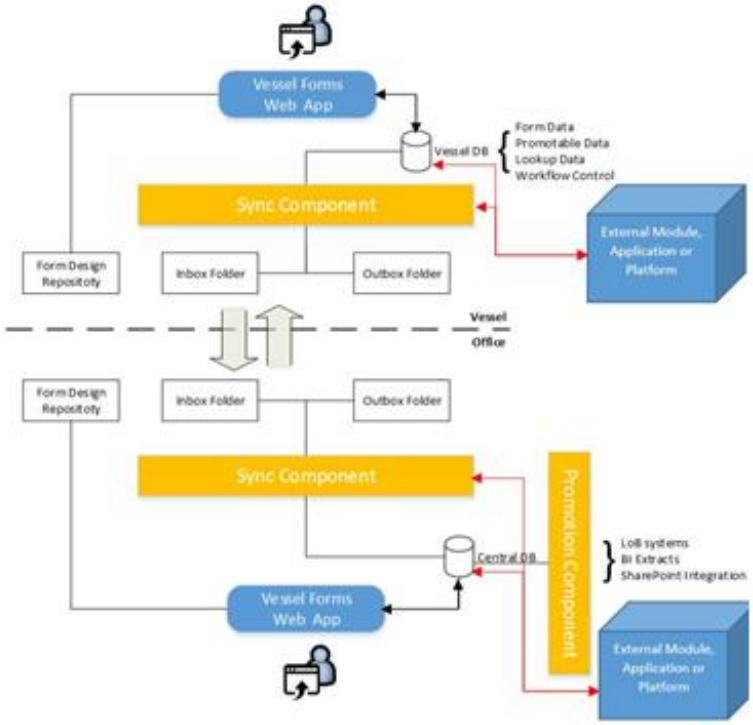

Figure 1: Architecture

1) *File based Inbox/Outbox approach on both sides.* Both sides (office and vessel) keep a very simple INBOX/OUTBOX approach to send and receive files. Inbox and outbox are folders, synchronized when each vessel establishes a connection. The files are split in small segments, to avoid issues with disconnections, which is a common scenario.
2) *Data compression/encryption.* Data is encrypted and compressed before leaving each outbox, and the reverse procedure (decompression and decryption) is performed on arrival.
3) *Priority.* Sending a file instead of another, depends on many factors. These factors vary from maritime company to another, but a rule of thumb is:
   - Send smaller files.
   - First send to vessel with recent connectivity (or better connectivity).
   - Send important files (this is based on metadata).
   - Send almost completed files (when a file is split in many parts, prefer to send the files that are almost complete).
   - Send the older files (saved in outbox).

The above algorithm uses weights and the files in each outbox get a score which defines the final order of delivery.

Keep change management on vessels simple

1) *Simple Database Design.* In order to avoid vessel database maintenance, a very simplistic database schema is selected that persists its actual structured data in JSON format and not in a normalized database. This has the drawback that it is more difficult to apply referential integrity in the submitted data, but the actual benefit, is that this approach is very easy to maintain and change whenever the business needs to change.
2) *Promotable mechanism to allow fast and reliable search.* To allow faster searches, the system "promotes" selected data in a "semi-normalized" format. The important data values from each form, are saved in a separate database table, thus allowing faster searches, as well as the option to use promoted data as master data for other forms. There is a disadvantage due to low performance on searching when no promotable data is used and the underlying system does not support native JSON queries.

3) Concurrency updates. Entity ownership. Each transferred entity, is marked as owned by a site (office or vessel) and a user. Two levels of ownership:
- Site level
- Person level

As soon as the vessel submits a form, the engine applies the defined workflow, changes the owner of the form to {OFFICE/Marine-Personnel-Department} and at the same time, the vessel loses any edit rights on the form, even if the form does not arrive at the office that exact time. Specific users from the office, will have access to this specific form instance, as soon as it arrives at the office side and synchronizes with the office database. Administrative tools can recall the form, but this is not the common scenario. Person level ownership spans across multiple user attributes and systems:
- Rank
- Department
- Username
- AD Group
- Company
- Hierarchy position

Feed and sync reference data on vessels

Define a file-based data-source entity. Data residing on the office side, which should be used as reference data on the vessel forms, should be gathered and fed to the vessels in a structured and automatic daemon. An integration daemon on the office side runs on a schedule basis, and identifies changes on master data. It uses the inbox/outbox system to send changed data on the vessel side. An automated mechanism on the vessel expects changed data and stores them in a way that is usable to existing applications/forms. The office integration daemon can work using rules, sending different data for each vessel, when applicable (i.e. Sending specific engine or tank info for each vessel).

Forms Designer

The most traditional vessel-office communication is based on email messages and office documents (word/excel files). Information is greatly unstructured and it usually requires a lot of additional effort (from the office side) to archive and maintain structured data out of the data received from the vessels. This procedure generates many errors and due to the effort required, it is not done for every piece of information received.

To assist the rapidly changing business needs, easy and flexible tools must be used to allow office-users/developers to design and maintain structured forms for every business need. A drag-n-drop designer helps users quickly design forms as well as design reusable user interface components (widgets) that can be added to new forms and save effort and time from the design process (Figure 2.). The actual data that must be persisted by the form and transferred between vessel and office, are easily marked by just applying a property name for each control. The control, form, underlying engine has the mechanisms to transform user data to a JSON formatted object, attach required metadata (vessel, author, dates, etc.), apply validations and workflow rules and persist data in the generic database residing both at the vessel and the office side. Versioning is a critical issue when designing forms. Each form designed keeps its version inside the form metadata and the engine is responsible to display the correct form for each piece of information in the system database. Finally, to keep maintenance simple for form design, the actual form definition is saved in files, so the same mechanism that is used to transfer data, is used to deploy the latest form definitions to each vessel.

Workflows – Business Processes in a disconnected world

A critical issue in a vessel-office data exchange is the need to apply constantly changing rules and strict procedures in the exchanged data. This forces us to employ a flexible mechanism to build and maintain processes. To be able to follow changes, our approach required to design and process for each exchanged form, and letting the form “carry” its process along the way, as it travels between vessel and office infrastructure. The data travels, and the defined process travels with it. This has a size impact, as the

defined process/workflow, contains information that transfers through the network and adds some size to the exchanged data. Nevertheless, it allows the system to be super flexible to changes, without the need to maintain complex sync mechanisms on the vessel side. Moreover, compression mechanisms could be used to minimize process/workflow info size.

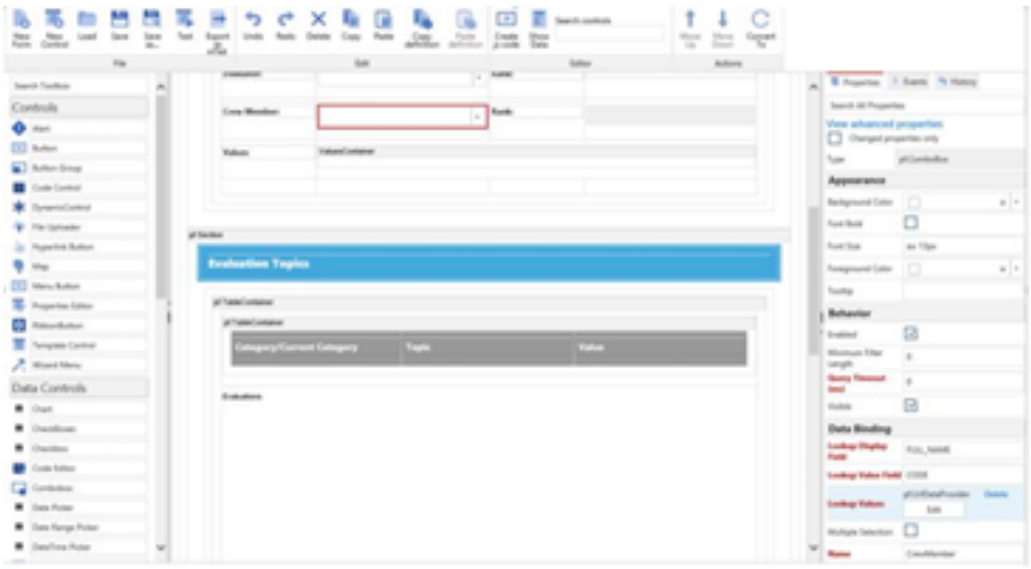

Figure 2. e-Form Designer

To execute the workflow, 2 approaches can be applied:

- Full workflow engine on the vessel side.
- Run-on-submit execution for processes.

Although the disconnected nature of the data exchange system, does not allow parallel workflow steps, most of the processes can be simplified to something like a state-machine workflow, making it possible to run both on vessel and office without issues. In some cases, parallel actions on data can be allowed using complex merging algorithms on data persistence.

The workflow's steps are:

1) *Design the process.* The process is designed using a complex but user-friendly user interface and vessel-process-specific workflow nodes, allowing the designer to focus on the process itself (Figure 3.).
2) *Binding process to the form.* Each designed form, contains a rich set of vessel specific metadata, like user rights and workflow process definition.
3) *Running the process.* Run-on-submit execution The simplest way to execute the process is to automatically run the workflow engine, at the submission time. The user can wither approve/submit or reject a form, and the system automatically handles all the process rules defined in the workflow. This way, no infrastructure is required on the vessel, meaning a more clear and maintainable environment.

Advantages:

- Allows users to design applications from simple to complex, without worrying about the change management to follow
- Has minimal maintenance cost for vessels
- Most of data maintained on the office side and automatically fed to the vessels

Disadvantages

- Limited referential integrity on submitted data, since JSON structured data is used. Although this is a drawback, this also is the key factor that allows the system to maintain its flexibility overtime. Data integrity can be enforced and maintained on the office side, where all the tools and man power is available.

Use of the Transmited structured Data

Using the "MarineInfo" platform as an information and Data source we implement several solutions for further analysis and decision support, such as:

Figure 3: Process Designer

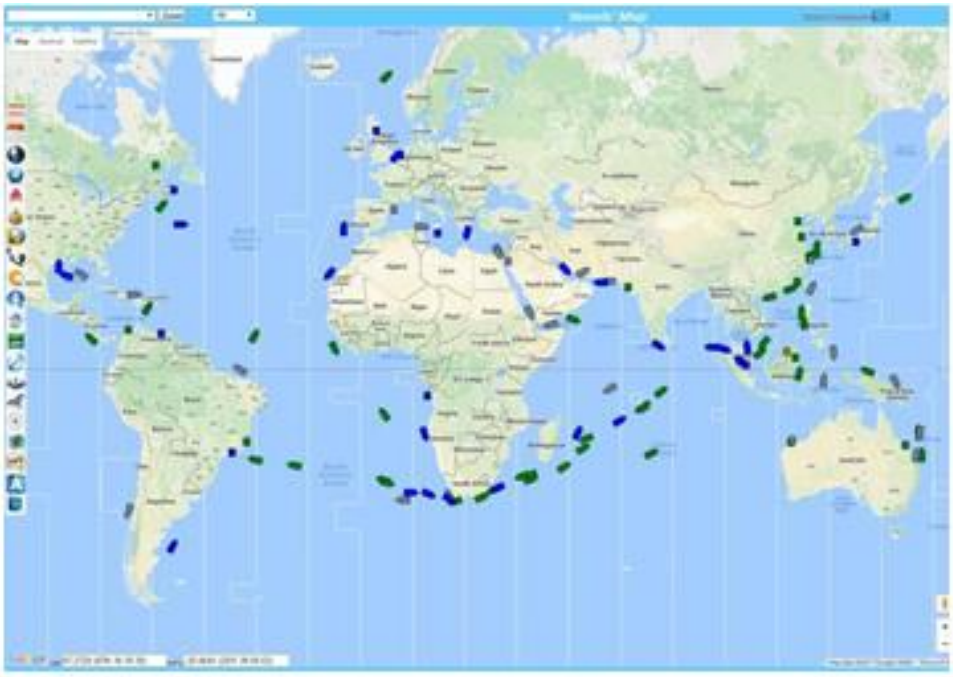

Figure 4: Vessels' Map

1) *GIS – Vessels' Map*. Which is an umbrella application that uses information from several sources (platforms, Databases etc.) and combine them to a single point of reference (Figure 4.).
2) *Seaman Evaluation Cartd.* A combined report that uses evaluation e-form data from "MarineInfo" Platform (Figure 5. and 6.).

Figure 5: Crew Evaluation Form

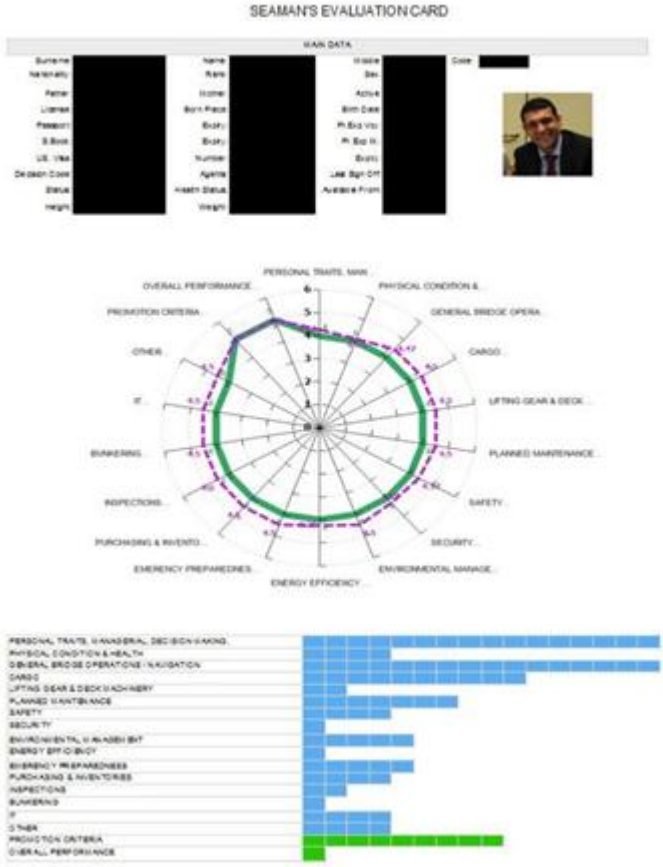

Figure 6: Evaluation Card

CONCLUTION

In this paper, we described the implementation of Marine Info platform, with which we can transferring structured data between Vessel and Office and applying business processes.Things to consider for future enhancements are:

1. Orchestrator, an automated rule engine that will enforce rules among different processes is considered to be vital for a more complex system. As the system progresses and gets bigger, the need to monitor the complete process could be done, using an engine that will be fed with simple

and complex rules that will notify users, create new processes, monitor data exchange periodicity, etc.

2. Full workflow engine on the office side could enable parallel actions from multiple users on a single process.
3. Split Vessel and Office workflow processes in order to minimize data transferred. Allow rapid business process changes on the office side (which is the most common scenario).

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PUBLIC AND PRIVATE TOOLS OF SOCIAL ENTREPRENEURSHIP SUPPORT: COUNTRY ANALYSIS

UDC: 005.511:364.3

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ABSTRACT

The rapid progress of modern society makes weaknesses of traditional economic systems more plainly evident. Latest century Western and Eastern world have faced a variety of cultural, social and informational revolutions while conservative management methods stayed permanent. Long-standing patterns of distribution responsibilities between government, business and citizens have been dispersed because solving of contemporary problems is possible only with complex cooperation of various actors, not only governments. Internal and external factors provoke a progress of the nonprofit sector all over the world, including social entrepreneurship. The article addresses this phenomenon in the view of economic and legal systems development and gives some conclusions about local specifics of its evolution in different regions. Authors make country analysis of this phenomenon and focus on relation between public and private methods of social business development. The research demonstrates what tools are more popular among governments and foundations, what forms of support are more effective and what over-estimated are and also fix cross-country tendencies of social entrepreneurship evolution.

Key words: social entrepreneurship, social innovation, government support, private foundations.

INTRODUCTION

The world at the turn of the 19th and 20th centuries needed great scientific discoveries, inventions, new machines and machine tool stations; the world of the 21st century requires new approaches to economics and business, as it is the world that has survived several cultural, social, and information revolutions in a short time.

In a study conducted by the World Economic Forum organization on the grounds of the 2008 economic crisis, two-thirds of respondents under the age of 30 expressed the opinion that the financial crisis is a reflection of the crisis in modern business values (Everybody's Business: Strengthening International Cooperation in a More Interdependent World, 2010). Traditional market-based instruments and approaches to business lag behind social changes, but the conservatives who believe that the usual approaches work and the sole purpose of business is only to earn money, continue to prevail not only among ordinary citizens but also among people who make key political and economic decisions. But happily there are enthusiasts who profess new views on business, offering social innovations and modern integrated approaches.

Among plenty of famous concepts, such as corporate social responsibility or the shared value theory that has grown out of it, implemented primarily by large corporate players, there is a concept of social entrepreneurship which is being singled out, mainly by representatives of small businesses. The business approach, which is based on the social problems solution, has already gained credibility. In many countries the state, funds, and the educational environment are actively stimulating the

development of social entrepreneurship. However, the "third sector" has yet to develop its potential to become an equal participant in the solution of social problems.

For our country, a culture of social business development is a timely topic, considering the state's declared interest in this subject and a wide range of social problems. The focal point of our research are local models of social entrepreneurship, especially in aspect of balance between public and private instruments to stimulate social entrepreneurship, as well as identifying prospects for the social entrepreneurship development in Russian environment.

ANGLO-SAXON AND CONTINENTAL ENVIRONMENT OF FORMATION SOCIAL ENTREPRENEURSHIP

Theoretical justification of the concept of social entrepreneurship began in the decade of 1980s: P. Drucker was one of the first who designed an idea of entrepreneur whose motivations are more than material. In his book "Innovation and Entrepreneurship" (1985) he pointed that one of brightest examples of social business were American private universities which obviously didn't realize making money as their main mission. Approximately in the same years, the term "social entrepreneurship" has been formed. Probably this term was introduced by F. Spreckley in the monograph "Social Audit: a management tool for Cooperative Working" (1981) and meant "labour hiring capital with the emphasis on personal, environmental and social benefit". However, an idea of an enterprise focused on solving social problems began to take shape much earlier. The forerunners of modern social enterprises began to appear in the United States and Great Britain in the first half of the 20th century. In the US, the Great Depression exacerbated social contradictions, and it finally approved the request for the participation of the population and business structures in solving social problems. The emerging "third sector" has quite successfully established itself in the American system and has spread to countries consisting the Anglo-Saxon legal system (primarily Canada and, to a lesser extent, the UK).

It should be noted that the highest entrepreneurial culture, stable and effective institutions have been formed in Anglo-Saxon legal system, that evidenced by the Global Entrepreneurship Index for 2018 (GEI), where the USA, Canada, the United Kingdom and Australia dominate in the top five countries. Quite logically, the "third sector" in these countries is an important branch of the economy: according to data published by J. McCrary from the American University (2016), 11% of start-ups launched in the US are social-oriented. In general, 5.8% of the total population is involved in social entrepreneurship. Despite the existence of hybrid organizations and non-commercial organizations engaged in commercial activities to provide statutory activities, the specifics of the Anglo-Saxon countries, and primarily the United States, is a focusing on an enterprise as a profit-making institute. According to J.A. Kerlin (2006), the definition of social entrepreneurship, which is shared not only by many leading associations and foundations, but also by the academic sphere, can be formulated as an activity aiming two equivalent missions – revenue generation and achievement of "social benefit". At the same time, for organizations whose fundamental activities have a non-commercial nature, the term "social enterprise" is often used in the meaning of any income-generating activity or strategy that is implemented by a non-profit organization with the aim of generating profits to support a charitable mission.

In the US, the state, as a rule, doesn't take an active part in stimulating social entrepreneurship, providing only a supporting function. Because of local legal specifics, even the issues of organizational and legal regulation here don't have a national nature: the special organizational legal form L3C for low-profit enterprises was first introduced in Vermont and is currently extended to 34 states. Its alternative for commercial organizations with the social component is called "Benefit corporation" and covers 14 states for today. It should be noted that the registration of enterprises in any of these forms does not imply legal or tax preferences, and primarily provides a positive image trail in the form of confirmation of social-oriented activity, which allows to attract investments more successfully.

The high level of ethics of non-profit organizations in the USA has naturally led to the fact that several authoritative associations offer certification of social enterprises. High requirements, verification of the data lead to the fact that, for example, the status of "B corporation" appropriated by the non-commercial association "B Lab" is usually quoted among investors even higher than the choice of a special organizational and legal form.

As stated above, state support has a supportive nature: federal and state governments seek to reduce administrative and bureaucratic barriers for social entrepreneurs, enhance the image of social business, implement public procurement from socially responsible companies, and extremely rarely use direct government grants. At the same time, despite the absence of tax preferences for social enterprises, the state encourages funds and large business to grant social business support by deducting from the tax base the amounts that went to grant support.

For today the support of dozens of large and small funds is the main driver of the development of social entrepreneurship in the United States. Support is provided in the form of grants, loans and quasi-loans. For example, the Ashoka Foundation provides financial support, gives access to infrastructure, forms professional communities and promotes best practices.

Finally, an important element in the development of social entrepreneurship in America is the inclusion of social entrepreneurship in its agenda by the academic community of the United States. To date, social entrepreneurship in the United States has been devoted not only to individual courses, but also entire syllabuses in leading universities (Pennsylvania University, Yale, Stanford and others).

The British environment of social entrepreneurship is close to the American because it is also oriented on financial sustainability – profit making and its reinvestment. Despite working within an European, socially-oriented agenda, social entrepreneurship is involved even in those areas that in the continental Europe have a reputation of commercial and most technological. According to the last annual report by Social Enterprise UK (The Future of Business. State of Social Enterprise Survey, 2017) 16% of UK social enterprises work in retail, 9% in creative industries (web, design, printing), 7% in the ecological sector (including recycling), 7% provide financial services. Besides, 51% of British social enterprises demonstrated profitability in 2017, and another 20% achieved the break-even point.

At the same time, the British model looks more balanced than the American one: here the effective work of the funds is combined with the deliberate actions of the state, which has formed the regulatory and legal foundation and infrastructure.

An attention of the first persons of the state to the subject of social entrepreneurship has been observed since the end of the 1990s, when Tony Blair announced in 1997 his readiness to support socially-oriented entrepreneurs. After him the importance of social entrepreneurship has been stressed by all major political parties and by the Queen. Such attention is not just an image stroke or part of an election manifesto: under Tony Blair, the Department of Trade and Industry established the Department of Social Entrepreneurship and the first regulations that defined the essence of social entrepreneurship in the British environment: according to the definition of the Department, “a social enterprise is a business with primarily social objectives whose surpluses are principally reinvested for that purpose in the business or in the community...” (Social Enterprise: a strategy for success, 2002). A bit later, in 2005, in the UK was introduced a new legal form for social enterprises – CICs. Unlike the USA, such registration has not only image advantages: firstly, it provides the possibility of “asset lock”, protecting against aggressive investment. The second advantage of CICs is the optimization of taxation, which makes it possible to avoid an income tax from non-core entrepreneurial activities.

The second important direction in the state stimulation of social entrepreneurship in the UK is the provision of a certain share of government purchases from social enterprises: in England this measure is provided by Social Value Act and by the Procurement Reform in Scotland. At the same time, the British Parliament became the first accredited state organization that purchases in accordance with social principles.

However, considering the British model of stimulating social entrepreneurship, we can’t ignore the large participation of non-state funds. The first fund, which supports social entrepreneurs – UnLtd, based on seven non-profit organizations – appeared in the UK a few years before the introduction of the first state-provided tools. To the current moment in Great Britain there are about a dozen large funds (Social Enterprise Investment Fund, Big Society Capital), which provide entrepreneurs with support on the described above American model. We can note that in this aspect the state also takes an active part, providing a 30% tax deduction for investors of charitable foundations and CICs.

Finally, social entrepreneurship communities play an important role in providing the infrastructure for social entrepreneurship and promoting best practices, among which Social Enterprise UK leads the way, providing methodological support and promoting the values of social entrepreneurship in the UK and beyond.

Thus, the British model is well-balanced, combining the private tools used in the US and a carefully thought-out public policy.

Turning to the model of continental Europe, it should be noted that the local conjuncture didn't imply the rapid development of non-profit organizations and socially-oriented companies, because there was formed a reliable model of social protection in the European Union. Until recently, the solution of almost the whole range of social problems was the content basis of the EU countries and they successfully solved it. However, the crisis events of recent decades forced the EU countries to form and involve the "third sector". At the same time, social business is viewed as an actor to whom the state delegates some of the problematic issues, which generates the primacy of the social effect over profitability. The definition given by the European Commission in the Report "European Map of Social Enterprises and Ecosystems for Social Entrepreneurship", confirms our thesis. According to it, "a social enterprise is an operator in the social economy whose main objective is to have a social impact rather than make a profit for their owners or shareholders". The relative exception is a short list of countries (Czech Republic, Croatia, Italy), where local laws set a minimum limit for income received from entrepreneurial activities (from 10 to 70% depending on the country).

Obviously, in such conditions, the state should find particularly effective incentives for potential entrepreneurs. To date, more than half of the EU countries have formed or are in the final stage of forming a comprehensive policy towards social entrepreneurship. Thus, at the end of 2016, 16 countries developed a special legal framework for social enterprises. One of the main tools for stimulating social entrepreneurship are financial indulgences for social enterprises in different countries. Local acts of different countries suggest subsidies, partial exemption from taxes and other preferences. For example, the Finnish Law on Social Enterprises suggests subsidizing social enterprises for hiring people with disabilities as compensation for reduced productivity. Similar measures are in force in Greece, along with tax benefits for income tax, exemption from municipal taxes and VAT. In Italy, there are also extensive tax and insurance indulgences for social cooperatives, as well as giving social enterprises the status of preferred public procurement suppliers for contracts of up to 300 000 euros. Similar measures to support social entrepreneurship operate in Poland, Lithuania, Slovakia and other countries.

In Western Europe, we can state a certain heterogeneity in the spread of social entrepreneurship: about half of the EU countries do not take active measures for development. It is worth summarizing that the development of social entrepreneurship here is stimulated mainly by state with critically low participation of private funds, which affects the nature of social entrepreneurship as solving problem oriented more than profit-oriented in contrast to the Anglo-Saxon model.

RUSSIAN ENVIRONMENT OF FORMATION SOCIAL ENTREPRENEURSHIP

For the Russian reality, social entrepreneurship is not yet an important element of the economy, but attention to this topic, both from the state and from private foundations, is increasing. So, in the last five years we can notice a serious interest of the first persons to this topic. In particular, in 2013 D. Medvedev instructed to draft a bill regulating social entrepreneurship, and in 2017, V. Putin at a meeting with representatives of social and charitable organizations, noticed that the Government has drafted a law that defines the essence of social entrepreneurship in russian conditions.

It should be noted that the inclusion of social entrepreneurship in the agenda of the meeting with representatives of charitable organizations and volunteer movements demonstrates that the state perceives social enterprises as non-commercial projects, obviously underestimating the business potential of this direction. In support of this thesis we can quote the Assistant to the President of the Russian Federation A. Belousov who said that the state "needs to understand how the mutual relations <…> of social entrepreneurship and volunteerism should be built, because these are like communicating vessels". In addition, social entrepreneurship in Russia remains a "marginal story", as 90% of social entrepreneurs in Russia are women over 30 who have children and provide services in the field of family and child support.

As a positive moment, it should be noted that the state drew attention to such a mechanism for supporting social entrepreneurs, as providing non-governmental organizations with access to provision of services in the social sphere. To some extent, this reminds us of the British practice of the Social Value Act, but the analysis of the triggers of the road map developed by the Government in 2016 demonstrates a focus on a very narrow range of services (preschool education, medical insurance, etc.) again.

At the same time, the experience of the funds (including funds affiliated with the state) demonstrates that Russian entrepreneurs are able to create competitive projects in various fields, including a technological component. For example, the publication of the "Republic" in February 2018 (Now I realize what for I wake up and go to office every morning, 2018) issued an interview with the founders of three technological social projects. Among them is the "Meet for Charity" platform, designed to organize meetings with famous people; "One + One" trading platform, aggregating offers from users or shops ready to give a percentage of the sale to charity in exchange for access to the blockchain-platform; "Greenhouse of social technologies", which provides an educational platform for non-commercial organizations, and also additional services in the field of web-technologies. At the same time, all listed projects have been launched with money from funds or private investors, are close to self-sufficiency, and "Meet for Charity" is already preparing for the test opening of offices in London and New York.

The thesis that social entrepreneurship in Russia is capable of diversification is confirmed by the data of the "Catalog of Social Entrepreneurs", created with the support of the Gladway Foundation and the "Our Future" Foundation. To date, more than 500 projects have been registered in the catalog, of which a tenth are representatives of the technology sectors: IT, waste recycling, energy efficiency, development of the territory, etc. At the same time, we can't deny the imbalance in the direction of educational services, goods for children because they occupy more than half of the positions in the catalog. In addition, it should be noted that some of the projects presented in the technology sections do not have a high level of development and in the current state hardly claims to achieve a break-even point.

Despite the critical appraisal of the work of legislators in the formation of the regulatory framework and rather superficial work with the institutions, a certain set of measures by the state deserves complimentary responses. In particular, in 2014 the Ministry of Economic Development launched the program "Economic Development and Innovative Economy", according to which subsidies of up to 1.5 million rubles are provided for socially-oriented business. Besides, the Agency for Strategic Initiatives implements the launch of Social Innovation Centers in different regions: currently, the centers that provide infrastructure support for social entrepreneurship exist in 22 regions.

In light of the above, we can say that the situation with social entrepreneurship in Russia is not as critical as it may seem at first: the attention of first persons is focused on the issue, several large funds are fruitfully engaged in social entrepreneurship, in the next three years it is expected to consolidate some fundamental issues in normative legal documents. Social entrepreneurship is viewed by market participants in the framework of Western (rather American, than European) tendencies, which is demonstrated, for example, by the definition given by the "Our Future" Foundation: social entrepreneurship is an innovative activity, initially aimed at addressing or alleviating the social problems on a self-supporting basis and stability. It is only natural that the trust fund Thomson Reuters Foundation estimated the prospects of social entrepreneurs in Russia in the top 40 rating in 2016, while Norway, Austria, Japan and other countries were below Russia. To implement this potential, a whole range of measures is needed, including the development of an institutional environment for social entrepreneurship, an increase in the volume and forms of financing of social projects, the improvement of the image of socially responsible companies and, of course, the creation and dissemination of learning programs for social entrepreneurs.

CONCLUSION

Social entrepreneurship in the last 15 years has become one of the main trends around the world. Increasing social problems, cultural and information revolutions, changing views on business solely as a source of profit – all this provokes the creation of new harmonious business approaches. The experience of the United States, Great Britain and Western European countries shows that these

approaches do not just work as an increment to the economy, but are an independent significant branch. Modern social business can effectively solve social problems and simultaneously show financial stability. It is quite natural that the first successes of social entrepreneurship in the world provoke active stimulation of this sector.

Our analysis demonstrated that, depending on the legal and cultural environment of certain countries, a different balance of state and private actors' participation in the development of social entrepreneurship is emerging. In the United States social entrepreneurship is so successfully generated by private foundations and a private civil initiative that the state is virtually excluded from participating in market development, concentrating itself to symbolic supportive measures. A similar situation could arise in the UK, but the legacy of EU policy, the greater compactness and homogeneity of Britain in comparison with the US is manifested in the successful collaboration of funds and the state, which every year produces new and new fundamental steps for the development of social entrepreneurship, which makes this country the best a place for social business in the infrastructure and institutional aspects. In the countries of continental Europe, social entrepreneurship is very heterogeneously developed and is almost always provided with the active support of the state, which sees in social entrepreneurs rather a sector to solve social problems than financially sustainable successful participants in the national economy.

In Russia, social entrepreneurship is still at the initial stage of its development, which is reflected in its orientation to a very narrow range of activities (for example, more than half of the projects are implemented in the sphere of motherhood and childhood) and no claims for financial stability. Nevertheless, the close prospects for the formation of an institutional foundation for social entrepreneurship, the extensive interest of private foundations and the growing interest of civil society in such business approaches can raise the potential of Russian social business.

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STRATEGIC EVALUATION OF MICROFINANCE PROGRAMS

UDC: 005.21:336.77

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ABSTRACT

Strategic evaluation of microfinance programs in essence covers that approach we handle the programs. In the framework of this approach, we can differentiate two main directions of the evaluation; social and business side. In Hungary, microfinance is currently approaching from a business point of view, while in the western countries the social impact is much more important. This approach causes several problems in the SME sector, e.g. missing sources, lack of growing and lower surviving rate. It's especially important to find a solution for this problem because Hungarian economy success largely depends on the domestic SME sector.

Key words: microfinance, microcredit, SME, strategy, self-employment

INTRODUCTIONS

Nowadays, Hungarian SME financing programs facing off with several problems in comparison with best practices of western countries:

- business approach is used at the planning of success requirements
- current microcredit programs are not accessible for the classical "microfinance" SMEs,
- creditable SMEs can be excluded from the sources
- lack of mentoring after the financing decision.

The layer of the population - primarily the poor and the women - who do not have the opportunity to turn to a formal financial sector should be granted by establishment of microfinance institutions. This means the most important and the original goal of microfinance. (Handa, 2012) (Yunus, 1999)

MICROCREDIT IN HUNGARY

The primary objective of microcredit is to provide a lending system that allows the provision of capital, professional and financial assistance to non-bankable poor who can't funded by conventional banks. (Szabó, 2006) In Hungary, during the 2007-2013 period, a large number of SME-related support programs ran on a high level. Among them, one of the most popular products was the so-called combined microcredit which operated within the framework of the New Széchenyi Plan (in short, ÚSZT). The essence of the scheme was that the SME could take a loan up to 10 million HUF, of which 10% was self- contribution, 45% was the loan itself and 45% was the state aid. In practice, for a transaction of 10 million, it meant that the state provided a non-refundable grant of 4.5 million HUF, the remaining 4.5 million HUF was a loan on a fixed interest rate (9% per annum, from 2012, 6.5% per annum). The product contained social obligations; the contractor had to employ at least one employee and the wage and salary paid to him had to reach half of the non-refundable amount until the

end of the follow-up period (3 years). This program clearly showed the essence of the microfinance; a business model was adopted in a social field. Overall, it can be concluded that the success product of the 2007-2013 period was the ÚSZT Microfinance program, which helped thousands of SMEs to expand, survive, start, and resume their business. Unfortunately, this unique product has not been resumed during the 2014-2020 period. Among others, ÚSZT Combined Microcredit and the "classic" ÚSZT Microcredit (with no 45% state aid) have not been resumed, the 0% Competitiveness and 2.5% Growth Loans was introduced to fill their place. The result in this case is also a success story, as the total amount of funds has been evacuated within a very short time. But the success should be considered in this case, because this result had a shadow side, namely not the classical target group, the non-bankable SMEs was granted by the programs.

At this point we have to make several comments:

1. The new programs are only built on reimbursable elements which is absolutely the right way
2. There is a strong demand for a classic microcredit program besides the current programs
3. There are several well-functioning intermediary networks in Hungary

The essence of the 1. point is that while in the previous planning period the ÚSZT Combined Microcredit program became popular from its combined scheme, even if we introduce a similar product in the current period would be most likely very destructive for the domestic entrepreneurial culture. In the previous period this product was a kind of pleasant catalyst for the economy, but if we were to base our support system on combined tools for these four years, it could easily lead to that Hungarian SMEs wouldn't be interested in the repayment and in the success of their own projects. In a classic microcredit transaction, the interest rate is only the tool of responsibility taking form the SME side (and not the tool of accumulation of wealth by the intermediaries). As a result, it was an impeccable step to move towards to reimbursement products. The only problem with these programs was that it didn't limit enough the maximum loan amounts. The highest reachable amount was 600 000 000 HUF which is extremely high in comparison with the previous 10 000 000 HUF. It caused that most of the participant SMEs were medium or bigger enterprises, or micro- and small with strong capital and the classic target group (non-bankable SMEs) was pressed out from the program. This led to 2. point, that there a strong demand for a classic microcredit program besides the current programs. If we are thinking about the introduction of a new microcredit, we can't pass by the question of intermediaries (3. point). Previously, the Hungarian Enterprise Promotion Network (MVA) was the main intermediary of the microfinance programs. In the current period this role was taken by the Hungarian Development Bank-points (MFB points). At the new programs the new network performed very well, achieved a rapid allocation of the program. In spite of this, there is a demand of the presence of the MVA network, because they built out a strong connection with non-bankable SMEs over the years, furthermore, if we don't involve them in the system, we lost a strong non-profit network which developed their knowledge and know-how (in the field of mentoring, SME trainings, social finance, local SME demands etc.) over 20 years. (Szekfü, 2014) Overall, a very effective solution would be that if we lead a new microfinance tool which aims the non-bankable SMEs through the MVA network to the market, of course, besides the operating network and programs (not instead of them). To verify this proposal a questionnaire was elaborated with which we tried to assess the current support of local SMEs and determinde their demands. In addition, as one of the most important parts of the identification of valuable strategic evaulation requirements, we make deep interviews with several experts of microcrediting, at the end of which we filter out the major strategic decision-making elements. From the interviews, the most important was which we made with Nicola Benaglio, the Policy and Research Officer of the European Microfinance Network.

OPPURTUNITIES IN THE FIELD OF MICROCREDIT

The primary research was carried out in a online questionnaire survey in March 2018. Finally 222 SME filled out the questionnaire, most of them was local, from Zala County. At the research, we the following results:

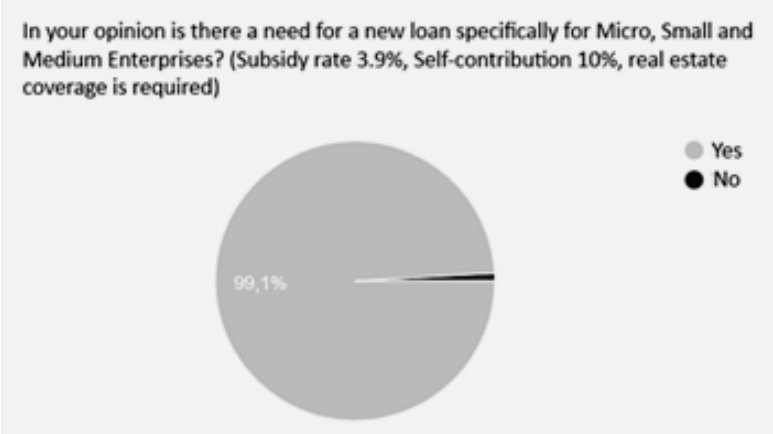

Figure 1. The need of the potential new construction

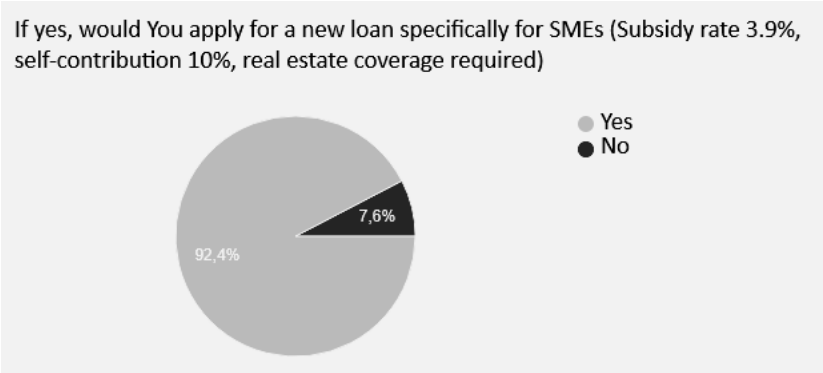

Figure 2. Application willingness of the potential new construction

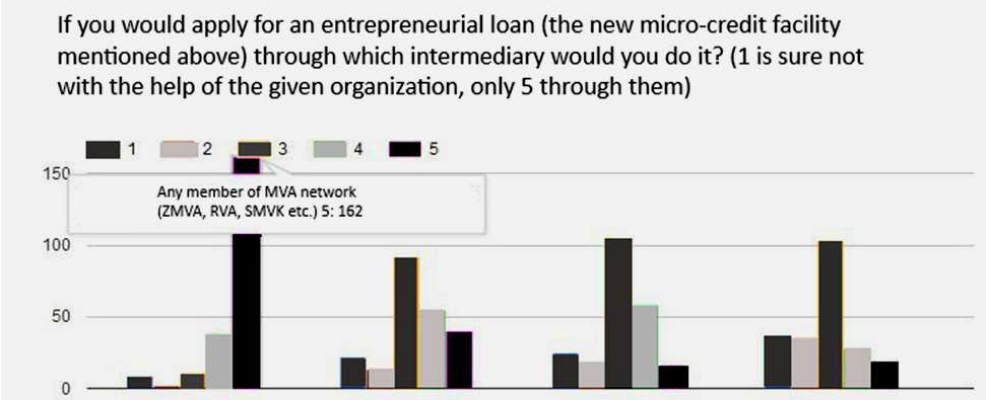

Figure 3. The evaluation of the intermediaries

In the Figure 1. it is clearly visible that from the 222 questioned respondents 99.1% answered a new microfinance construction would be needed. In addition, the 92,4% would apply for this new construction. On the ground of this results we can confirm, there is a huge demand for a classic type of microcredit in the Hungarian SME sector. On the Figure 3. we can see that against its neglect still the MVA network. It doesn't mean that the other intermediaries did a bad job in the previous period; its primary reason was that the construction was inadequate itself. Unfortunately, the owner of the source approached the new construction from business side which caused anomaly in the system. It is very important that the social approach is to come back in the near future, as without this, SMEs will remain without resources for another long years. It should also be mentioned, if this happens, the economic grow of Hungary can easily be damaged. So all in all, it can have serious negative effects on national level, not just in the sector. After we identified the problem, we should think about the solution. For this, we made several deep interviews to get to know how the domestic and foreign

microfinance experts see the essence of today's microcredit and how can we use it more effectively? As a part of this interview-series, we talked with *Nicola Benaglio*, the responsible *Policy and Research Officer of EMN* (European Microfinance Network).

For the question, how do you see microfinance today?

> *"In the context of economic crisis and growing inequality that has faced Europe in the last years, microfinance has emerged as an important policy tool to fight against social and financial exclusion, promote self-employment and support microenterprises. Nonetheless, today in Europe there remains a significant, unmet demand for people and microenterprises who are financially excluded."*

In your opinion, the business or the social side has to be prevailed in the case of microcrediting (and why)?

> *"Both elements are equally important. MFIs shall target vulnerable clients that are left apart by banks and offer suitable products (that are not harming the clients) and the non-financial support needed (mentoring, business development services, financial education) to ensure sustainability of the business financed. Viability of the business financed is key as it enables microcredit recipients to improve their income and overall quality of life."*

In your opinion, how can we strategically consider a microcredit-program as a success story? (e.g. it's reached its social goal or it was profitable, 90% customers payed back in time etc., concrete examples are also suitable)

> *"Overall, and regardless of the business model adopted, when there's the achievement of the social goals envisaged by the institution making an efficient use of the resources available ensuring the organisation/programme sustainability in the long run."*

On the ground of the answers many hypothesis has been confirmed. First of all, we can clearly see, the classical microcrediting has important impacts on EU level and not just on Hungarian level.

Because most European countries in transition (Russia, Hungary, Romania, Bulgaria, and the countries formed after the breakup of Yugoslavia, including Serbia) characterized by high unemployment rate and still insufficient readiness for competition. (Nikolić et al.), microcredit is an excellent tool to fight against poverty and to support excluded SMEs which directly contributes to economic growth. Furthermore, we can notice, there is an unmet demand for people and microenterprises who are financially excluded. This demand is absolutely measurable in Hungary. At the second answer, in our opinion the most important part is the non-financial support. We need to highlight the importance of the mentoring, the education and other business development services, because without them the for the skills needed for the survive would be never developed and owned by the SMEs. Finally, we can filter that there should be a business model which provides the maintenance of the system, but the social impact gives the efficient use of the source and this way the sustainability and long-time run of the program.

PROPOSALS

Proposals:

- A new classical microcredit should be introduced to the sector which can work beside the currently operating products
- A SME survey would be implemented in the regions to identify the most important demands of SMEs and of course the most needed social impacts
- The new product would have different targets in each region, on the ground of the previously made SME survey
- The current intermediary system should be extended with non-profit business support agencies/foundations which represents the social approach in the network

- For the success of the new program strong cooperation is needed between the local municipalities and the local intermediaries
- Final decision-making conclusions or the development factors required for strategically successful micro-credit programs:
- Social approach
- Mentoring
- Interest rates are for maintenance of the intermediary network and for sharing the responsibility between the MFI and the client (in the field of the given project success)
- In calculating a framework amount, we can calculate with loss but not for profit (if we reach profit, we should reallocate it into the framework amount)
- Close cooperation between the state and credit intermediaries / economic developers
- Success Criteria: achieve social impact

CONCLUSIONS

As a summary, we can identify the need for a microfinance facility that moves within classical microcredit borders; the framework-amount/transaction is up to 7-10 million Forints, besides the standard input criteria (cover, closed business year, etc.) the subsidy rate is 1.5% to 3.9%. The success of the program should be measured first on a social basis, within more types are available: job creation, self-employment, survival of SMEs, innovation enhancement and many more outputs. Of course, we would choose one or two of these to measure the success of the new product. The program would be tailored to the chosen target, its intensity may differ from one county (or region) to another, as well as the target set. At the allocation of the budget, the planned loss is considered acceptable by its social impact, the purpose of the interest is to provide only the necessary costs to maintain the system. It is important to mention that the money that may be generated must be reallocated into the source fund, and making new sources from this capital is also possible. Overall, we gained a realistic picture of how the social approach to microfinance should prevail, and why this is the only way for microfinance programs to function successfully.

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USE OF MULTIVARIATE CONTROL CHARTS IN ECOLOGICAL MANAGEMENT

UDC: 005:502

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ABSTRACT

A process's ability to meet specifications relies on two important parameters: accuracy and variation. Accuracy is the degree of closeness of observations to that quantity's true value and variation is relative to specification width and dispersion of data. From these factors, various control charts were developed to detect undesirable changes. With the enrichment in data acquisition systems, it is common to engage in process with more than one correlated quality characteristic to be monitored. Recently, the multivariate control charts have gained some prevalence because of their efficacy on process stability. In this study, for controlling ecological monitoring data, multivariate control chart approach has been utilized. From a multivariate distribution view, the water chemical variables have been considered together, not independent. Bu using a Hotelling T^2 multivariate control chart, variations in the signals have been assessed and interpreted. For future subgroups, some simulation works were performed and the results have been illustrated.

Key words: multivariate control charts, ecological management.

INTRODUCTION

To meet or exceed an expectation on a product, a stable and repeatable process is expected. In particular, the process must be capable of operating with little variability around the target of the quality characteristics. As a powerful collection of problem-solving tools, statistical process control (SPC) is useful in achieving stability and improving capability through the reduction of variability.

SPC is based on sound underlying principles, is easy to use, has significant impact, and can be applied to any process (Montgomery, 2012). A general practice is to inspect/control the stability of the process by univariate control charts. There are some useful control charts are encountered in literature and also in the real applications (Levinson, 2011).

In a multivariate system, it is general to engage in processes with more than one correlated quality characteristic to be monitored. To control a multivariate system, multivariate control charts (MCC) are utilized. In these type charts, the variables are analyzed together, not independently. The MCCs have a goal of quickly detecting instances when a process is out of control, as remarked by a shift in the statistical distribution of multiple measures of quality (Bersimis et al., 2007).

For monitoring the mean of many quality characteristics with a single control chart simultaneously, the Hotelling's T^2 control chart can be utilized. It has been recorded that for monitoring several correlated quality characteristics, the Hotelling's T^2 is well suited (Sullivan, 2008). This method is named as multivariate Shewhart control chart.

Environmental and ecological monitoring includes sampling from several locations of a habitat at intervals through time. The main objective of monitoring is to specify where and when an impact may have occurred or, once detected, may still be occurring. In an outstanding study, Anderson and

Thompson (2004) discussed the usability of sequential statistical techniques in the environmental monitoring. It was recorded that the control chart-based dissimilarity approaches clearly would be useful in the context of environmental monitoring. Similarly, in a recent study a new control chart strategy have been discussed for monitoring the ecological mediums (Paroissin et al. 2016).

The main motivation of this present study is to examine MCC application in ecological sciences. For this purpose, control chart applications and some simulation works are presented for monitoring the ecological situation and the variations of the measurements derived from different sites. In the next section, the theory of multivariate distribution and multivariate control charts will be introduced. After that, a case study using a real data set will be presented. In the last section a brief discussion and conclusion will be given.

METHODOLOGY

Multivariate Control Charts

Understanding the variations of samples has critical importance for system identification. As a graphical display of an attribute that was calculated or measured from a sample versus the sample number or time, a control chart provides some information for the identification. The center line of the chart denotes the average value of the characteristic corresponding to the in-control state. The upper control limit (UCL) and the lower control limit (LCL are determined so that if the process is in control. As long as the points plot within the control limits, the process is accepted to be in control. Thus, no action is necessary (Montgomery, 2012).

Multivariate process control (MPC) is designed using an observation vector. In some cases, it can be based on measuring a statistic, such as a mean vector or covariance matrix estimate, calculated from a sample of measurements. In particular, a covariance matrix describes the variability of a multivariate process. The multivariate control charts are particularly established to detect changes in a covariance matrix. A typical MCC can be specified as two phases:

Phase 1: control charts are employed for retrospectively testing whether the process was in control when the first subgroups were being sampled.

Phase 2: charts are employed for testing whether the process maintains in control when future subgroups are sampled.

Hotelling T^2 Control Chart

Hotelling T^2 statistics is the frame of this popular control chart. Consider *p*-dimensional vector of observations, $x' = (x_1, x_2, \dots, x_p)$. When the processes in control, $\boldsymbol{x}$ vectors are independent and follow a multivariate normal distribution with an unknown mean vector $\boldsymbol{\mu}$ and an unknown covariance matrix Σ. In practice, the parameters μ *and* Σ are unknown and these should be estimated by sample mean $(\bar{x})$ and sample covariance matrix (*S*). The general expression of this statistic is as follows:

$$T^2 = n\left(\bar{X} - \bar{\bar{X}}\right)' (S)^{-1}\left(\bar{X} - \bar{\bar{X}}\right). \quad (1)$$

The statistics T^2 follows an F distribution with p and (*mn-m-p+1*) degrees of freedom. This statistics uses only the UCL for process control. To provide the controls in the phase 1 and 2, the following expressions are utilized, respectively (Santos-Fernandez, 2012):

$$UCL = \frac{p(m-1)(n-1)}{mn-m-p+1} F_{\alpha,p,mn-m-p+1}\,, \quad (2)$$

$$UCL = \frac{p(m+1)(n-1)}{mn-m-p+1} F_{\alpha,p,mn-m-p+1}. \quad (3)$$

In eq. (3), the number of samples (m) denotes the preliminary samples taken to build the in phase 1 (in-control state). This charts need at least 2 quality parameters and 20 samples (Montgomery, 2012).

APPLICATION

The applications were performed by a real data set (Manly, 2009). The data is about the effects of acid precipitation in the Scandinavian countries. In addition to the coordinate values, the data set includes the water chemical parameters such as pH, sulphate (SO4), nitrate (NO3) concentrations at each sample lake.

Descriptive Statistics

The data set covers 44 measurement locations. Because detecting the spatial changes in the ecological process is the first motivation, the relationships between the coordinates have been mapped (Figures 1). The variability recorded among the chemical parameters has also been in Figure 2.

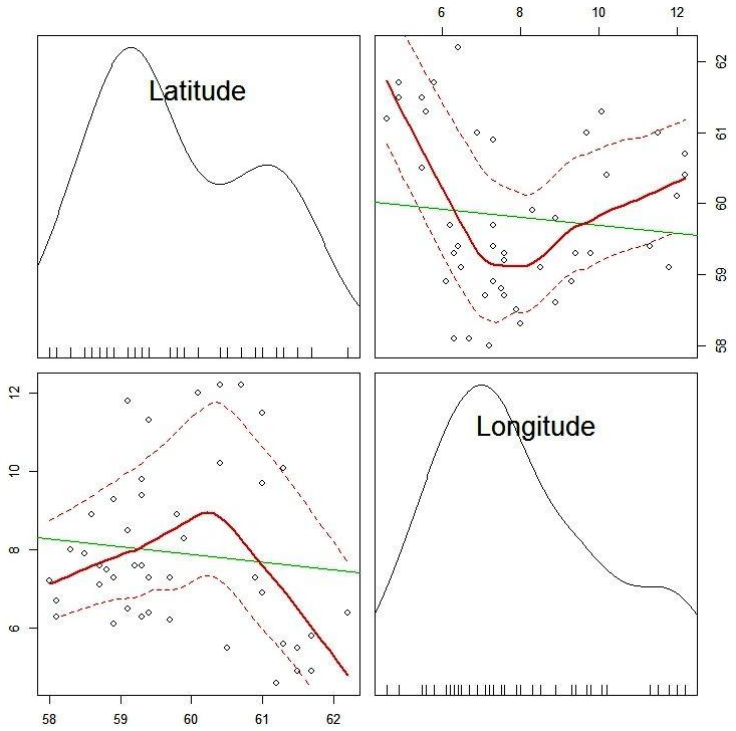

Figure 1: Scatter diagrams for coordinates.

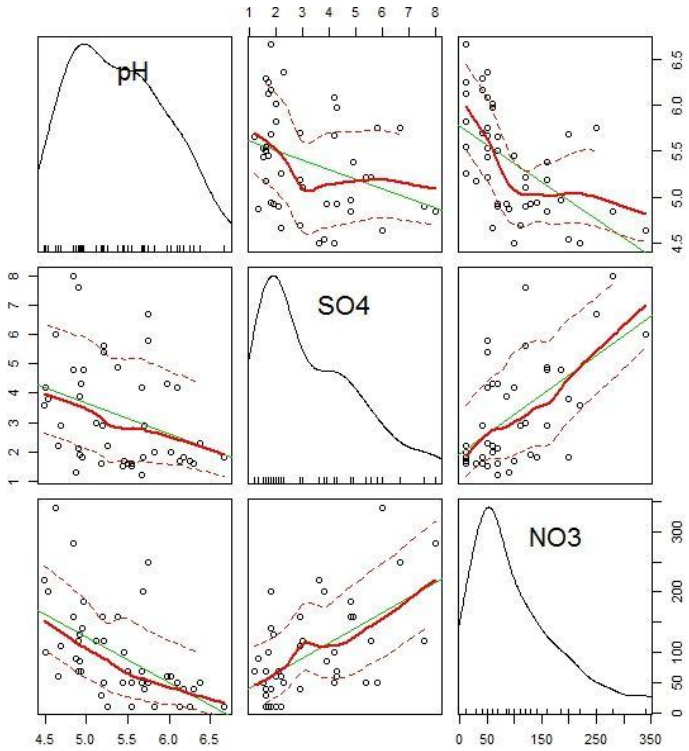

Figure 2: Scatter diagrams for chemical parameters.

Results and Discussion

By using the data set, Hotelling T^2 application has been performed. The UCL has been obtained as 10.27. As can be seen in Figure 3, no points fall beyond the UCL and the process is in statistical control.

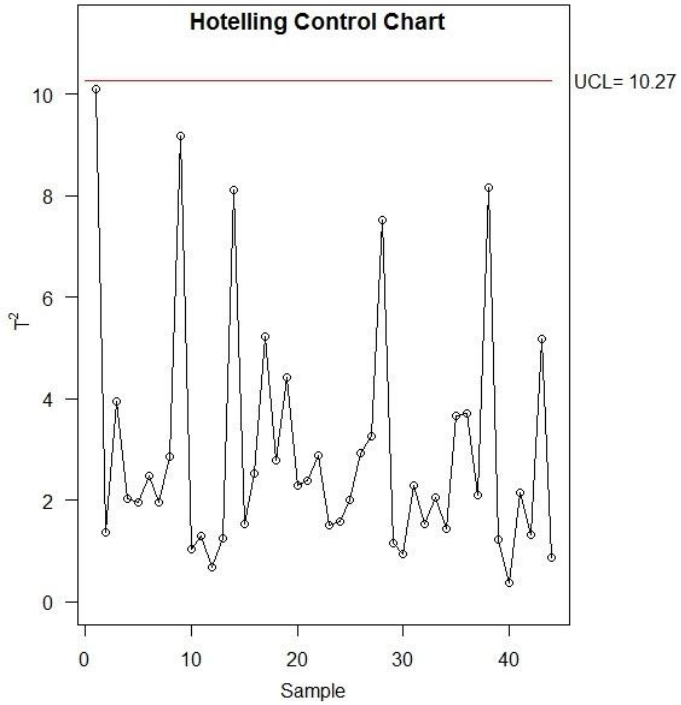

Figure 3: Hotelling Control Chart for precipitation data.

When one or more observations fall outside of control limits, there is evidence that the process has been exposed to a non-random shift. In the multivariate control charts, a decomposition technique is

used to detect the problematic non-normal signal component. In the second phase, many simulation data sets have been produced and the effective parameters on the observations outside the control limit have been appraised by the MYT decomposition proposed by Mason at al. (2008). The MYT decomposition shows the contribution of each individual variable and possible combination. In phase 2, the following expression compares the simulated data threshold in accordance with the sample size;

$$UCL = \frac{p(m+1)(m-1)}{m(m-p)} F_{\alpha,p,m-p} \quad (4)$$

In the simulation works, the T^2 value, bigger than upper control limit ($T_j^2 > UCL$), was eliminated and the new T^2 statistics was constructed for the combinations of the remaining variables. The outcomes of some simulation works are given in Figure 4. As seen in the simulation plots, about two points fall beyond the UCL and about 98 points are under the control. Although the results indicate a non-problematic ecological system, the extraordinary measurements recorded should be analyzed together with the chemical variables parameters by the decomposition method.

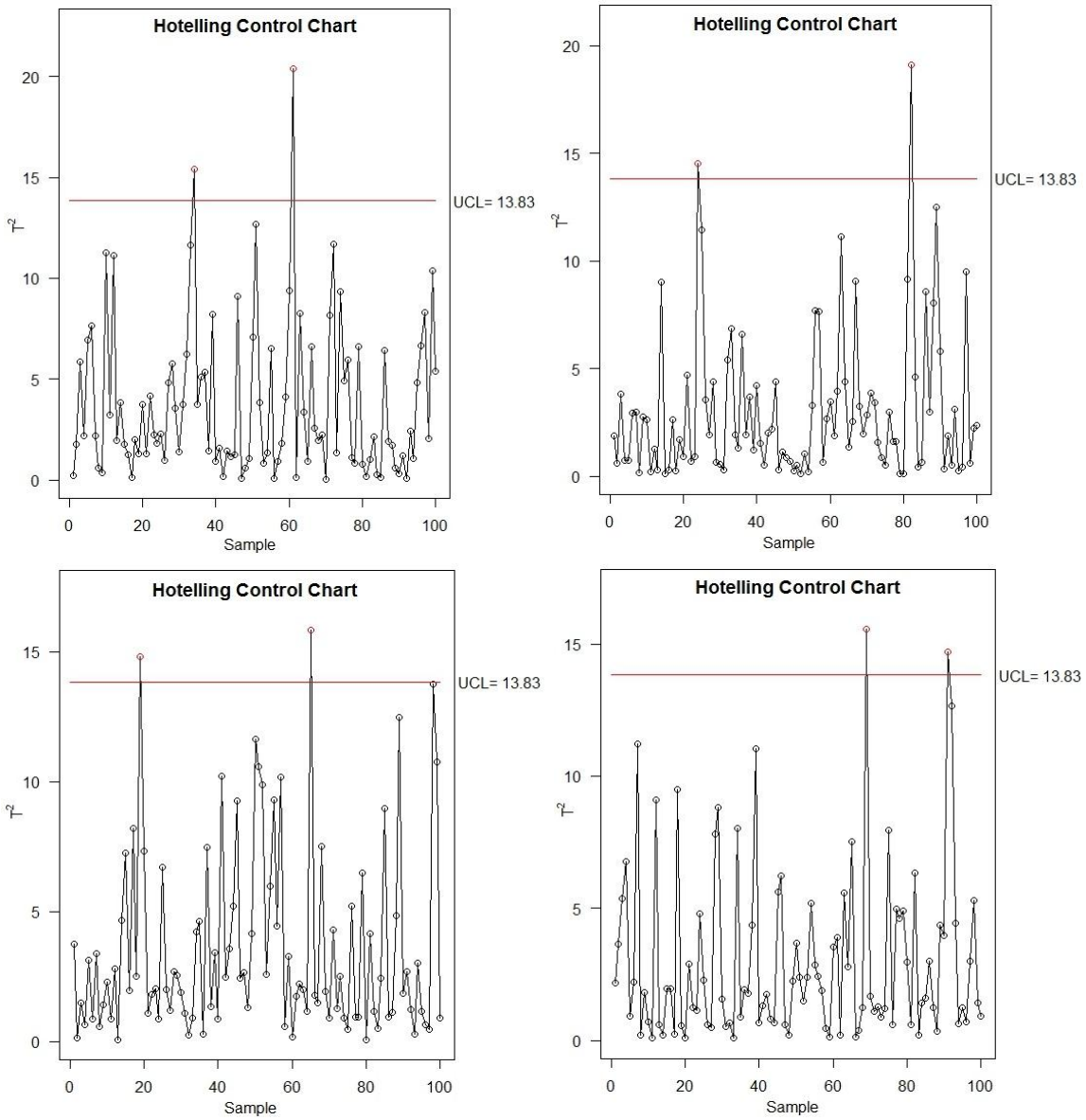

Figure 4: Simulation works for process stability.

CONCLUSIONS

In experimental system identification, both accuracy (closeness to true value) and variability (dispersion) should be assessed. The control charts provides some opportunities for making an integral evaluation.

In this study, multivariate control chart methodology has been used for monitoring and detecting the water science data. The water chemical variables were considered together, not independent. By this way, variations in the signals have been assessed and interpreted in the same framework. The conventional chart analyses and the simulation works indicated that multivariate control chart can be employed at the sites to appraise the ecological changes.

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Session A: MANAGEMENT

Papers (pp. 43-80):

KEY FACTORS FOR A MORE EFFICIENT APPLICATION OF CORPORATE SOCIAL RESPONSBLITY IN A COMPANY

UDC: 005.21:005.35

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ABSTRACT

In contemporary business, issues such as environmental protection, taking care of employees and their job satisfaction, ethical principles, supporting endangered groups, caring about young people, caring about the society and the like, are serious challenges that a company has to deal with, no matter which industry it belongs to. Global market leaders have accepted the application of the concept of corporate social responsibility (CSR) with a view to satisfying customers' and other stakeholders' demands. What is seen as a prerequisite for a successful realisation of CSR concepts in a company is a genuine wish for its application by the management, management's readiness to understand the basic postulates of this concept, good communication (both internal and external), promotion of examples of good practice in the company and outside of it, motivating employees for a more active role in realising good business practices. In this paper, the authors have presented the results of a survey about young people's attitudes towards corporate social responsibility.

Key words: company, corporate social responsibility, business strategy, competitiveness, business excellence

INTRODUCTION

Global market conditions have contributed to national economies being more flexible than before. As a result of national economies flexibility, companies are facing more complex management processes. Companies' competitiveness is the key goal in the new business practice.

Business environment is constantly changing. Changes are heavily influenced by technological advancement and the process of global market unification. These changes are permanent and business organisations have to make behaviour models in relation to observed and expected changes (Đorđević et al, 2016).

Adapting to market changes shall demand of companies to coordinate their business strategies, but also to prepare strategic resources with a view to its successful realisation. Compared to earlier periods of economic politics, today, in the age of the 4th Digital Revolution, intangible resources (knowledge and information) are more dominant than material resources. Đuričin (Đuričin et al. 2016) thinks that intangible resources enable material and financial resources to be used efficiently (with lowest possible costs) and effectively (using best choices) which enables value creation for product buyers and/or service users and company owners.

Challenges that companies face do not influence only the company, but also its stakeholders such as end customers, employees and the environment in which the company operates. Executive directors have the key role in corporate social responsibility (CSR) concept application through honest communication with their employees and motivating them to adequately understand and accept this

concept as a part of business politics. With a view to a more efficient communication, companies today publicise CSR reports in which they present their activities in this area. All company employees and its stakeholders are thus informed about the company's CSR activities. Owing to the accelerated development of new technologies, companies post their CSR or sustainable development reports on their official web sites.

Honest communication is one of the prerequisites for any change implementation in a company and it is thus necessary to insist on it. Successful application of quality management system (QMS), integrated management system (IMS) or companies' corporate responsibility is not possible in the long run if there is resistance in the organisation itself, which most commonly appears as a result of bad communication between executive directors and employees. QMS, IMS and especially TQM, as strategic variants for improving companies' competitiveness, integrate in themselves the demands for socially responsible business.

Companies in the Republic of Serbia have, in the last 15 years, accepted this concept as a part of their business strategy. Successful promoters of CSR on the domestic market are companies which were successfully privatised and which are mostly in foreign ownership. Examples of good practice are seen in NIS, Erste Bank, Coca Cola, Telenor Serbia, VIP Mobile, Metro Cash & Carry Serbia, Heineken Serbia, Carlsberg Serbia, Hemofarm j.s.c and the like. Domestic companies such as Telekom Srbija j.s.c, Komercijalna Banka j.s.c, Metalac j.s.c, Bambi, Nektar, Elektroprivreda Srbija etc, also actively apply the concept of social responsibility.

For further corporate social responsibility concept development, the opinion of young population in this area also matters. Namely, young people (18 to 27-year olds) are the future managers and directors of companies or future owners of their own businesses. If they possess the knowledge in the CSR area, they will be able to successfully apply it in the companies they work for.

Some advantages of corporate social responsibility application are:
- It creates conditions for achieving business excellence;
- More efficient communication in the company (both internal and external);
- Employee satisfaction with working for the company, influencing higher company efficiency;
- Reducing business costs by saving energy, recycling waste and the like;
- Improving company's image in the society;
- Better positioning of the company and its products on the market;
- Improving company's competitiveness;
- Clearer transparency in business operations.

WAYS OF IMPROVING CORPORATE SOCIAL RESPONSIBILITY IN THE COMPANY

Competition forces companies into constant change, as they seek to beat the competition or at least keep up with it. Some, of course, fail or go under, throwing their employees out of work (Fulcher James, 2017).

This is why successful executive directors have decided that the application of this concept in their business operations is of strategic importance. The emergence of the term corporate social responsibility is connected to the 1970s and since then many different forms of it have appeared. Moreover, it should not be neglected that technological and social changes in the world have influenced CSR forms and these have contributed to changing the awareness of what this concept stands for. In the beginning, companies' focus was on the philanthropic activities, but in the following period it was on the working practice and ethical business operations. Contemporary trends in the area of good business practice application relate to matters connected with human rights, environmental protection, customer protection, fighting against corruption, supporting social problems and the like.

At the end of the 19th century and the beginning of the 20th century, industrial philanthropists were doing business in a way which is widely accepted today, such as by applying employment standards and good practice in the community. William Hesketh Lever, the founder of the Lever Brothers company, which merged with Margarine Unie company in 1930 creating Unilever, is one of the most significant philanthropic industrialists to date. The Lever Brothers company was the first one in Great Britain to employ a safety inspector full-time, as well as an in-company doctor with 8 working hours and a generous payment policy, and since 1905 the company introduced pensions for both male and female workers. In 1980, the company built the village Port Sunlight, with houses for factory workers, an elementary school, village hospital and an art gallery (Fitzgerald et al, 2010). Today, Unilever is

a multinational company with over 400 brands, which still follows the good business practice established by its founder. The company has created its central business model "Unilever Sustainable Life Plan" (USLP), which serves as a basis for creating new businesses while focusing on reducing pollution and improving good company influences on the society. The proof that they still uphold the company's policy can be seen in the goals of their program.

The goals of the USLP program (Unilever) are: helping more than a billion people to improve their health and well-being; reducing the influence of our products on the environment by half; getting a 100% of our agricultural raw materials in a sustainable way and improving the conditions and incomes for people in our value chain.

When talking about the directions of improving corporate social responsibility in companies, two important elements contributing to its successfulness have to be emphasized:

– Executive management's responsibility and
– Communication in the area of CSR.

Company's executive management, owing to its position, creates an adequate atmosphere which will enable employees to understand and apply the principles of good business practice. The experiences of companies who are successful CSR promoters have shown that it is not possible to talk about an efficient CSR application in a company without the proactive executive management.

A research conducted by the renowned international consulting house Deloitte Central Europe in the region of Central Europe and among companies on the list of TOP 500 companies in this region, has shown the managers' attitude about the role of companies in CSR implementation and its influence on the social and economic development.

In this study, the polled managers had the opportunity to express their opinion on the position of CSR in the coming years. The most optimistic were the respondents from Lithuania (100%), Bulgaria (90%), Serbia (79%) and the Czech Republic (78%). Almost half of them believe that CSR will flourish and that there will be a continued growth in the number of socially responsible businesses. One third of respondents claim that CSR will reach maturity as social and environmental issues become a part of business models.

The polled managers have singled out the benefits which include a more active employee involvement in the company, as well as the changes to the image of the company (improvement in reputation, relations with local communities and recognition of the brand as socially responsible). According to the opinions of Serbian managers (CSR Managers Survey 2015), the biggest benefits from CSR implementation in their companies are: improvement in reputation (67%), improvement in relations with local communities (63%) and improvement in employee involvement (54%).

Communication in the CSR area is important as the company's efforts in the area of CSR are best shown in this way. The form of communication itself is created by the company and can be presented in different forms, for example, in the Report on Sustainable Development, Report on CSR, the internet and so on and so forth. However, for the transparency of company's operations and stakeholders trust, the CSR information has to be true and of high quality (Bogetić et al., 2016).

Contemporary business conditions have contributed to the stance that quality and social responsibility are considered the most important elements that can have an influence on companies' positive reputation. Companies with bad reputation will as a result have negative financial performances and a weak corporate image.

In 2015, Volkswagen was in the middle of a scandal connected to the software program which faked the date on the emission of exhaust fumes. For the company, apart from financial crisis, this meant losing the position on the respectable "100 Most Ethical Companies in the World", list, formed by the Ethisphere Institute. Three years after the scandal, Volkswagen managed to recover financially, but it still hasn't managed to repair its image and get back on the list of "100 Most Ethical Companies in the World". This scandal proved that Volkswagen's management was not ready to behave according to the principles of good business practice (ethical business, respecting employees) and that the consequences of bad management are far-reaching. For this reason, companies establish their CSR communications through corporate communications responsible for sustainability and social responsibility issues.

One of the key CSR communication forms is corporate reporting that companies use in a strategic and instrumental way. CSR Reporting has been described as "a way for organisations to provide information to different stakeholders regarding social and ecological questions" (Hetze et al., 2016).

Many people who criticise reporting on social responsibility (SR) miss the point that in the 21st century, SR reporting is, or should be, the basic tool for managing business operations. SR reporting is a way in which a company can understand its exposure to the risks of these changes, as well as its potential to profit from new commercial possibilities. Socially responsible reporting is a process in which a company can collect and analyse data it needs for creating a long-term value and resistance to ecological and social changes. SR reporting is of crucial importance in convincing investors that a company has a future even after the next quarter or next year (KPMG, 2013).

Companies have used the development of information and communications technology (ICT) to shift the key role in CSR communication from the, until then, traditional printed document to the internet. Internet is a great communication tool which offers great possibilities to companies, such as fast communication, reducuction of costs, greater stakeholder involvement, greater involvment of young people as potential users and the like. Companies create separate sections on their web sites where they state their goals and examples of good business practice in the area of CSR. Furthermore, companies can post CSR or sustainable development reports in those separate sections, thus informing all stakeholders about the company's activities and achievements in this area and reducing pollution by not printing the report.

THE ANALYSIS OF STUDENTS' ATTITUDES ABOUT CORPORATE SOCIAL RESPONSIBILITY APPLICATION IN THE REPUBLIC OF SERBIA

In the period from November to December 2016, on the territory of 16 towns and municipalities in the Republic of Serbia, a research was conducted, titled "The Analysis of Young People's Attitudes and Opinions about Starting your own Business and Implementing Corporate Social Responsibility". In this research, 553 polled students, aged 19 to 27, expressed their opinions on starting your own business, corporate social responsibility and the competitiveness of domestic economy. In the last four years (2013, 2014, 2015, 2016), similar researches were conducted, which can serve for comparison and for getting an overview of young people's attitude towards corporate social responsibility.

As can be seen in table 1, there has been a decline in the frequency of young people encountering this term since 2015 (57.07% compared to 53.80%). The percentage of people who did not understand the term corporate social responsibility has been changing during these years from 52.36% to 46.20%. These data should partly be an evidence that consciousness about the significance of CSR implementation has still not developed among young people, future managers and company owners. However, the problem is that in 10 years of promoting this concept on the domestic market, it has been met with understanding only in the last two years.

Table 1: Encountering the term CSR

	2013	**2014**	**2015**	**2016**
Yes	47.64%	56.71%	57.07%	53.80%
No	52.36%	43.29%	42.93%	46.20%

Different ways of young people's familiarisation with the CSR concept are shown in table 2. As can be seen, in the last two years, the media and different textbooks as well as the internet are emphasized as the models of young people's familiarisation with the CSR. The influence of textbooks speaks about the important role of educational institutions in promoting this concept. A distinction between private and state higher education institutions must not be made here. Furthermore, we can also see the important role of the media and the internet in young people's familiarisation with CSR which is a good way for a more intensive CSR promotion. This especially applies to the internet since young population is its biggest user.

Table 2: Ways of familiarisation with CSR

	2013	**2014**	**2015**	**2016**
Media	36.71%	38.94%	28.98%	26.95%
Textbooks	28.26%	28.35%	35.23%	31.17%
Internet	27.78%	23.99%	25.85%	32.79%

When speaking about CSR activities done by domestic companies, young respondents emphasized promoting social goals the most, while the second most represented was social marketing, followed by socially responsible practice (table 3). Examples of some social campaigns done in the past by certain media (B92, TV Prva, Blic, RTS), confirmed the research's attitude that domestic companies direct too much attention to promoting social goals.

Table 3: The most frequent CSR activity in domestic companies

	2013	**2014**	**2015**	**2016**
Promoting social goals	28.14%	29.53%	26.38%	24.20%
Marketing associated with social goals	20.10%	17.78%	20.14%	15.91%
Socially responsible business practice	17.78%	19.58%	17.25%	17.43%
Social marketing	19.24%	16.48%	20.43%	23.35%

Unfortunately, the research has shown that even besides the great effort invested in CSR activities by certain companies, young respondents still do not see domestic socially responsible companies on the market (table 4). It is, thus, necessary to promote more the examples of good business practice.

Table 4: The existence of a domestic company which can be described as a socially responsible organisation

	2013	**2014**	**2015**	**2016**
Yes	19.11%	26.30%	25.24%	32.84%
No	80.89%	73.70%	74.76%	67.16%

The reason for such a high percentage of unawareness of domestic socially responsible companies, can be found in the lack of understanding of the term corporate social responsibility, which has improved over the last two years and which can best be seen in the percentage of familiarity with the CSR term in table 1. For this reason, a comprehensive promotion of the corporate social responsibility concept among young people can be the solution and it has to encompass the following three levels (Bogetić et al. 2017)

1. It is necessary to create programmes for familiarising young people with the importance and practicality of CSR implementation and its role in improving competitiveness.
2. The cooperation of more public and private institutions which have activities dealing with the issues of young people and the economy within their business activities, with a view to promoting corporate social responsibility. Such institutions are: Ministry of Education, Science and Technological Development, Ministry of Youth and Sports, Ministry of Economy, National Employment Service, Serbian Development Agency, Chamber of Commerce and Industry of Serbia, Universities, Association of Entrepreneurs and the like.
3. A more substantial promotion of domestic socially responsible companies by the media, as well as awards for corporate social responsibility, such as the Virtus Award and the National CSR Award. It is necessary to particularly emphasize the importance of the internet and social networks here, in the function of a more substantial media coverage, especially among the younger population.

CONCLUSION

Corporate social responsibility is increasingly becoming an important segment of company's business politics and that is mostly owing to the country's legislature. Companies in the newly created conditions, where besides legal regulations and recommendations from the state we have highly developed customers' consciousness about the significance of CSR implementation, have to adjust and follow the new trends.

However, a prerequisite for successful corporate social responsibility application in a company are its executive directors and communication. Executive directors create an adequate atmosphere in the company in which this concept is understandable and acceptable to all employees. Company managers have to be the promoters of the company's changed relationship to reducing environmental pollution, ethical behaviour, employee satisfaction, young talents, cultural attractions etc. Communication is extremely important since it enables all stakeholders to be informed about the company's activities in

the area of CSR on two levels, internal and external. Companies today write annual CSR reports or sustainable development reports where all activities done in this are presented. Owing to the development of the internet they are today more available to all stakeholders. Moreover, the internet offers a faster and more efficient company communication to its stakeholders when it comes to the promotion of the good business practice.

CSR implementation in the Republic of Serbia still isn't on an adequate level which is a serious problem in developing domestic economy's competitiveness. Namely, the biggest promoters of this concept on the domestic market are the companies whose owners are foreigners or those whose majority stakeholders are foreigners. A small number of domestic companies is willing to engage in this area. The reason for this kind of attitude of domestic companies lies in the fact that managers still do not understand completely the practicality of CSR implementation for improving competitiveness, or in other words, they are profit-oriented. For this reason, it is necessary to create an adequate atmosphere which will promote the implementation of CSR concepts. It is necessary to emphasize the examples of domestic companies which operate in accordance with CSR principles and insist on punishing those that do not follow certain CSR principles, such as environmental pollution, bad attitude towards the environment in which they operate, inadequate relationship towards employees and the like.

Special emphasis on the domestic market must be put on popularising CSR implementation among young people, who are unfortunately still not well-informed about the very concept of CSR, as well as the good business practices on the market of the Republic of Serbia. In that respect, a more active promotion of the CSR concept among young people, in which the focus shall be the basics of CSR with examples of domestic companies that nurture good business practice on the market, is and imperative, in order to eliminate prejudice that socially responsible domestic companies do not exist.

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THE IMPORTANCE OF BUSINESS QUALITY IMPROVEMENT IN FUNCTION OF COMPETITIVENESS DEVELOPMENT OF SERBIAN COMPANIES

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ABSTRACT

New competitive conditions require new approaches in the field of organizational management and development of competitiveness. The basic imperative of modern economy and crucial global competitive factor lay in continuous improvement of knowledge and work productivity. The application of modern management techniques, as quality management system, and integrated management systems is an essential preconditions for the success of business in general. Standards and the best practices are the way to excellence. Serbia companies have had a problem with the competitive ability in international level for many years. Insufficient investment in quality has resulted in extremely poor competitive position of the domestic economy. To make local companies become competitive at the international level, it is necessary to alter the ways of thinking and adopt modern world achievements in the filed of quality, as integrated management systems.

Key words*:* quality, competitiveness, management, productivity, knowledge.

INTRODUCTION

Competitive conditions have changed, and in terms of elements that enable companies to successfully fight on the market. Global competitiveness is becoming increasingly intensive, noticeable and offensive. The current moment of global economy can be marked by slow but sure rise of enterprises from newly industrialized countries, such as China, India, Brazil, South Africa, Turkey, etc. Enterprises from these countries are becoming global competitors. Their competitive ability is based on lower business costs, first of all because of lower labour costs, but also for their readiness to accept foreign investments and the most modern methods and management techniques.

The world economic crisis and its long lasting effects emphasize the need for permanent improvement of knowledge – in recent years only the best, no matter where they come from, can win. The winners are usually the companies which have performed optimization between the price and the quality on the grounds of reducing costs and permanent productivity increase by applying standardized quality management concept and intensive innovativeness. Modern organization has to build in ist structure management of changes. Organization has to undertake following steps: to permanently develop overall business, to learn on others expiriences and to learn to apply inovative practice.

Quality, product diferentiation and integrated marketing communication represent a key element for making a successful trade mark with stable market position. Quality is becoming a primary development aim materialized through achieving business excellence and top class of products and services. Quality is imperative, and it is based on the continuous improvement of business

productivity. Quality is given by the management of the organization as a market concept, which creates conditions for achieving business excellence. Improving the quality of business operations is the basis for the improvement of other factors that affect the competitiveness of companies internationally. In addition to working on the implementation and development of the concept of quality, the company that wants to achieve business results based on the actions in the international arena, has to improve the knowledge of their employees, particularly executive management, as well as to apply modern management techniques. Chinese and Indian companies are such examples. This implies the necessity for developing new business models aimed at establishing competitiveness on the global market. The main reason for sucsess of some Asian countries, such as Japan, South Korea and Taiwan, was foreign investment with transfer of technology.

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. Serbian 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. When it comes to the competitiveness of domestic enterprises we have to say that it is at a very low level. Insufficient applications of knowledge, low technological level of enterprises, unproductivity and inefficiency are just part of the problem that domestic companies face.

COMPETITIVENESS AND GLOBAL MARKET CONDITIONS

The competitive ability of a company in the modern business conditions is hard to achieve and easy to lose. The reason for this attitude is the fact that the rapid technological advances enabled the technology to become available to everyone in the world under reasonable terms. The problem of competition and the establishment of a new model of competitive advantage is essentially a problem that is only further demonstrated during the global economic crisis. New realities require new organizational and management skills. In addition, the global economic crisis has highlighted the fact that it is necessary to create new business models. 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).

In modern business conditions the following business functions with the strategic role are particularly emphasized in organizational management because of their market orientation: marketing, quality, research and development, (Đorđević & Ćoćkalo, 2007). The company's growth, development and success are determined by tight interdependence of these three functions and their synergistic effect. Business excellence implies that businesses constantly work on the implementation of quality of business organizations based on the increase in productivity and skills of each employee. Business excellence is the development of market economy, with the user in focus of the organization, permanent improvement operations based on knowledge and productivity of labor and business in line with the requirements of the various interest groups in the region.

Modern understanding of management is influenced by the global economic crisis in 2008. Years of appropriation of management techniques at the moment global crisis could not provide practical answers to the question of market survival. The problem lies in the fact that large corporations were unwieldy bureaucratic, burdened with unnecessary administration and turned only its own profits. This

situation might not take long, and that did not happen to the global economic crisis, it would become a problem expressed in terms of the lack of competitiveness of companies from developed countries to the industrialized countries of the competition - only companies from industrialized countries during this crisis showed that the vitality. Corporations are doing business in the global economic crisis. In times of crisis, maintaining stable financial flow is important. Cash is the most important - so it is well to keep cash and reduce costs. In the long term, it is necessary to preserve human resources in order to overcome the crisis. Countries that are competitive are also the countries where the awareness of the need for continuous quality improvement of business has been developed for many years. Industrialized countries of the world such as China, India and Brazil are putting great efforts in spreading the concept of sacrificing business practices in order to create conditions for improving the competitiveness of its economy.

Table 1: Ranking of the top 10 countries in the world according to the WEF Report 2017-2018.

Country	Rank in 2017-2018	Rank in 2016-2017
Switzerland	1	1
USA	2	3
Singapore	3	2
Netherlands	4	4
Germany	5	5
Hong Kong	6	9
Sweden	7	6
Great Britain	8	7
Japan	9	8
Finland	10	10

The Global Competitiveness Report 2017-2018, (2017,) World Economic Forum, 2017. http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2017-18.pdf

THE ANALISYS OF THE IMPORTANT ASPECTS OF COMPETITIVENESS OF SERBIAN COMPANIES

Most domestic companies are insufficiently competitive on the global market. Only a few local companies can successfully perform in the regional business environment. Global analysis of innovation and competitiveness points the embarrassing facts when it comes to companies from Serbia. The lack of business productivity and innovation of local companies comes not from technological aspects of the business, as much from a lack of productivity knowledge of local executives. Since the early 1980s domestic economy has had problems with improving quality and productivity. According to Nikolić (2016) Yugoslav economic model was unrational as well as in other socialistic countries in the Eastern Europe. The economic model was etatistic without principles of free market system. Concept of social ownership was main generator of permanent economic crysis. The productivity problem did not appear in domestic economy only in the time of transition but it was present before, as well, (Đorđević at all, 2012). These problems were the result of inappropriate business performance which was not based on market principles. Certain products had unjustifiably high prices which were not competitive on the world market. Therefore, Serbian companies reduced export prices in order to gain competitiveness on the world market, while domestic customers had to pay this cost of unproductiveness through high prices. Old technology, poor quality, unattractive packaging and high prices are thus the main reasons for uncompetitive appearance of Serbian products on international market.

Technological equipment also represents a significant element of productivity rising. The average machine age in Serbia is about 30 years. Compared to the situation in the region, this represents the approximate 12-year obscolescence. Serbian economy is, technologically, 29.5 years behind European Union, which was confirmed on the representative sample of 154 small, medium and big companies within six economical branches with similar production programs. The comparison was carried out in textile, food-processing, pharmaceutical, machinery, chemical and building material industries. Austria was taken as a criterion because of its similar natural, social and demografical characteristics

in relation to Serbia (Serian chamber of commerce, 2012). The greatest obscolescence was noticed in textile companies (35 years), then in machine industry (34.5 years). Pharmaceutical companies were best ranked with 21 years' delay. Considering the regions, the equipment, tools and other production means are most obsolete in south Serbia (41 years) and the least in Bačka region (18.5 years' delay). In Belgrade the delay is 20.5 years.The most productive companies are those with the equipment and machines of the highest quality. These are pharmaceutical companies, some companies from the field of food processing and companies with foreign capital, which is totally 8.5 to 9% of the whole Serbian industry. Metal industry is in the worst situation, with 35 year- old- machines in average, and reject of 36%, which is more than double compared to the average in EU countries.

According to the list of the World Economic Forum for 2017, Serbia ranked 78th place out of 137 countries that were analyzed. Serbia was on the 90th place on the list in 2016. Table 2 provides a ranking of the countries of the Western Balkans in period 2013-2017.

Table 2: Ranking of the country of the Western Balkans towards competitiveness in 2013-2017.

Country	Rank in 2013.	Rank in 2014.	Rank in 2015.	Rank in 2016.	Rank in 2017.
Slovenia	62	70	59	56	48
Montenegro	67	67	70	82	77
Croatia	75	77	77	74	74
Macedonia	74	63	60	68	-
Serbia	101	94	94	90	78
BiH	87	-	111	107	103

The Global Competitiveness Report 2017-/2018, The Global Competitiveness Report 2016-/2017, The Global Competitiveness Report 2015-2016, The Global Competitiveness Report 2014-2015, The Global Competitiveness Report 2013-2014, The Global Competitiveness Report 2012-2013

Among the countries in the close environment, Hungary is on the 60th place, Bulgaria is located on 49th place, Romania is located on the 68th place, Greece, is located on the 87st place and Albania is on the 70th place.

Table 3 provides a ranking of the countries of the Western Balkans towards competitiveness indicators. The basic requirements of competitiveness of the country consists of the following indicators - institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, the efficiency of capital markets, technological capacity and market size. As can be seen, Serbia is slightly better when it comes to business efficiency, than when it comes to innovation.

Table 3: Ranking of the Western Balkan countries to indicators of competitiveness in 2017.

Country	Rank in 2017. In sum	Rank to primary requirements	Ranking by business efficiency	Ranking by innovation
Slovenia	48	35	58	35
Montenegro	77	80	72	91
Croatia	74	58	69	106
Macedonia	-	-	-	-
Serbia	78	74	82	95
BiH	103	91	100	128

The Global Competitiveness Report 2017-2018, (2017,) World Economic Forum, 2017

According to the World Economic Forum, all countries in the world are divided into five groups. The first group consists of countries with its economy based on resources. The third group comprises countries whose economies are based on the development of business efficiency and the fifth group consists of countries whose economies are based on the application and development of innovative activities. Second group consists of countries in transition from the first to the third group and the fourth group consists of countries in transition countries from the third to the fifth group of countries.

Serbia is located in the third group of countries (the economy keeping efficiency), together with Montenegro, Romania, Bulgaria, Macedonia, Bosnia, Albania, Indonesia, South Africa, and so on. Croatia is in the fourth group (transition from efficiency to innovation), while Slovenia is located beside the fifth group countries that stem (economy driving innovation and sophistication). The fifth group consists of mainly the most developed countries of the world.

The success of the company is significantly associated with incorporating the concept of quality which enables competitive advantage. The three pillars of business excellence are meeting customer needs, improving business productivity and corpoprate social responsibility (Đorđević & Bogetić,. 2008). Application of ISO management standards and IMS concept can be very important for companies from countries in transition. For a company that wishes to achieve business excellence goals at the current development level, it is completely justified that it determines to integrate certain management systems defined by individual standards. Implementation of quality management system an its permanent improvement outline the conditions for increase productivity of work and overall business operations, which enables cost reduction and competitive prices on global market. From the aspect of competitive capacity, quality of business operations of a company, marked through the international standard ISO 9001, is nowdays gaining more and more on its importance, especially of the Eumarket.

Table 4. Number of sertificates of standards standarda ISO 9001 and ISO 14001 in region in 2015.

Copuntry	ISO 9001	ISO 14001
Serbia	3.017	1.139
Slovenia	1.848	461
Croatia	2.659	984
BiH	1.037	200
Montenegro	92	24
Macedonia	286	130

ISO Survey of certification 2015, ISO, 2016., www.iso.org

According to data from Table 4 Serbia is leader in number of sertificates of standard ISO 9001., but this number is realtivly small in comparation with other countries of South and East Europe, sach as Romania, Greece, Bulgaria etc. The majority of companies which introduced quality management system belong to the group of large companies. One of the major factors which can improve competitive capacity of domestic companies is broader implementation of quality management system within the small and medium sized enterprises (SMEs) group.

CONCLUSION

Competitiveness at international level is achieved on the grounds of quality business performance, product differentiation and relevant marketing activity, (Đorđević et al., 2012). Innovations, flexibility and productivity are guidelines for the future development in the field of competitiveness and organizational management. Competitivness shall be improved if business productivity has been improved. Quality is essential tool to fight with, in the battle for achievemevt of competitivness on the global market. Improvement of the quality is based on improved business productivity, and directly is linked to the improvement of the productivity of knowledge.

Companies from transitional countries are faced with numerous problems – among them the most important are those related to improving knowledge and organization. To achieve commercial success of the company it needs to have a competitive advantage in the form of lower costs and/or product differentiation, with a long-term strategy of providing products and services of high quality and continuous innovation. The main problem is the lack of competitiveness of domestic companies which occurs as a result of poor productivity performance and the lack of implementation of new technologies and knowledge and inadequate application of the concept of quality management. Improvement of quality management makes foundation for development of other factors which are impacting the competitive capacity of the company on international level, especially the productivity

process and prices strategy. Domestic companies have to base the internationalization of business on the application of international experience, international standards and internationally accepted business practices. Therefore, it is necessary to apply those management techniques that emphasize long-term commitment to competitiveness, as well as quality management system and integrated amanagement systems.

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THE INTER-ORGANIZATIONAL DIMENSION OF VALUE-CREATION PROCESS

UDC: 005.7:330.133

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ABSTRACT

In business relationships the focus has moved from individual companies to value-oriented networks where participants operate together in order to realize own and network objectives. In the era of digitization the network is set up in a virtual environment consisted of participants from various sectors, industries, countries, etc. The creation of value is the central process of economic exchange. This article develops a rationale for process of value creation: how value is created within the inter-organizational network? Today a major challenge is to reconfigure business activities from linear value chains to the dynamic value network model. Traditional models suggest that value is created within value chains; however value-creation in the networking environment is much more complex to understand. The aim of this paper is to examine opportunities of network participants to capture and/or create value on the both, individual and the network level.

Key words: Inter-organizational networks, Value network, Value chain, Value—creation, network participants

INTRODUCTION

Due to globalization value chain links become more present in a widespread industry, connecting geographically distant companies to global markets. Global standards, orientation towards industry 4.0, and advances in technology develop suitable environment for transition from value chain to value network.

Value network is not radically new concept; it summarizes existing approaches related to networked business environment and upgrades them by considering value as central element of the network. Value networks connect SMEs, large companies, R&D institutions and support organizations that are specialized in certain industries, services or technologies (Allee, 2008).

The purpose of this paper is to examine opportunities of network participants to capture and/or create value at the both, individual and the network level.

This paper is organized as follows: in the second chapter inter-organizational networks and importance of networked environment are introduced. In this chapter special focus is put on the Small and medium enterprises (SMEs) and different forms of their grouping. Third chapter investigates how is value created among networked participants and different types of value are identified and explained.. In the end, authors reviewed opportunities of creating value at the individual and network level and made implications for further research.

INTER-ORGANIZATIONAL NETWORKS

Due to digitization and advances in technologies, organizations have an increasing possibility to cooperate, communicate and exchange information with other organizations regardless where they are located. Such kind of grouping in the literature and practice is known as *networking*. Brass et al. (2004) define a network in a very general way as "*a set of nodes and the set of ties representing some relationship, or lack of relationship, between the nodes*." The term network is not only one that is used for describing this phenomenon. Many authors prefer to use another terms, such as partnerships (Hagedoorn, J. 2002; Osborne, S. 2002), strategic alliances (Hamel, G., 1991; Mowery et.al, 1996; Larsson et.al, 1998), constellations (Lorenzoni & Ornati, 1988) or collaborative networks (Nieto & Santamaría, 2007; Singh, J. 2005; Camarinha-Matos & Afsarmanesh, 2005).

However, each term has the same or very similar meaning – gather together companies and other organizations with common interests in order to exchange information and ideas among themselves. Number and type of participants in networks varies depending on the characteristics of the whole network, such as size, type, objectives, resources, etc. and preferences and actions of individual organizations as well. Considering this, it can be said that smaller companies become part of some network rather than large companies or academic/research institutions.

SMEs in the networked environment

SMEs are faced to many challenges, e.g. lack of resources, unstable financial situation, insufficient number of experts, etc. (Moraca et.al). Due to these problems SMEs do not have enough capacities for increasing their competitiveness on the domestic and foreign market. In response to their problems, clusters appeared to be intermediaries between SMEs and market/government/research institutions.

Porter (1998) defined a cluster as "*a geographical proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and externalities*". Considering this, any effort for increasing competiveness of companies needs to be done not only at individual level, inter-organizational cooperation is very significant for achieving this goal.

The new digital era has brought a number of changes at each level of the society and the industry. Companies exchange information, collaborate and communicate no matter in which part of world they are located in. Local SMEs become members of cluster which further upgrades into global value chains (Figure 1)

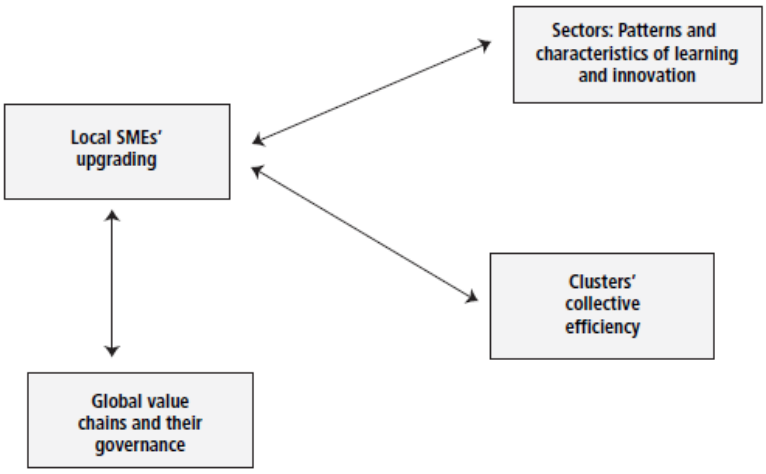

Figure 1: Upgrading of SMEs in global value chains (Humphrey & Schmitz, 2002).

Individual and collective cluster efficiency have been analyzed and explained in the literature last 30 years. Upgrading cluster into global value chains or network bring new challenges for researchers and practitioners to understand and explain role of SMEs and cluster in complex global networks. Such kind of network in the literature is called *value network*, where "*suppliers, customers, companies, partners are no*

longer on the opposite sides, now they interact with each other in order to increase competitiveness and create new business opportunities" (Allee, 2008).

To better understand concept of value networked environment, Peltoniemi (2004) defined five features that were used for comparison between cluster and value network: geography, competition and cooperation, concept of industry, knowledge creation and knowledge transfer, control/power. Comparing those concepts according these five features can help in understanding that value network is broader and more comprehensive concept than cluster is.

Geography - Cluster represents geographic concentration of enterprises and support organizations, with characteristics of locality and regionality. Value network is not based on geographic aspect, can be global or be restricted to limited area.

Competition and cooperation - Members of cluster are much more competitors than cooperators. Value network is based on cooperative structure which consists of participants with an active role within the network (Figure 2). Each member has its own task which is oriented to achievement of individual and network objectives; they do not competing with each other.

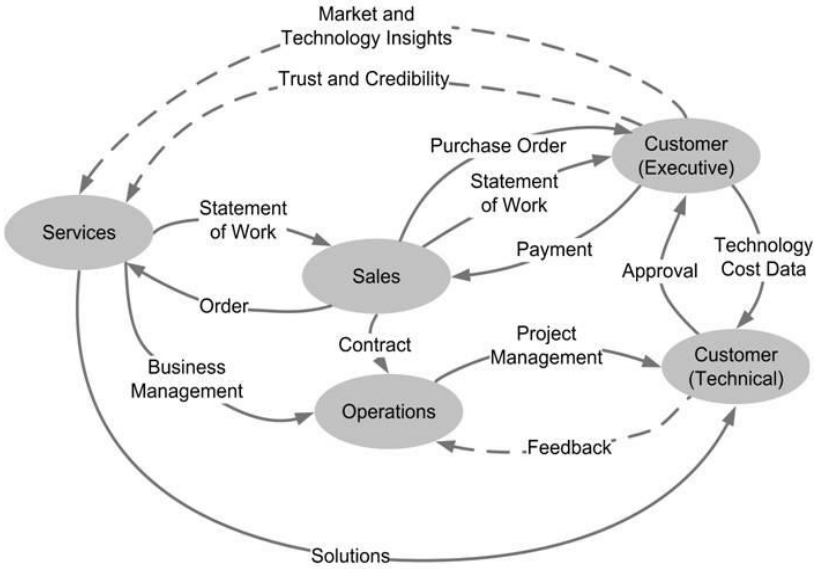

Figure 2: Example of Value network

Concept of industry – Porter (1998) matches two concepts: clustering industries and clustering companies. Value network participants can be from different industries. Single company cannot produce the whole product by itself and capabilities from other companies are required.

Knowledge creation and knowledge transfer-Rivalry within cluster limits the willingness to share knowledge and create it cooperatively. Proximity of companies and other organizations can facilitate exchange of information. Concept of value network is based on cooperation, thus participants would be more open to share information and business data.

Control/power - In cluster should not be such strict control because members are independent of each other and management of cluster does not have authority to manage and organize business of each separate organization. In the value network there are organizations of different size, type, level of productivity. It is not rare that large organizations or top innovators take a lead role.

Concept of cluster and value network concept have a lot in common, but also there are differences in many areas, especially in the process of value co-creation among participants. In dynamic business environment clusters are oriented towards global value chains and value network rather than operating in the local market.

Giuliani et al (2005, 3-4) emphasize the importance of upgrading the cluster and companies into global value chains in order to make better products and achieve skilled activities within the network. Porter (1998) also states significance of external linkages of clusters and SMEs because "clusters are a driving force in increasing exports and are magnets for attracting foreign investment".

HOW IS VALUE CREATED AMONG NETWORK PARTICIPANTS?

The strength of the network based on value co-creation lays in cooperation, intensively communication and interaction among its participants. Frequently asked questions among researchers and practitioners in this field is how value is created and what represents value for each participant in the network? Haglind & Helander (1998) state that cooperation is mostly motivated by achieving increased revenue or reduced costs. However, this applies more to network in whole, while network participants have their own motivators for participation.

Collaboration and co-creation become core elements in value creation processes, which allow companies, customers and other network participants to create value through interaction. Vargo and Lusch (2008) state that companies should not only focus to products, but they need to take into considerations services that they can offer to customers and clients. Co-creation of value need to be achieved through inter-organizational and inter-sectoral cooperation.

Each value network is consisted of participants (nodes) and relations among them. Number and structure of participants depends on type and scope of business goal for the particular network. Small and medium enterprises are usual members of the network, but it is not rare that big companies have been there and even be central node in the network.

Allee (2008) defined three types (currencies) of value: tangible, knowledge and benefits.

Tangible value includes transactions around good, services and revenue. Knowledge is intangible value and includes exchange of strategic information, planning and process knowledge, technical know-how, policy development, collaborative design which support the core products and services.
Third group of value, according to Allee (2008), is intangible value or benefits. In this group are included all benefits which go beyond core products, services and finances, such as customer and brand loyalty, sense of community, increased customer satisfaction, enhanced user experience.

Allee (2008) defined that tangible assets are the most exchanged value type in the network. However, knowledge is seen as priceless kind of value that could be exchanged for any other type (good, services, revenue, benefits or even knowledge for knowledge). Jaakkola and Alexander (2014) suggests that companies should focus on the values that customers can contribute, and explore the potential of other stakeholders.

The creation of value presents central process of any economic and business exchange. Traditional ways of value creation put focus on the company's performances. Later, this focus is extended to value creation for both companies and individuals. The way in which value is created and exploited differs from traditional supply chain model.

Nowadays, companies are encouraged not to doing business only at the individual level but to cooperate with other business entities and become part of larger network.

CONCLUSION

Co-creation of value in complex business networks becomes a significant research topic in the field of network business theory. In the paper three different types of value are identified and explained from the aspect of individual company and the whole network as well.

This paper represents theoretical background for future author's research on the topic of inter-organizational networks. Further research is going to be focused on examination of value co-creation process in networked environment: which type of value is most appropriate for each type of organizations? These findings can help for better understanding of value network efficiency.

Empirical research on examining value co-creation by network participants need to be taken, and it is going to be basis for first author's PhD dissertation.

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THE RELATIONSHIP BETWEEN CULTURE AND PERCEPTION

UDC: 005.73:005.311.6

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ABSTRACT

In this paper we intent to explore the relationship between culture and perception. We will conduct literature review and explore the effect culture has on the information processing, field (in) dependence, our development stage, the way we store information (Schemata theory), the relationship between organizational culture and perception and the way culture influence ethical decision-making.3

Keywords: cross-culture; perception; decision making.

INTRODUCTION

The relationship between the culture and perception has been studied topic. Many cross-cultural researchers have been describing the effect which culture has on us. The nature of the relationship between perception and culture is merely part of the larger problem of psychological differences between groups of people who are living under varying geographic, economic, social and cultural conditions (Berry, 1966). There are different approaches towards the perception.

It is often stated that national culture is influencing/constraining the organizational culture. Contrary, certain researches showed that organizations can localize and standardize organizational culture, or to make it unique. We often read that organizational culture can be used as *strongest asset* or *biggest liability*. Theories such as institutional theory (Scott, 2000), state that organizations should adapt to the pressure of external environment, in sense that they should accept the ways of doing business in the accordance with the environment. In this regard, they will appear legitimate to investors. Organizations mirror societies from which they originate (House, Hanges, Javidan, Dorfman, & Gupta, 2004).

Contrary, others believe that organizational culture is value which is hard to imitate and can be seen as the advantage, which makes company distinctive and unique. Lawler (2003)stated that corporate culture is built through the organizational design elements of people, structure and rewards. According to Gelfand, Nishii, and Raver (2006), I countries that have looser cultures, there should be more room for organizations to be distinctive and to find employees that fit that distinctive model.

THE EFFECT OF CULTURE ON OUR PERCEPTION

Field (in) dependence

Culture effects not only how we think and what values we hold, but also the way we perceive the reality. Psychologist which were studying the human perception have distinguished the field-independent and field-dependent persons (Witkin & Goodenough, 1977). This research is based on the theory that culture has the effects on individual's experiences on basic perceptual level. Furthermore,

G. H. Hofstede, Hofstede, and Minkov (2010) have stated that men are more often field-independent, women field-dependent. From the investigations of individualism-collectivism, Kühnen et al. (2001)found that participants from collectivistic countries (Malaysia and Russia) exhibit stronger degrees of field dependence than did participants from individualistic culture (Germans and Americans).

Development stage

Biesheuvel (1963)stated that it is generally accepted that there are psychological differences between ethnic groups which are at different stages of development. Different level of evolutional development may affect the way of visualization. Severity of cultural influence on individual may be seen in Whorf (1940) statement "no individual is free to describe nature with absolute impartiality but is constrained to certain modes of interpretation even while he thinks himself most free". We learn from the study of culture that the patterning of perceptual worlds is a function not only of culture but of *relationship*, *activity*, and *emotion*(Hall, 1966).

Schein (1984) described the organizational culture as the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation and internal integration, and that have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. This definition of organizational culture, shows clear transmitment of cultural elements to its new members, which in the end influence their perceptual world.

Shemata theory

The cognitive approach to perception direct our information selection process and give us a structure to interpret stimuli (Neisser, 1976). In such context, our stimuli is highly affected by our pervious experiences and cultural context in which we are living. There is popular saying, *When in Rome do as Romans do*. When we travel, we try to adapt in the environment and learn how to act. It is since in different countries the meanings and customs may differentiate. The schema theory, introduced in 1932 by Sir Fredric Bartlett, shows the process of how knowledge is acquired, processed and organized (see Figure 1). If we examine the schema, we may notice that it may vary in accordance with context in which it is placed. Bartlett highlighted the reciprocity between culture and memory. Schemas were necessary to explain the consultative role of culturally organized experience in individual sense making and it suggested a transactional relationship between individual knowledge and cultural practice (McVee, Dunsmore, & Gavelek, 2005). When we form such schemata in our mind, it is form base on the meaning, which is formed in the accordance with cultural and emotional context.

The Gestalt approach states explains the ability to acquire and maintain the meaningful perceptions. Such approach is based on the law of similarity, since while regarding we tend to group objects together. we tend to perceive any given visual array (whatever we are seeing) in a way that most simply organizes the disparate elements into a stable and coherent form (Hergert, 2013).

Organizational culture and perception

G. Hofstede (1983)stated that if we see what effective organizations in different cultures have done we recognize that their leaders did adapt foreign management ideas to local cultures and that the management is *culturally dependent*. The GLOBE project also emphasized the relationship between national and organizational culture. Johns (2006)explicitly stated that national culture is constraining variations in organizational cultures.

Unfortunately there is no empirical evidence, which estimates the level of magnitude which national culture has on organizational culture. There are contradicting theories concerning the position of organizational culture, in the relationship with national culture. One group of theories states that

national culture is constraining organizational culture versus the other which states that it is organization's choice.

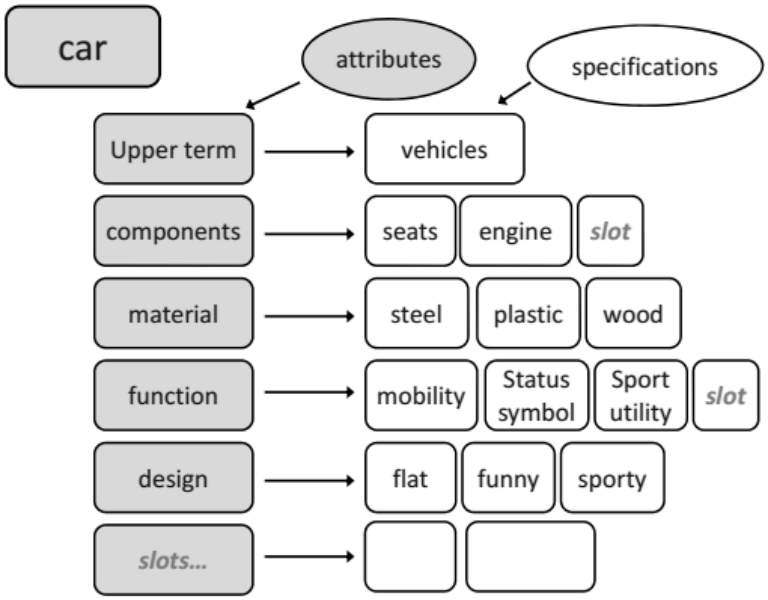

Figure 1: Knowledge representation with schemata

Organization's actions are by their nature externalized. Schein (1984)emphasized the external adaptation problems. He stated that while a part of the group's environment is "enacted", in the sense that prior cultural experience predisposes members to perceive the environment in a certain way and even to control that environment to agree, there will always be elements of the environment that are clearly beyond the control of the group and that will, to a degree, determine the fate of the group.

When organizational culture is formed, it is thought to new members. Members, depending on the level of their organizational identification and commitment, perceive and make the decision in the accordance with the organizational values. It would not serve its function if every generation of new members could introduce new perceptions, language, thinning patterns, and rules of interaction (Schein, 1984). Avolio and Bass (2004)statedthat although it is true that an organization's culture develops in large part from its leadership, it is also true that organizational culture would also affect the development of the organization's leadership. In such sense we may induce that perceptions, thoughts and response of organizational leadership may affected by the organizational culture. Schein (2010)supports the idea that founders of the organization have the influence on shaping and creating organizational culture. Kostova and Roth (2002)noted that institutional elements enter organizations through the people working in them and through their cognitions and beliefs.

Ethical decision-making

Bartels (1967)noted that there are different things which influence our ethical decision-making. He identified cultural factors such as values and customs, religion, law, respect for individuality, national identity and loyalty (or patriotism), and rights of property as the factors which are influencing ethics. Cultural norms affect perceived ethical situations, perceived alternatives, perceived consequences, deontological norms, probabilities of consequences, desirability of consequences, and importance of stakeholders (S. D. Hunt & Vitell, 1986). Furthermore, they developed model which was explaining the effect culture has on ethical decision-making.

The variables which effects ethical decision making have been elaborated in the model developed by S. Hunt and Vitell (1992). This model shows that there are five main factors which have influence: Cultural Environment, Professional Environment, Industry Environment, Organizational environment and Personal Characteristics. According to Hofstede's typology, the persons coming from

collectivistic societies tend to be under the influence of groups and intraorganizational influence. They can't easily distance themselves from the norms existing in such groups. In such types of groups, their members take care of each-other, but they expect the permanent loyalty in return.

CONCLUSION

The way we perceive is culturally biased. Our thoughts are formed by the cultural context in which we are living. We've saw that culture and human perception can affect whether we are field-independent or field-dependent persons. Our perceptual worlds differentiate in the way we storage and process information. Similarly, organizations as social construct may differentiate globally in the way they process information. Culture is one of the variables which is affecting the organizational culture. Question which arose was whether culture can affect organizational culture. Then, we may examine what effect organizational culture has and what are the pros and cons of having unique and strong organizational culture. Since the society is influencing us, the level of its development may have effect on the way we visualize things around us. The way we store information may differ, according to cultural context in which we are living.

When working in organization, depending on the level of organizational identification and commitment, employees tend to make decisions which are *in the best interest of the organization.* That is why it is important for such relationship between national culture, organizational culture and employee's decision making to be examined. Understanding such concepts may help us to better understand the different visualization and perception, which may on the end influence the differentiation among the decisions which employees make.

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ON FUZZY SETS

UDC: 510.644

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ABSTRACT

The purpose of present paper is to review current published theory of fuzzy sets focusing on the basic definition of fuzzy sets and fuzzy logical operations. The aim of this short review is not to discuss fuzzy sets in relation to its application in control, data processing, decission support, management, but to present the basic mathematical framework of fuzzy set theory.

Keywords: fuzzy sets, t-norms, t-conorms, operations on fuzzy sets, fuzzy logic.

INTRODUCTION

Classical logic has been recognized by philosophers in ancient Greece. Aristotel's two-valued logic is based on the principle of excluded middle. So, it is not possible that the same element is a member of a set and its complement at the same time. This means that an element is either a member of a set or not. Classical sets are known as crisp sets.

There are some unsolved problems in classical logic such as Russell's paradox. Fuzzy logic, introduced by Zadeh (1965), solves such problems. Fuzzy logic is many-valued logic based on human reasoning. Elements belong to a given fuzzy set with a certain degree. Crisp sets are identified by its characteristic function and fuzzy sets are identified by its membership function. Membership function extends to the whole interval between 0 and 1 and fuzzy logic models human reasoning. Fuzzy logic deals with truth values between 0 and 1 so these values can be considered as degrees of truth. So, fuzzy logic is based on fuzzy set theory which is a generalization of crisp set theory (Zadeh, 1965).

The paper will start with basic definitions of fuzzy sets. After this some properties of fuzzy sets are given. The union and intersection of fuzzy sets, and complement of fuzzy sets are presented.

FUZZY SETS

The definition of membership function of fuzzy sets appears accoring to Jager (1995):

Definition 1. A membership function for a fuzzy set A on the universe of discourse X is defined as:

$$\mu_A(x): X \rightarrow [0,1]$$

where $\mu_A(x)$, called membership value or degree of membership, quantifies the grade of membership of the element in X to the fuzzy set A.

The membership of fuzzy sets has grades in interval [0,1]. So, fuzzy sets are generalization of crisp sets. A fuzzy set A, where A is fuzzy subset of X, is denoted by:

$$A=\frac{\mu_A(x_1)}{x_1}+\frac{\mu_A(x_2)}{x_2}+\cdots+\frac{\mu_A(x_n)}{x_n}=\sum_{i=1}^{n}\frac{\mu_A(x_i)}{x_i},$$

This representation of fuzzy set is given when X is finite. If X is not finite then fuzzy set A is denoted by:

$$A=\int_{x\in X}\frac{\mu_A(x)}{x},$$

where X is the universe of discourse (Subašić, 1997; Jager, 1995).

Properties of fuzzy sets are given below (Subašić, 1997):

1. Idempotency: $A \cup A = A$, $A \cap A = A$.

2. Commutativity: $A \cup B = B \cup A$, $A \cap B = B \cap A$.

3. Associativity: $A \cup (B \cup C) = (A \cup B) \cup C$, $A \cap (B \cap C) = (A \cap B) \cap C$.

4. Distributivity: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$, $A \cap (B \cup C) = (A \cap B) \cup (A \cup C)$.

5. Law of double negation: $A = \tilde{\tilde{A}}$

6. De Morgan laws: $\overline{A \cup B} = \overline{A} \cap \overline{B}$, $\overline{A \cap B} = \overline{A} \cup \overline{B}$.

The law of excluded middle: $A \cup \tilde{A} = X$, and the law of contradiction: $A \cap \tilde{A} = \varnothing$ are two laws which are not valid in fuzzy sets theory.

Let X be a set and A a fuzzy subset of X and μ_A the membership function characterizing it. The following definitions appears according to Jager (1995) and Zimmerman (2010).

Definition 2. The height of A, denoted h(A), corresponds to the upper bound of the codomain of its membership function:

$$h(A) = \sup\{\mu_A | \, x\in X\}.$$

Definition 3. A is normalised if and only if h(A) = 1.

Definition 4. The support of A is the set of elements of X belonging to at least some A:

$$supp(A) = \{x\in X|\mu_A > 0\}.$$

Definition 5. The kernel of A is the set of elements of X belonging entirely to A:

$$noy(A) = \{x\in X|\mu_A = 1\}.$$

Definition 6. An α-cut of A is the classical subset of elements with a membership greater or equal to α:

$$\alpha\text{-cut}(A) = \{x \in X | \mu_A > \alpha \}.$$

In practice, we usually work on normalised fuzzy sets. According to previous definitons, noy(A) ⊆ supp(A).

The extension principle generalize crisp mathematical concepts to fuzzy sets, for more details see Zadeh (1973), Dubois & Prade (1983), Jager (1995), Subašić (1997).

OPERATIONS ON FUZZY SETS

Zadeh (1965) defined the following operations for fuzzy sets as generalization of operations for crisp sets. There are three basic operations on fuzzy sets: union, intersection and complement.

Definition 7. Let μ_A and μ_B be membership functions that define fuzzy sets A and B, respectively, on the universe X. The union of fuzzy sets A and B is a fuzzy set defined by the membership function:

$$\mu_{A \cup B}(x) = \max\{\mu_A(x), \mu_B(x)\}, \forall x \in X.$$

Definition 8. Let μ_A and μ_B be membership functions that define fuzzy sets A and B, respectively, on the universe X. The intersection of fuzzy sets A and B is a fuzzy set defined by the membership function:

$$\mu_{A \cap B}(x) = \min\{\mu_A(x), \mu_B(x)\}, \forall x \in X.$$

Definition 9. Let μ_A be membership functions that define fuzzy set A, on the universe X. The complement of fuzzy set A is a fuzzy set defined by the membership function:

$$\mu_{\bar{A}}(x) = 1 - \mu_A(x), \forall x \in X.$$

Requirements for complement function c: $[0,1] \rightarrow [0,1]$, $\mu_{\bar{A}}(x) = c(\mu_A(x))$,
(c1) boundary condition c(0)=1, c(1)=0
(c2) c is monotonic non-increasing a, b ∈ [0,1] if a < b, then c(a) > c(b)
(c3) c is continuous function
(c4) c is involutive c(c(a))=a, ∀a ∈ [0,1].

Zadeh's t-norm and t-conorm were used for modeling all practical problems, but these definitions were later extended. Some other t-norms and t-conorms happend to be more efficiant (Dubois & Prade, 1986). Triangular norms, conorms and negation are used for modeling the membership function of the union, intersection and complement of fuzzy sets. There are a great number of t-norms and t-conorms known today, and the best known ones are given below (Gupta & Qi, 1991; Zimmerman, 2010).

Definition 10. Triangular norm T (t-norm) is a function T: $[0,1]^2 \rightarrow [0,1]$ having the following properties:

1. $T(x, y) = T(y, x)$ (commutativity)
2. $T(x, T(y, z)) = T(T(x, y), z)$ (associativity)
3. $T(x, y) \leq T(x, z)$ za $y \leq z$ (monotonicity)
4. $T(x,1) = x$ (boundary condition).

A natural consequence of previous definition is the following properties: T(0, x) = T(x, 0), and T(1, x) = x.

The best known t-norms are:

1. $T_M(x, y) = \min(x, y)$
2. $T_P(x, y) = xy$
3. $T_L(x, y) = \max(0, x+y-1)$
4. $T_W(x, y) = \begin{cases} \min(x, y), & \text{ako } \max(x, y) = 1 \\ 0, & \text{osim toga} \end{cases}$

These t-conorms are ordered as follows: $T_w < T_L < T_P < T_M$. These operators represent the intersection of two fuzzy sets.

Definition 11. Triangular conorm S (t-conorm) is a function S: $[0,1]^2 \rightarrow [0,1]$ having the following properties:

1. $S(x, y) = S(y, x)$ (commutativity)
2. $S(x, S(y, z)) = S(S(x, y), z)$ (associativity)
3. $S(x, y) \leq S(x, z)$ za $y \leq z$ (monotonicity)
4. $S(x,0) = x$ (boundary condition).

It is evident that t-norms and t-conorms differ in boundary conditions.

The best known t-conorms are:

1. $S_M(x, y) = \max(x, y)$
2. $S_P(x, y) = x + y - xy$
3. $S_L(x, y) = \min(1, x+y)$
4. $S_W(x, y) = \begin{cases} \max(x, y), & \text{ako } \min(x, y) = 0 \\ 1, & \text{osim toga} \end{cases}$

T-conorm S was introduced as dual operations for t-norm T such as:

$$S(x, y)= 1 - T(1 - x, 1 - y), \quad x, y \in [0,1].$$

These operators represent the union of two fuzzy sets.

For given t-norm T and t-conorm S, ([0,1], T) i ([0,1], S) are commutatively totaly ordered semigroups. For ([0,1], T) neutral element is $e_T = 1$ and anihilator $a_T = 0$. For ([0,1], S) neutral element is $e_T = 0$ and anihilator $a_T = 1$.

FAZY LOGICAL OPERATIONS

In two-valued Boolean algebra there are three basic logic operations: AND ($\wedge$), OR ($\vee$) and NOT ($\neg$). In fuzzy logic basic logical operators can be modeled by t-norms and t-conorms. Let t-norm be given, then Zadeh's negation c(x) is given by $c(x) = 1 - x$. Let us considered t-conorm S, which is dual to t-norm T and given by $S(x,y) = c(T(c(x),c(y))$, then logical operators in [0, 1]-valued logic are defined by (Pap, 1999):

conjuction: $x \wedge_T y = T(x, y)$,
disjunction: $x \vee_T y = S(x, y)$.

General forms of conjuction and disjunction operators are represented by t- norms and t-conorms, respectively. Possible definitions of fuzzy implication and fuzzy equivalence depends on chosen t-norm and dual t-conorm as we can see in Table 1. (Aeby, 1999).

Table 1. Fuzzy logic operations

A	B	¬ A	A ∨ B	A ∧ B	A ⇒ B	A ⇔ B
x	y	1-x	max (x,y)	min(x,y)	max(1-x,y)	1 - |x - y|
x	y		min(1,x+y)	max(0,x+y-1)	min(1,1-x+y)	min (max (1-x, y), max(1-y, x))
x	y		x + y - xy	xy	1- x + xy	max (min (x, y), min (1-x, 1-y))
x	y					max(0,min(1,1-x+y)+min(1,1-y+x)-1)

CONCLUSION

The purpose of the paper is to present a review of well known theory of fuzzy sets and it can be used as an introduction to fuzzy set theory for those who are not familiar with this field. Fuzzy sets thus far have its applications in mathematical theory and practice in various fields (Zadeh, 1973; Zadeh, 1975; Dubois & Prade, 1982; Kosko, 1992; Jager, 1995; Subašić, 1997; Zimmerman, 2010).

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DETERMINATION OF CAPACITY BUILDING BY APPLICATION OF THE METHOD OF CURRENT OBSERVATIONS

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ABSTRACT

The paper presents the basics of production capacity utilization and method of current observations (MCO), as one of the most common methods for measuring the degree of capacity utilization. They are theoretical and mathematical-statistical basis of MCO. The possibilities for a detailed analysis of the degree of capacity utilization via MCO are shown. The implementation procedure, the advantages and disadvantages of MCO were presented. The basic conclusion is that the MCO is a very useful and sometimes irreplaceable tool for measuring the degree of capacity utilization, the structure of working hours, etc.

Key words: Capacity utilization, Method of current observations, Advantages and disadvantages of MCO.

DETERMINATION OF STAGE CAPACITY USE

The degree of capacity utilization is one of the most used indicators of the mode of production in production. The degree of capacity utilization has a central place in analyzing the level of organization of the company, the factors of production and the causes of losses in the enterprise. It is often presented as the only measure of good or bad performance even where capacity utilization is not a primary goal.

Accuracy of degree of capacity utilization is a special problem. There are rare cases that it is sufficiently correct and scientifically measured. It often happens that the degree of capacity utilization is very precisely calculated by certain institutions (eg the Statistical Office), but based on inaccurate and very inaccurate data supplied by enterprises.

There are various methods for measuring and quantifying the degree of utilization of production capacities. Some of them are: (Klarin, 1991)

- Based on the realized and planned annual production,
- Based on the maximum monthly production,
- Based on the analysis of the layout of workers by shifts,
- Based on the installed power of the electric motor,
- Based on the maximum monthly production and employee shift coefficient,
- Based on the planned mechanical hours and realized mechanical hours,
- Based on analysis of the quantity of sawdust (in the metal processing industry),
- Complex method,
- Comparative method (in the process industry),
- Method of an integral mathematical model (in the process industry),
- Oscillation method (in the process industry),
- Method of current observations (MCO) and others.

All these methods are applied for different conditions. When the method will apply, it depends on several factors, and most often from the techno - economic level, the type of production process and the desired precision.

For these methods, data on realized capacity utilization can be obtained mainly in two ways: (Klarin, 1991)

1. Budget. The number of operations is multiplied by the duration of operations (normative or real).
2. Shooting. Recording can be done by: drive record (monitoring of work order), using registering instruments connected to each machine and the current observation method.

METHOD OF CURRENT OBSERVATIONS (MCO)

Theoretical basis of MCO

As mentioned, there are several methods for determining the degree of capacity utilization, but in practice the Method of current observations (MCO) is most applied. The method of instant observation was first applied by L.N.C. Tippet in the textile industry around 1934. Since then, the MCO has undergone a number of modifications and complementations, making her application wider and more versatile (for example, Klarin, Cvijanović, Spasojević-Brkić, 2000; Radojković, Sajfert, Cvijanović, Stanković, 2011). This trend continues so MCO remains a challenge for researchers in the field of industrial engineering.

In manufacturing business systems, MCO is mostly used for:

1. Determining the degree of capacity utilization and the analysis of factors that affect it: machines, machine groups, workplaces, workgroups, production units.
2. Determining the degree of openness: workplace, workgroups, production business units.
3. Calculating the level of organization of production units and looking at changes in that level in time.
4. Determination of the structure of time capacities: preparatory - final, basic, auxiliary, additional and interoperational (non - technological) time.

The basic characteristic of MCO is that the idea of a phenomenon is obtained from current observations carried out at random moments. For example, one machine is considered for a period of several months. If a total of 1000 observations were made during that time, one possible case: the machine worked 600 times and did not work 400 times (for various reasons). Accordingly, the degree of capacity utilization would in this case be:

$$\eta_k = \frac{600}{1000} \cdot 100 = 60\,[\%]$$

Therefore, in the observed period, the machine was used with 60 [%], while 40 [%] represent various congestions. However, these data can not be absolutely correct because recording is not done continuously. Continuous recording would require a special "recorder" that would sit continuously next to the machine and measure its work and standing. Of course, this is very impractical, especially for longer observation times and a number of machines. In addition, full recording is not economical, and there is no need for it because MCO provides data with satisfactory accuracy. These facts support the justification of the MCO application.

The basis for using the results obtained through the MCO is based on the probability, that is, the Law of Large Numbers. The greater the number of observations performed, the greater the likelihood that the result obtained corresponds to the actual state of the observed phenomenon. It follows that an infinitely large number of observations also correspond to absolute accuracy as for continuous shooting. A typical example is the coin throw. If the number of throws is sufficiently increased, the ratio of the outcome "head" - "letter" will tend to be 50 [%] to 50 [%], which is realistic. It's similar with the number of machine observations. With an increase in the number of observations, the "working" - "not working" relationship is tending to one value, which is the real value. The timing of the machine in order to check whether it works or not is determined from the table of random numbers.

Mathematical - statistical basis of MCO

MCO is basically based on the laws of probability and mathematical statistics. The phenomena recorded by MCO have a binomial distribution. The binomial distribution of some phenomenon or size P can be graphically represented as in Figure 1.

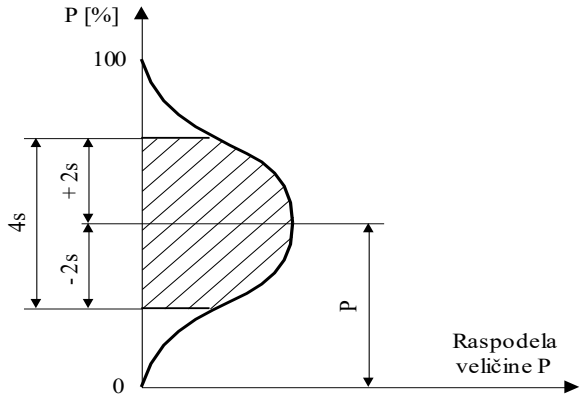

Figure 1: Binomial distribution of some size P

The area below the entire size distribution curve P (for example, the degree of capacity utilization) corresponds to total recording or infinitely large number of observations. By definition, the error (unreliability) of P depends on the number of observations in the following way:

$$g = \frac{\frac{1}{2} \cdot 4 \cdot S}{P} \cdot 100 = \frac{2 \cdot S}{P} \cdot 100 \,[\%]$$

wherein: g [%] - error (unreliability) of size P, P [%] - size whose reliability is determined by MCO,
S - standard deviation of binomial distribution. It depends on the number of observations and the size of P in the following way:

$$S = \sqrt{\frac{P \cdot (1 - P)}{n}}$$

wherein: n - total number of observations.

If the standard deviation form is classified as an error for an error, then:

$$g = \frac{2 \cdot \sqrt{\frac{P \cdot (1 - P)}{n}}}{P} \cdot 100 = 200 \cdot \sqrt{\frac{P \cdot (1 - P)}{P^2 \cdot n}} = 200 \cdot \sqrt{\frac{1 - P}{P \cdot n}} \quad [\%]$$

Obviously, a greater number of observations n corresponds to a minor error, and an infinite number of observations corresponds to an error of 0 [%], that is:

$$\lim_{n \to \infty} g = \lim_{n \to \infty} 200 \cdot \sqrt{\frac{P \cdot (1 - P)}{P \cdot n}} = 0 \,[\%]$$

Accuracy (reliability) and error (unreliability) are complementary in size (up to 100 [%]). This means that the accuracy of size P depends also on its frequency and number of observations, but in the following way:

$$t = 100 - g = 100 \cdot \left(1 - 2 \cdot \sqrt{\frac{1-P}{P \cdot n}} \right) [\%]$$

An infinite number of observations corresponds to an absolute accuracy of P, ie an accuracy of 100 [%]. Therefore, it is valid:

$$\lim_{n \to \infty} t = \lim_{n \to \infty} 100 \cdot \left(1 - 2 \cdot \sqrt{\frac{1-P}{P \cdot n}} \right) = 100 [\%]$$

One of the prerequisites for achieving an adequate MCO application is to correctly determine the number of observations. The required number of observations can be obtained from the expression for the error:

$$g = 200 \cdot \sqrt{\frac{1-P}{P \cdot n}} \ [\%] \ \Rightarrow \ n = \frac{4 \cdot 10^4}{g^2} \cdot \frac{1-P}{P}$$

For the practical application of MCO, the accuracy of accuracy greater than 95 [%] can be considered absolutely correct ($t \geq 95$ [%] $\Rightarrow g \leq 5$ [%]).

DETAILED ANALYSIS OF CAPACITY STEPPING CAPACITY THROUGH MCO

For the purpose of detailed analysis of the degree of utilization of the capacity of a particular technical system, the work can be differentiated into several types of work: V1, V2, ..., Vm (m - number of types of work), and the causes of reluctance - delays can also be viewed separately: U1, U2, ..., Un (n - the number of causes of reluctance). This decomposition of work and reluctance enables a more thorough analysis of the efficiency of the work, especially the cause of the delay. If the method of instant observation records the recording of all workers or machines (depending on what the objective of the analysis is), based on the recorded material for each workplace, it is possible to form a summary table (Figure 2).

Time period	Workplace	Work				Do not work				In total
		V_1	V_2	V_i	V_m	U_1	U_2	U_j	U_n	
From	RM_1	V_{11}	V_{12}	V_{1i}	V_{1m}	U_{11}	U_{12}	U_{1j}	U_{1n}	
_____	RM_2	V_{21}	V_{22}	V_{2i}	V_{2m}	U_{21}	U_{22}	U_{2j}	U_{2n}	
to										
_____	RM_r	V_{r1}	V_{r2}	V_{ri}	V_{rm}	U_{r1}	U_{r2}	U_{rj}	U_{rn}	
	RM_k	V_{k1}	V_{k2}	V_{ki}	V_{km}	U_{k1}	U_{k2}	U_{kj}	U_{kn}	
In total										

Figure 2. General case of the summary table with the types of work and the causes of the reluctance for observed jobs (Sajfert, Nikolić, 2007)

The markings from Figure 2 are: r - 1, 2, ..., k - number of jobs, i - 1, 2, ..., m - number of types of work, j - 1, 2, ..., n - number of causes of reluctance, Vri - the total number of observations pertaining to the r-job and i-type type of work, Urj - the total number of observations pertaining to r-th work place and the nth-cause of reluctance.

The formation of a precise summary table enables the calculation of different indicators. Some of them are:

1. Total degree of use of all workplaces

$$\eta_k = \frac{\sum_{r=1}^{k} \sum_{i=1}^{m} V_{ri}}{\sum_{r=1}^{k} \sum_{i=1}^{m} V_{ri} + \sum_{r=1}^{k} \sum_{j=1}^{n} U_{rj}} \cdot 100 [\%]$$

2. The overall degree of non-utilization of all jobs (percentage of total congestion)

$$\eta_z = \frac{\sum_{r=1}^{k}\sum_{j=1}^{n} U_{rj}}{\sum_{r=1}^{k}\sum_{i=1}^{m} V_{ri} + \sum_{r=1}^{k}\sum_{j=1}^{n} U_{rj}} \cdot 100\,[\%]$$

3. Participation of some kind of work in the overall level of utilization for all workplaces

$$R_i = \frac{\sum_{r=1}^{k} V_{ri}}{\sum_{r=1}^{k}\sum_{i=1}^{m} V_{ri} + \sum_{r=1}^{k}\sum_{j=1}^{n} U_{rj}} \cdot 100\,[\%]$$

4. The involvement of some of the causes of reluctance in the total degree of inefficiency for all workplaces:

$$N_j = \frac{\sum_{r=1}^{k} U_{rj}}{\sum_{r=1}^{k}\sum_{i=1}^{m} V_{ri} + \sum_{r=1}^{k}\sum_{j=1}^{n} U_{rj}} \cdot 100\,[\%]$$

5. The degree of use of a particular job

$$\eta_{kr} = \frac{\sum_{i=1}^{m} V_{ri}}{\sum_{i=1}^{m} V_{ri} + \sum_{j=1}^{n} U_{rj}} \cdot 100\,[\%]$$

6. The degree of non-use of a particular workplace

$$\eta_{kz} = \frac{\sum_{j=1}^{n} U_{rj}}{\sum_{i=1}^{m} V_{ri} + \sum_{j=1}^{n} U_{rj}} \cdot 100\,[\%]$$

7. Participation of some kind of work in the degree of use of a particular workplace

$$R_{ri} = \frac{V_{ri}}{\sum_{i=1}^{m} V_{ri} + \sum_{j=1}^{n} U_{rj}} \cdot 100\,[\%]$$

8. The involvement of some cause of reluctance in the degree of inefficiency of a particular workplace

$$N_{rj} = \frac{U_{rj}}{\sum_{i=1}^{m} V_{ri} + \sum_{j=1}^{n} U_{rj}} \cdot 100\,[\%]$$

The preceding terms allow you to track and analyze individual causes of reluctance for all machines or just some of them. Tracking a cause of reluctance involves looking at his movement in time (whether his influence is growing, stagnating or decreasing). Thus, detailed data can be used which can be used for preventive action (Sajfert, Nikolić, 2007).

PROCEDURE FOR IMPLEMENTATION OF MCO

The MCO implementation process has a number of phases to be carried out in the appropriate order: (Radović, 2001)

1. Determine the aim of the recording, the purpose of the MCO application.
2. Get to know people working in jobs that will be recorded with the purpose and method of recording.
3. Make a schematic view of the objects to be recorded.
4. Define the recorder path, determine the best position of the recorder for each object to be recorded, and draw all of it into a schematic view.
5. Create recording formats.
6. Train the workers who will record.
7. Determine the time each recorder is taken to record using a random number table.
8. Adopt the accuracy of indicators to be determined by MCO.
9. Calculate the required number of notes and tours.
10. Control whether the process takes place normally. If that's not the case, stop recording.
11. Arrange the tanned material.

12. Calculate indicators (the degree of capacity utilization for the entire drive or individual machines, causes of delays, etc.) and determine their accuracy.
13. Analyze the results obtained.
14. Make appropriate conclusions.
15. Take the necessary measures.

ADVANTAGES AND INJURIES OF MCO

The advantages of MCO on methods with continuous recording are: (Klarin, 1991)

1. Many activities and operations are too costly to shoot continuously.
2. One recorder can record a large number of jobs, machines and work elements.
3. MCO requires significantly less work, and costs are considerably lower compared to costs when continuous recording is carried out.
4. The observation period may, if necessary, be extended sufficiently in order to avoid various restrictions that reduce the representativeness of the sample.
5. Workers have no feeling that they are continuously observed, so they are more or less normally related to work.
6. No special instruments are used.
7. Recorders are easily and quickly trained.
8. Error and control limits can be determined to a certain extent.
9. There is a possibility of analyzing elements of time.
10. MCO can also use registry tools for mechanical times, both to correct the recorder or to facilitate the work by making the instruments record other elements of the time.

Disadvantages of MCO in relation to methods with continuous recording are:

1. MCO does not provide detailed information as continuous-shooting methods.
2. MCO is not economical if it is applied for only one workplace or with significant job dislocation.
3. When implementing MCO, there are sometimes problems in the form of employee dissatisfaction or their unrealistic behavior during the recording.

CONCLUSION

On the whole, MCO represents a very successful solution and enables the access to important data on capacity utilization, working hours structure, etc. The advantages of this method prevail over its shortcomings. Accordingly, the MCO application is justified, and in many cases irreplaceable.

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ASPECT ANALYSIS OF CREATING A NEW ORGANIZATION FOR IMPROVING THE EFFICIENCY OF BUSINESS OPERATIONS ON THE GLOBAL MARKET

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ABSTRACT

New business conditions demand from companies to change the way of their business behaviour and also to establish a new model of organization management. This became particularly noticable after the beginning of the global economic crisis. A new way of organization management is necessary for all business organizations that want to become competitive on the global market. Domestic companies are currently not competitive in the international business environment and in order to change that, they first have to change their way of business, which implies establishing a new model of organization, applying modern management concepts and techniques, as well as implementing knowledge management.

Key words: competitiveness, global market, management, organization, transition.

INTRODUCTION

Thinking about a need to establish a new organization is present from the moment when market globalization showed all its possibilities. Global competitive environment affected the necessity of analysing theory and practice in order to build a new type of organization. Nowadays, competitive relations are very complex – new competitors, mainly from newly industrialized countries, appeared on the global market. New business conditions demand a new approach to studying about organization management, as well as to business practice. So, as mentioned before, in the last twenty years competitive relations have become more and more complex because of many reasons: the number of competitors on the global market is growing, the competition is being transferred from product to innovation level and it is also present between big, small and medium enterprises, etc. Business organizations cannot be indifferent towards changes happening around them – they have to follow them, but also to perceive them in advance and use all the advantages that they offer, in order to handle business successfully. According to Robins and Judge (2009), the environment includes institutions or forces outside the organization itself that can potentially influence the organization performances.

Nowadays, it is increasingly talked about redefining the postulates of organization management. Fast technological changes demand a new philosophical approach to studying business management – it is now becoming information and technology management. According to Tisen et al. (2006), the new logic of organizations is: dynamic, ready to learn, rich in information, global, small and big, product/client-oriented, skill-oriented, promotes team work, focused on inclusion and on the customer, lateral, networked, etc. The economic crisis from 2008 affected the change in companies' behaviour regarding the maintenance of competitive ability. Kotler and Caslione (2009) find that the turbulences represent a new normality which is interrupted by occasional and alternate welfare and descending

conditions, including also the expanded ones, such as recession or even depression. Business of companies in transition countries is not on a satisfactory level. There are multiple reasons for that, but the most common ones are: negative effects of transitory recession and world economic crisis, outdated equipment, bureaucratization of state enterprises, etc.

MODERN ORGANIZATION

Modern business demands quick responses of the business organization to what is happening on the market. Experience of the United States in the early twenties of the last century showed that big corporations loaded with administration are losing the race against more enterprising competitors from abroad. In order to maintain the competitive position, it is necessary to make decisions that can sometimes be hard, but that will have further market development as their final goal. Managing an organization is becoming a harder and harder task, if we take into account the market globalization process. Yates (2011) asks a question: "Why people in some companies make better decisions than others? Currently, the most obvious answer is that those people have better possibilities, tools and actions."

One of the problems that have a negative impact on management practice is the fact that a good part of management methods and techniques is outdated. According to Hamel (2009), the biggest part of main tools and techniques of modern management were discovered by people born in the 19th century. Those fearless pioneers developed standardized desciptions of workplace and work methods. Hammer and Champy (2004), idea creators of the reengineering concept, share the similar opinion stating that the main problem of American business is that they entered the 21st century with companies created in the 19th century with the goal to be efficient and successful in the 20th century. However, something completely different is necessary. The traditional comprehension of organization is changing – new organization is focused on processes with direct access to users, it is propulsive in relation to information, managed by leader teams, based on multitasking and outsourcing. The main focus of organization is the consumer or more broadly, the user. The entire organization business has to be concentrated on satisfying customer demands. According to Bešić et al. (2009), there are at least three concepts that are esentially "spinning" around the customer and his demands: concept of quality management systems, concept of business excellence and concept of relationship marketing. New organization has to be ready to learn. Modern organization has to be innovative. Innovation represents a specific entrepreneurs' tool, a mean by which they use change as a possibility for execution of different business activities. Innovation actually creates a resource. It is one of the key factors of competitiveness in modern business, together with quality and marketing. Research-development function, oriented towards continuous improvement of the product quality concept, represents a main source of future growth and development of the company. The level of innovation has an influence on gaining competitive advantage. New organization has to be flexible, which also indicates its smaller size. In order to be successful, an organization should have a built organizational structure on one hand, while on the other hand it should strive for medium size. Organization's dimension is one of the very important factors for achieving competitive advantage in modern business. Large business organizations, burdened by oversized and unproductive administration are becoming a thing of the past.

According to Draker (2005), the most successful companies are medium sized. On the other hand, large companies and organizations need to learn how to be innovative, otherwise they would not survive. A juncture of these diametrically opposed demands can be found in outsourcing. According to Draker, outsourcing of employees and work relations is an international trend. A modern organization has to be entrepreneurial oriented and some of the characteristics of this type of behaviour are: innovativeness, taking risks, leadership, improvisation, flexibility and ability to learn. Entrepreneurial behaviour is a way of thinking, defined by creative business approach which increasingly takes shape of corporate entrepreneurship. Entrepreneurial organization is the one that notices and discovers new possibilities and chances in the variable environment and that is adapting to the changes quickly and successfully and uses them as a basis for development. Acharol and Kotler (2012) find that the „company of the future“ will be consisted of a small team doing all the work from one office. The team will build and use its knowledge about the demands of the market, consumers, suppliers and partners and it will be able to react quickly on the changes in trends and economic circumstances by using sophisticated electronic links. The process of creating value will be liberated from all the unnecessary activities.

New organization is based on knowledge. Tisen et al. (2006) state that, like in every new economy, the trigger is technology. The power is in knowledge exchange. Strong development of the Japanese economy and creating a

Japanese economic miracle encouraged other countries to start being interested in Japanese teaching methods and ways of specialization. Nowadays, Japanese methods and techniques of knowledge perfection are present in all corporations. Also, economic development of China and India influenced developed countries, especially USA, to start applying knowledge suitable for the new millenium. Globally observed, Indian IT specialists are the most wanted, while Chinese engineers and managers are slowly starting to dominate the global economy. Both economies are focusing on innovation and knowledge, as well as on entrepreneurship in the function of industrial development. The task of a modern organization is to improve the knowledge of its employees and in this way it improves also the business productivity. Nowadays, more often is talked about an organization that is learning, too. According to Robbins and Judge (2009), an organization that is learning is the one that developed a continuous ability to adapt to changes. Learning, that is implemented through all the levels in the company, enables the organization to achieve speed and flexibility and to respond to the environmental challenges. A modern organization has to accept the changes, to create them, to accept all kinds of information and to base its business on constant improvement of knowledge productivity. Organization management needs to be coherent with the customer needs and environmental demands. Changes in the market field most directly affect the way of thinking which refers to the company's management. More and more corporations are starting to think not only about their own future, but also about the future of society, or even humanity as a whole. Successful management of a business organization includes also incorporating the principle of sustainability – constant economic growth is necessary, followed by protecting and improving the environment, as well as by constant social development. Business quality involves three main dimensions: market, business and the social one (Sajfert et al. 2006). In terms of organization, improving business quality, apart from achieving business quality aspects (lower costs, higher productivity, profit growth) and market quality aspects (satisfying customer demands, achieving customer satisfaction, competitive advantage and stable market position) includes also achieving social quality aspect which is reflected in protecting people's health, consumer's interests and environment, saving natural resources, etc. The organization that wants to achieve business excellence and make world class products needs to accomplish a symbiosis of its own development goals, customer demands, as well as the demands of social community.

ANALYSIS OF MANAGEMENT PROCESS ASPECTS IN COMPANIES FROM TRANSITION COUNTRIES

When talking about the reach of business practice in transition countries, especially in the Western Balkan region, it can be noticed that the market results in global terms are not satisfying. Competitive position of the companies from the Western Balkan region is unfavourable, according to the world market renome. Those organizations mostly did not invest in adequate business efforts in order to establish competitive ability. Improving business productivity represents the main parameter of the organization success – it refers to creating conditions for improving knowledge productivity, but also work productivity, as its consequence. Battle for competitive advantage is mainly a battle for business productivity. The main question and issue is not knowing what is necessary to be done on the business organization level in transition countries. The first thing that is noticed is that transition represents changing the way of doing business towards the market model, together with the development of competitive relations and prevalance of private property in the economy. Therefore, privatisation is considered as an imperative in the transition process.

On the other hand, privatisation, which refers to changing ownership structure in business organizations from mainly state to the private one, is a necessary, but not enough reason for business organizations in transition countries to become competitive on the global market. Global experiences show that the ownership tranformation itself is not a final solution. Business organizations from transition countries have to reach for a number of tranformations that lead to the real market business and those are organizational, technological and marketing tranformations. These organizations are managing their business using outdated equipment, based on outdated technologies and there is also present a lack of knowledge. Listed issues have a far-reaching influence and result in poor competitive ability of both companies that are coming from transition countries and entire national economies.

Companies from transition countries are facing with chronic shortage of financial means: they do not have enough money that could be invested in purchasing modern equipment and technological solutions, as well as in applying modern management techniques. Most of the companies are not liquid in the greater part of

the business year. Moreover, the issue is also in the relationship to the management organization – not only that new achievements in the management field are not applied, but the managers of these organizations are also behaving the opposite of the entrepreneurship principles. In the companies that are mainly in state ownership, corporate entrepreneurship is not applied. The issue of public companies is especially important for improving business efficiency on national economy level, because they own considerable fixed capital, participate in employment and in creating GDP to a great extent, they mostly have a monopoly and they create losses. Public companies have a bureaucratized organizational structure that is often under the strong influence of politics and they are mostly monopolists on the market. Instead of being bearers of innovation and development, they strive for even bigger enlargement and market domination. As these organizations dominate the market according to the amount of capital and operation on the market, the process of improving their business efficiency therefore gets even more important. Public corporations also have to be entrepreneurially oriented and innovative. New organization implies incorporating entrepreneurial management into a business organization, starting from the top, but not only into public corporations, but in all segments of public authorities.

In order for undisturbed economic development to be enabled, it is necessary that the entrepreneurial behaviour model is accepted on all levels. Lack of leadership behaviour is especially evident in the field of innovation, research and development and this is not just a consequence of financial capital shortage, but of lack of entrepreneurial behaviour and management, above all. All business organizations that are operating in transitional economies should create preconditions for successful market battle in the global market conditions, according to the application of entrepreneurial behaviour. In the end, this implies market training of business organizations that are coming from transition countries, as well as developing their competitive abilities. The majority of countries that were once part of the Eastern bloc and that are now EU members have just proven it. Business organizations from these countries are successfully competing both on the EU and international market. They have to implement the achievements in theory, as well as in practice, into politics and strategy of the business organization. It is obvious that most domestic managers are not innovators, they are not able to accept the changes and innovations and the majority of them are not educated enough to be productive. Managers have to become effective and then make the rest of the staff effective, too. In the organization based on knowledge, productivity of every employee makes the whole system productive. According to Adižes (2006), success comes from within. If we are strong on the inside, we can solve every external problem and accept it as a convenient opportunity. But if we are weak, every external opportunity will be considered as a problem.

GUIDELINES FOR IMPROVING BUSINESS EFFICIENCY OF COMPANIES IN TRANSITION COUNTRIES BASED ON THE NEW MANAGEMENT MODEL

The practice of companies that are coming from the most developed world countries points to the fact that innovativeness and productivity are key factors for improving modern organization's business. The experience of all developed countries indicates that entrepreneurial spirit and organizational abilities are, together with knowledge, at the top of fundamental productivity factors. Business events on the global economic scene in the last decade are also indicating that newly industrialized countries have also accepted a business model based on constant improvement of productivity and on development of quality, innovation, products and organization.

Constant improvement of work and knowledge became a central issue, from executive boards of the biggest global corporations to the top government of newly industrialized countries. Productivity, quality and innovations are at the centre of consideration of all strategic variants for improving competitive ability of business organizations and competitiveness of nations. In the upcoming time, a process of constant improvement of knowledge productivity will be of crucial importance and innovations have to pervade the entire organizational structure of the corporation. New organization should be based exactly on the mentioned postulates.

Improving the process of knowledge management is a crucial factor for successful market positioning and development. It appears a need for constant improvement of knowledge and abilities of employees, especially managers. It is a common fact that in all developed countries, even in the newly industrialized ones, most managers need to attend 40 hours of training per year, so they would get conditions for

improving in the hierarchy of companies. In order for a business organization to be successfully managed, it is necessary that managers improve their knowledge and skills permanently. This issue of constant improvement is directly connected to the adequate and timely application of modern management methods and techniques.

Application of integrated and quality management systems, benchmarking and modern marketing concept is definitely a prirority in establishing a new business system in these companies. A need for applying these management techniques significantly coincides with generally accepted theoretical attitudes about restructuring business functions in modern organizations and about giving special strategic importance to the functions of marketing, quality, research and development. Quality management system is the main postulate of building integrated management systems – quality is the basis of competitive ability of every organization. Quality and productivity are mutually connected – when the quality is improved, productivity is improving, too. Benchmarking is necessary because of the constant analysing of organization's competitive position. Benchmarking enables the organization to consider its competitive environment and to learn both on mistakes of others, as well as on positive experiences of the market leaders. Relationship marketing refers to building the set of relationships between the company and the environment and it is based on managing databases, interactive marketing communication and network marketing. Relationship marketing oughts to create databases about the market and consumers, establish a two-way communication system with consumers and to insist on building a relationship network. Integrated management systems include implementation of several international management standards with the final goal to establish organization's business excellence.

CONCLUSION

The future belongs to those business organizations that are going to be the most resourceful, innovative and flexible and for now those are the corporations from newly industrialized countries. Other similar countries, that were until recently treated like developing, are going to join them very soon. In general, all the countries that finish the transition process are going to join this group. Companies from transition countries have to base the process of improving business efficiency and internationalization on applying international experiences, standards and on internationally approved business practices, especially in the entrepreneurship field, taking into account all current theoretical achievements. From that point of view, it is necessary that the companies from transition countries implement those management techniques which potentiate long-term commitment to business efficiency, in order to achieve and maintain competitive ability on the global market.

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Session B: OPERATION MANAGEMENT

Papers (pp. 83-146):

LEAN PRODUCTION AND EFFICIENCY OF MODULAR ARCHITECTURE IN SUSTAINABLE ENTERPRISE DEVELOPMENT

UDC: 658.5.012.2:502.131.1

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ABSTRACT

The significance of Lean production and modular architecture in sustainable enterprise development is presented in this paper. The implementation of Lean production in realization of modular design enables a development of an appropriate production programme in which design costs are lower and reduction of waste during processing is becoming an imperative. On the example of intelligent transmitters production it was shown that modular architecture enables the production of independent entities, realizes modules according to precisely defined technical documentation and makes possible easy servicing, improvements and fixing. The implementation of Lean concept algorithm in a repeated use of materials in a sustainable enterprise development is presented as well.

Key words: Lean manufacturing, sustainable development, product, modular architecture, reuse, transmitter.

INTRODUCTION

Current trends show that customers have become demanding so producers have to offer more quality, functional and ergonomical products at increasingly shorter terms of delivery. In regard to this, Bouchereau and Rowlands (2000), wrote that a lot of time is needed to estimate the relation between customers' requirements and characteristics of products or services. In other words, customers are often ambiguous and they have different perception regarding certain issues so there is a real problem in translating their codes into some measurable characteristics of products or services, (Chen et al., 2004).

According to Rainey (2005), increasing perfrormances and costs (waste) reduction within an existing product are seen as two most important reasons for continuing the changes of these products. Moreover, Ottosson (2004) showed that most redisigned products are incorporated into new technology so as the enterprise can stay on the market. Modular design of a product therefore has a strategic role for sustainable enterprise development. On one side, design costs will be lower if an existing module is used but on the other side, they can be even higher if new modules and the environment are designed. A selection of the current modules can save money that would be spent on testing and correcting the faults.

The aim of this work is to present a created algorithm for re-use of the materials in an enterprise sustainable development along with included Lean concept elements through modular architecture of a product.

LEAN CONCEPT AND LEAN PRODUCTION

LEAN concept (LC) represents a system characterized by optimisation of a production process and making a cheap product in time with the best quality. The main principles of LC are (Inmam and Mehra, 1990): 1) loss recognition; 2) process standardization; 3) continuity; 4) pull system; 5) quality at input; 6) permanent improvement.

According to Wolmack and Jones (1994) LEAN manufacturing (LM) can be defined as an alternative integrated model of production which combines recognisible tools, methods and strategies of product development and manages supply and operations in an enterprise. LM assumes less work at workplace, less work space, less investment, less time and stock as well as smaller number of tools. It has been proved in practice that methods and instruments of LM are not equally applicable in small and big enterprises (Matt & Rauch, 2013). There are also differences in relation to a type of production, where significant possibilities have been observed in large-scale and mass production and, some partial and under certain conditions, in small-scale and individual production, (Vorkapić et al., 2017). Also, LM has better usage in the enterprises which have accepted and implemented quality system (Zhou, 2012).

MODULAR ARCHITECTURE OF PRODUCTS

Modular architecture (MA) is an engineering methodology which takes into consideration both physical and functional relations between the components within a product life cycle (Kreng & Lee 2004). MA divides a product in modules which are changeable and where it is possible to change geometric size or functions so as different product variances can be got (Erens & Verhulst, 1997). Gu et al. (1997) point at the importance of MA in a functional interaction between the components during the exchange of materials, energy and signals as well as in spatial and geometric coordination (positioning, linking, bending, hermetic quality).

MA implies design of components and their packing in modules. In relation to this, according to Gu and Sosale (1999), modular design of a product has the following advantages: (1) divides design in a parallel product development, (2) improves the production and assembly, (3) improves standardization, (4) enables unhindered product servicing, (5) enables product improvement, (6) enables recombination of elements within a product, (7) enables recycling, (8) enables re-use and product waste, (9) adjusts a product to customers' needs.

Since the modules are physically connected, a designer is given a chance to realize different module's combinations in the form of a new product (Umeda et al., 2008). Also, MA enables connecting components or forbids mixing and convergence of components (Sa'ed and Kamrani, 1999). Changes in modular design represent another form of continual improvement. In this regard, the advantages of modular products are reflected in the following: 1) economical scope of components, 2) easy finishing, 3)increased diversity of products, 4) reduced time of ordering and 5) simplified design and testing (Ulrich, 1995).

Modules should be adjustible enough in order to have general significance for many current and future products. According to Anderson (2004), the principles of modular design include: (1) total costs, (2) re-use, (3) connections and protocols, (4) standardization, (5) clear connection for faster connecting, (6) documentation, (7) faults removing and (8) consistence.

During standardization it is necessary to take into account that too many different parts and types of material are not used because it is not possible, in this situation, to organize a permanent flow owing to diverse and uncertain demand. It is a real problem because, on one side, engineers do not understand or appreciate the significance of a supply chain and the flow of operation while, on the other side, there is a pressure put on engineers to analyse similarities or compatibility as well as the independence of elements within MA (Gershenson et al., 2003).

CLOSED MATERIAL FLOW IN SUSTAINABLE DEVELOPMENT

In closed supply chains a customer can become a supplier, in other words, a customer can be a seller of used products (Thierry et al., 1995). In this situation, used products "behave" like starting resources in sustainable development of an enterprise. For making a closed material flow block of diagram by implementing LEAN production in sustainable development of an enterprise, presented in Figure1, several studies were used (Fleischmann et al., 1997; Spengler et al., 1997; King et al., 2006). The purpose of the closed loop of material flow is to save material, total energy input and reduction of waste and harmful gas emission (Nasr & Thurston 2006).

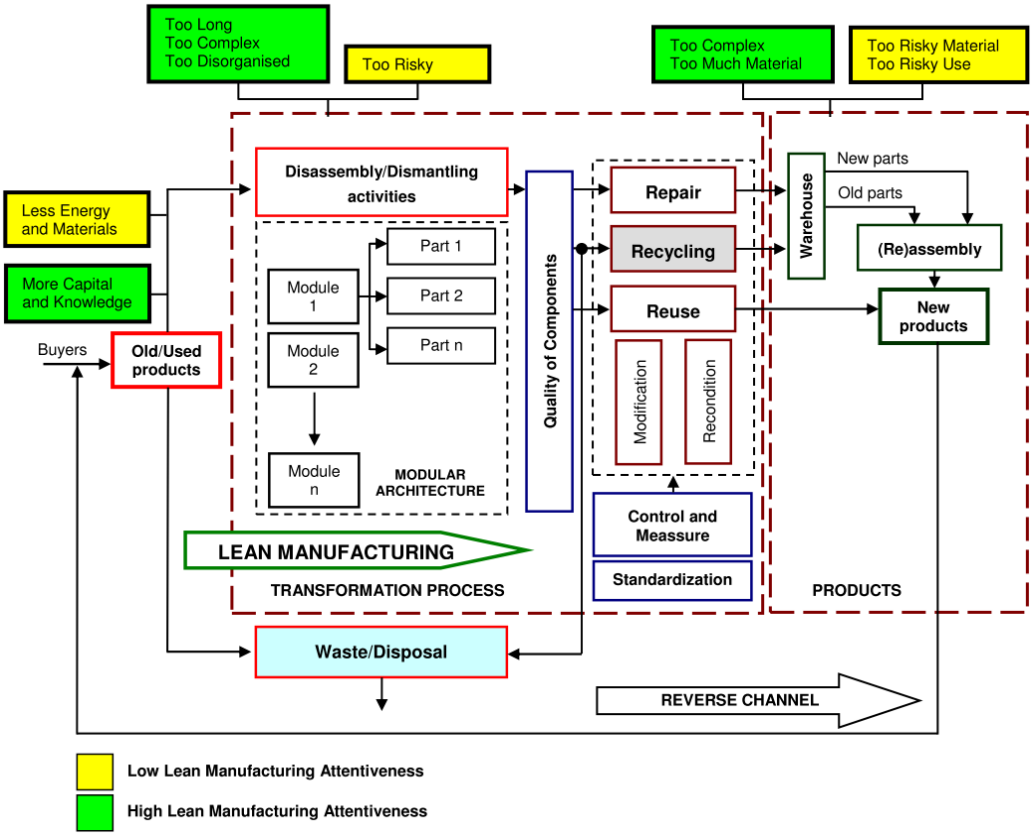

Figure 1: Closed material flow by implementation of Lean production in sustainable development of the enterprise

The received product is disassembled after inspection and disposed in waste. Correct parts are then disassembled in integral modules in reverse order from the way they were assembled. Disassembled modules are then separated. Each part of the module is then inspected and controlled. Further activities are related to measuring and control. All activities are independent and they are carried out based on factual situation and the insight in correctness/incorrectness of the device.

The first activity means fixing or refreshing modules or parts. A repaired or later contolled part goes to warehouse of finished parts. These repaired or fixed parts combined with new parts participate in the realization of new products. The second activity implies recycling. Recycling represents a procedure which strives to return the product into original state by applying the operations of disassembling, restoring and exchanging certain parts or joints. Recycling of used material can be divided into the following techniques: 1) for processing in-built parts and 2) re-use of processed material. At this point, classification of a module's functional parts is carried out while disfunctional parts are disposed in waste. Correct parts are also stored in warehouse of finished parts. If some modules satisfy the basic functions and purpose, the third activity which means re-use is applied. Re-use includes: modification (changing one or more characteristics of a product) or processing the existing parts.

SUSTAINABLE DEVELOPMENT ON THE EXAMPLE OF IHTM TRANSMITTER

A new product, realized through MA, iz based on the family of different products in which a basic component can participate in diverse variants of a product by means of module division. Product design has an important role in fast and easy disassembly of components. It is exactly the level where important designer's decisions related to further product realization can be made in regards to technical and economical feasibility, overall functionality and structural product compactness (Desai & Mital, 2003).

On the example of intelligent transmitters of pressure, level and temperature from the production programme of IHTM-CMT, here will be explained the significance of modules in sustainable development of an enterprise. Previous experience has shown that the mentioned products were only serviced in or out the warranty period. Purchase of damaged or scrapped product both by customers or distributors was not taken into consideration. In the following section of this paper we have analysed, by implementing LC, the modules characteristic for recycling and re-use with the aim of achieving considerable savings of material and energy.

Figure 2 shows a transmitter with marked modules. Common names of all three modules are given in the following order: 1) module 1 – electronic box, 2) module 2 - joint, 3) module 3 – measuring chamber. All modules are consisted of parts which make a final product when joined together.

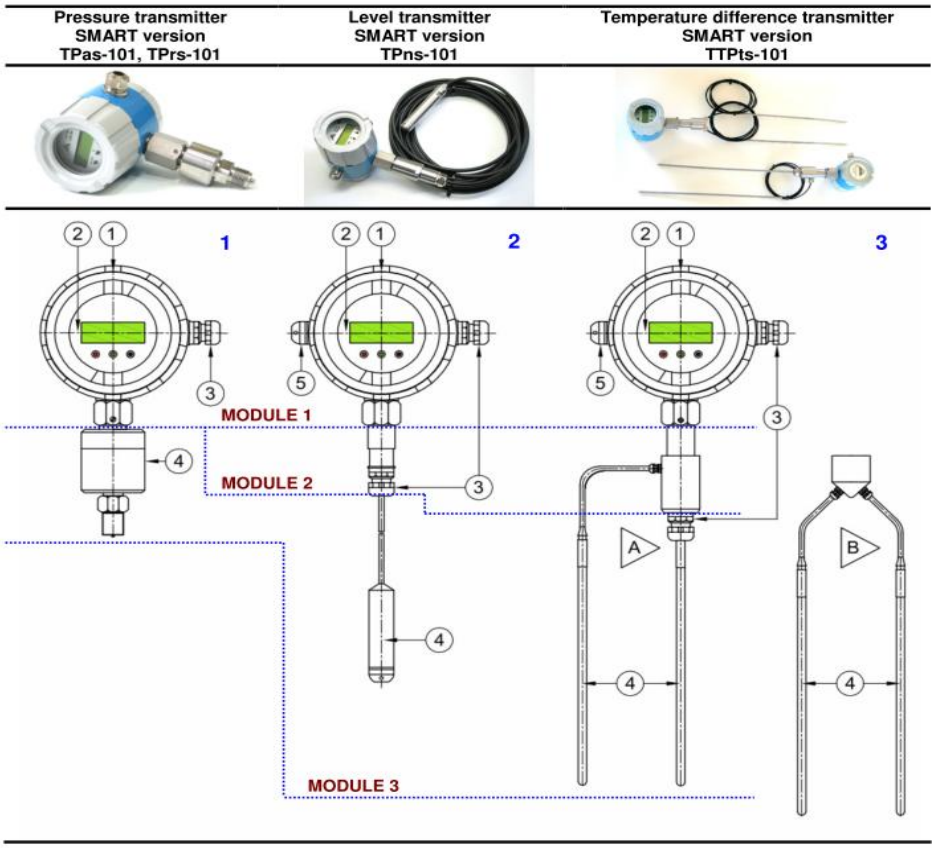

Figure 2: Modular architecture in intelligent transmitter realization

A detailed analysis of the module obtained after transmitter disassembly is presented in Table 1. The following activities were analysed: possible repairing, recycling and re-use of certain modules/elements. As can be seen, on most parts there haven't been any repairs so far but all parts can be recycled or re-used. A great number of parts cannot be repaired due to the selection of material or design solution (the exceptions are a printed board and Pt-100 sensors). In addition, the materials used in the transmitter realization are too expensive. The following materials are most used: 1.) stainless steel (most used, body: X6CrNiMo17-12-2, membrane: X2CrNiMo17-12-2/ X5CrNi18-10); 2)

aluminium alloy (Al.Cu5.Mg1.55); 3) electrical components (printed board and waterproof cable), 4) brass (CuZn39Pb3), 5) glass and rubber. Protection from corrosion requires hazardous chemical treatment or colours. Aluminium and its alloys are therefore frequently used as corrosion resistant metals.

Table 1: Module analysis of IHTM-CMT product disassembly

Product	Module	Part	Repair	Recycling	Reuse
Pressure transmitter SMART version TPas-101, TPrs-101 **1**	1	1.1 Metal enclosure	-	+	+
		1.2 Electronics package	+	+	+
		1.3 Cable connection (PG)	-	+	-
	2	2.1 Connection (M)	-	+	+
	3	3.1 Pressure sensor	-	+	+
		3.2 Process connesction	-	+	+
Level transmitter SMART version TPns-101 **2**	1	1.1 Metal enclosure	-	+	+
		1.2 Electronics package	+	+	+
		1.3 Cable connection (PG)	-	+	-
		1.4 Relative pressure sensor	-	+	+
	2	2.1 Connection (M)	-	+	+
		2.2 Distancer	-	+	+
	3	3.1 Absolute pressure sensor	-	+	-
		3.2 Wet probe	-	+	+
		3.3 Cable	-	+	+
Temperature diff. transmitter SMART version TTPts-101 **3**	1	1.1 Metal enclosure	-	+	+
		1.2 Electronics package	+	+	+
		1.3 Cable connection (PG)	-	+	-
	2	2.1 Connection (Var. A) Fixed and dislocated probes	-	+	+
		2.1 Connection (Var. B) Two dislocates probes	-	+	+
	3	3.1 Temperature sensors (Pt-100 sensors)	+	+	+

CONCLUSION

Modern business concept of an enterprise recognizes a customer as central figure along with maximun saving of its resources. Identification and elimination of unnecessary activities enable the achievement of production processes' maximum quality. Every activity which spends resources complicates the production process and increases the time of production which, on the other hand, increases the price of products.

The implementation of LM and MA on the example of IHTM-CMT product realization showed the influence which this concept could have on sustainable development of an enterprise. General conclusions point at the following:

1. MA divides a product design in several independent entities (modules) together with enabling development of the enterprise;
2. Product realization through modules improves production and assembly. It has been shown that most modules of a transmitter can be assembled even at some inaccessible places which reduces time and costs of assembly;
3. All mentioned modules are standardized and produced according to precisely defined technical documentation;
4. Servicing represents a very important segment (for more complex modules and preventive maintenance). Incorrect module can be exchanged by a new or repaired one.
5. Product improvement is permanently carried out. One of them is a module recombination. Each of all mentioned modules can be connected to a semimodule but different modifications of existing modules are possible as well.
6. Modules' components can be disassembled, repaired, separated, recycled and re-used.
7. Product adjustement based on diversity of modules is necessary in order to satisfy customer's individual requirements and desires. In this way an enterprises is trying to bridge a gap between customers and designers.

Implementation of modular design on the concrete example of IHTM-CMT transmitter realization enables development of a production programme based on the enterprise’s own results and contributes

to a high rate of flexibility. It is important to stress here a re-use of the transmitter which contributes to reduction of electronic waste. The concept of collecting outdated electronic equipment represents a new platform and a topic for serious thinking.

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DESIGN MINIATURIZED TENSILE TESTING MACHINE

UDC: 539.382:620.17

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ABSTRACT

The tensile properties of materials, such as the ultimate tensile strength, yield strength, elongation an elastic modulus, are very important factors for engineering designs. However, it is not easy for students to understand and evaluate the tensile properties of materials. In this study, a small and handy tensile testing machine was designed to help students conduct tensile tests in class using a miniature tensile specimen. The tensile testing machine consists of a stepping motor as an actuator, a load-cell, a load-cell amplifier, a data acquisition system and the testing machine frame. The detected load signal is amplified by the amplifier and is sent to the data acquisition (DAQ) system. The DAQ system with LabVIEW software receives the signals from the load-cell and displacement gauge. Using this testing machine, it is possible to conduct tensile tests on miniature tensile specimens at speeds of0.001~1.0 mm/s.

Key words: Portable tensile testing machine, miniature specimen, heat treatment, stress-strain curve

INTRODUCTION

In engineering design and analysis, tensile stress-strain relationships are frequently needed. From the relationships of the material, various mechanical properties, such as the ultimate tensile and yield strengths, Young's modulus, Poisson's ratio, the elongation, and reductions in area can be obtained. Also, the true stress -strain properties, strain hardening and tensile toughness can be calculated by means of conversion using special equations from the stressstrain curve.

Miniature tensile testing techniques to obtain the mechanical properties of materials have been an interest of many researchers (Partheepan, Sehgal & Pandey, 2005., Chao & Liu, 2003., La Van, 1999., Ma, Zhao, Huang, Zhang, Wang & Zhou, 2002., Hou & Chen, 2005.). Partheepan et al proposed a simple miniature disc-type tensile specimen and fixtures to hold specimens with the help of a rigid pin to predict the mechanical properties of materials. They verified the feasibility of the sample geometry using finite element method (FEM) analysis.

A miniforce tester driven by a DC-servomotor with a ball-screw guide-way was newly developed for a solder ball joint shear test by Chao and Liu. The full-scale displacement and maximum applied load were 100 mm and 100 kgf, respectively. The displacement resolution of the stage was maintained at 1 micron using a precision digital displacement gage closed-loop control module. LaVan developed a tensile testing system to perform tensile tests on microsamples 3.1 mm long with a gauge cross-section of 0.2 mm2. They conducted a tensile test of samples cut from weld metal to investigate the local mechanical properties of the weld joint.

A novel tensile device compatible with a scanning electron microscope (SEM) was designed and built by Ma et al. They integrated a servo-motor and a three-stage reducer for a quasistatic loading mode with a loading speed of 10 nm/s. They adopted a small lead precise ball screw with left- and right-hand threads to keep the centre of the specimen stationary during the tensile test.

Hou and Chen developed a new uniaxial tensile testing system, consisting of a closed-loop piezo-electric (PZT) actuator, a load cell, and two grippers to hold the specimen in order to investigate the mechanical of thin films. However, these systems are complicated and/or much more expensive than conventional tensile testing methods.

In this article, a miniaturised tensile testing system involving the use of a specially designed miniature tensile specimen is proposed. The system developed was designed to convert the rotation motion of a ball screw into the linear motion of specimen grips that apply a tensile load to the specimen. The frame contains an aligned linear motion guide for the movement of the specimen grips, ensuring the co-linearity of the travel axes. One side of the specimen is connected to a ball-screw block and the other side is connected to a load-cell to detect the load magnitude. It was concluded that such an apparatus can be designed, developed and constructed in house within a manageable budget. This can be accomplished by taking advantage of the capstone senior design project.

Design of the tensile testing machine specifications

The performance requirements of the machine were established for breaking using a 6061 aluminium alloy plate specimen with a thickness of 1 mm. In terms of the loading capacity of the testing machine, the specimen preparation and handling processes, thin miniaturised specimens are suitable. The functional requirements of the machine are as follows:

- Sample size: 1 mm thick, gauge cross-section area of 4 mm2, and gauge length of 8 mm.
- Maximum stroke: 20 mm.
- Maximum tensile force: 2.0

kN. Design Concept

The machine is designed to pull one end of the sample, while the other end of the sample is attached to the load cell to monitor the applied load. The maximum tensile load to break the aluminium 6061 sample with a cross section area of 4 mm2 and an ultimate tensile strength of at most 300 MPa was determined to be 1.2 kN. Thus, the maximum tensile force requirement of the machine was set to 2.0 kN. The load is measured with load cells with 0.5% of the maximum rated load.

In order to pull the sample without torsion, a ball screw converts the stepping motor rotation into linear motion. A ball screw with a diameter of 10 mm and pitch of 2 mm positioned in line with the specimen provides the tensile force. A chain is used to couple the stepping motor to the ball screw because a collinear arrangement would have made the system too long. A stepping motor with a capacity of 40 N-cm generates a full rotation in 200 steps and can be driven by the control system in 1/5 steps. A linear motion guide is adopted for precise alignment of the specimen without any distortion during gripping and tensile loading. Figure 1 shows the overall structure of the miniaturised tensile testing machine.

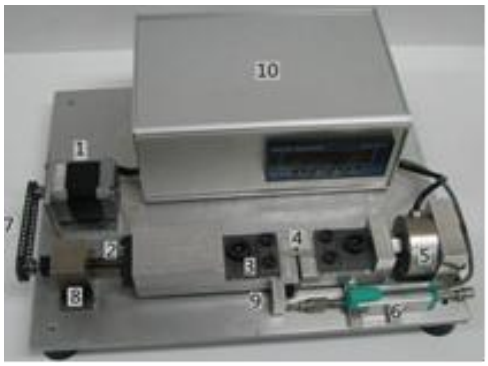

Figure 1. Photo of the miniature tensile testing machine with a size of 330 x 280 x 155 mm: 1) stepping motor; 2) ball screw block; 3) specimen holders; 4) miniature tensile specimen; 5) load-cell; 6) displacement gage; 7) chain; 8) bearing holder; 9) linear motion guide and 10) control box

A special specimen holder was designed to carry out the tensile test. The specimen holder consists of two fixtures made of die steel, as shown in Figure 2. The specimen fits into a cut-out in the specimen holder. The cut -out is machined into the same shape and dimension of the grip section of the specimen, 0.97 mm deep on the holder, for easy fixing of the specimen. The fixture is provided in the form of a hole that is 10.5 mm in diameter to hold the specimen with the help of a loading pin with a diameter of 10 mm. The test specimen experiences the tensile load through the loading pin. The specimen is attached at both ends by fixing the specimen holders. The prepared test specimen fixed in, then, gripped with the help of the loading pin. The test was carried out in the present case with a speed of 0.15 mm/min. A preload of 1 N is applied to nullify the effect of any initial nonlinearity in the output of the miniature test.

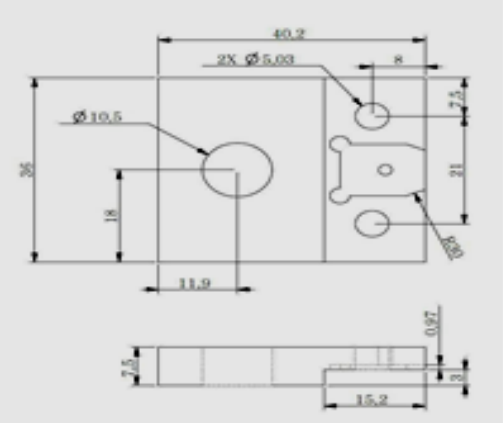

Figure 2. Dimensions of the specimen holder (all dimensions in mm)

A National Instruments USB-6009 data acquisition card is used to create the square-wave signal that drives the stepper motor and to acquire the analogue signals from the load cell indicator as well as the displacement gage. The application software of the system is written in LabVIEW, a graphical programming language provided by National Instruments. The graphical user interface (GUI) provides the user with complete control over all aspects of the tensile testing machine, as shown in Figure 3. When first powered up, the GUI guides the user through all of the steps necessary to conduct the measurements. Geometrical details such as the length, width and thickness of the test specimen are supplied to the software. All data gathered throughout the experiments can be exported to a text file for further processing using a spreadsheet tool.

Figure 3: The user interface written in LabVIEW. The interface includes a real-time plot of the applied load against displacement. Also included are setup routines for the sample setup process

SPECIMEN TESTING

In this study, a miniature specimen is designed, as shown in Figure 4. The size and dimensions of the specimen were miniaturised, based on a conventional standard tensile specimen. A finite element analysis of the miniature tensile test was carried out using the commercially available OptiStruct code in order to verify the specimen geometry without stress concentration. An elastic analysis of this test was carried out with the specimen geometry using various radii (from 5 mm to 40 mm) of gauge section of the specimen. Figure 5 shows the longitudinal stress distribution at an applied load of 500 N. The nominal stress of the gauge section with a cross-section area of 4 mm2 is 125 MPa, as

expected. The stress distribution result verifies that there is no stress concentration on the gauge section of the specimen geometry with a radius of 30 mm, as shown in Figure 5.

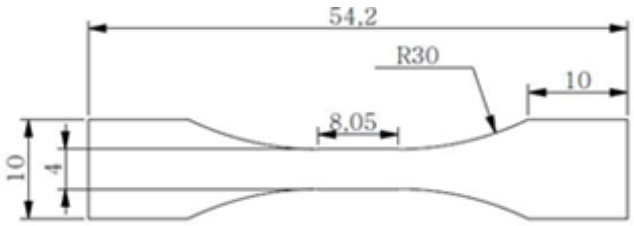

Figure 4. : Dimensions of the miniature tensile specimen

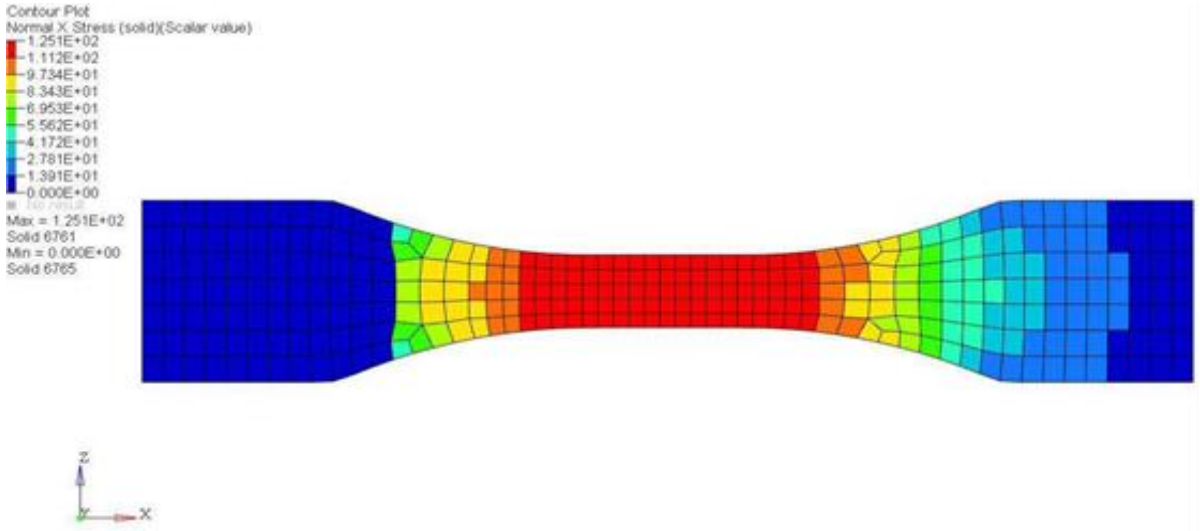

Figure 5. Finite element result of the miniature specimen to check the stress conntration

In order to make many specimens inexpensively for students, a punching process was adopted. The punch and die were made of SKD11 die steel. A die in the same shape as the specimen is punched on a thin plate with a thickness of 1 mm, as shown in Figure 6. The procedure for making this specimen is much easier compared with those of conventional tensile test specimens, which require a number of machining operations.

Figure 6: Photo of the specimen using a blanking process and a blanked-out plate

Tensile test and results

Different types of heat treatment are generally utilised to achieve a good combination of strength and ductility. Therefore, in order to help students understand the effects of heat treatments on mechanical properties, five specimens were provided to acquire the optimal heat treatment condition with respect to the ultimate tensile strength. The students were supposed to conduct tensile tests of specimens, which had been heat-treated under different conditions. In order to understand the influence of a heat treatment on the mechanical behaviour, heat-treatable aluminium 6061 alloy was adopted.

The students were supposed to find the optimal ageing time for the highest tensile strength of the 6061 alloy within an aging time range. The specimens were solid-solution-treated at 803 K for 1 hour, quenched in room-temperature water and, then, underwent aging treatments within an aging range of 0 to 300 minutes. The students had to choose an arbitrary aging time from between 0 and 300 minutes, because the maximum ultimate tensile strength was found near 120 minutes according to our previous experimental results. The students were asked to provide the stress-strain curve of the tested samples and determine the optimum aging time for the highest ultimate tensile strength in a laboratory class. They also had to summarise the test results, as shown in Table 1. *Table 1: Summarised tensile test results on various aging time.*

Table 1. Table 1: Summarised tensile test results on various aging time.

Ageing time (min.)	YS (MPa)	UTS (MPa)	Elongation (%)
0	81.1	169.5	42.3
10	150.8	258.7	27.3
30	254.2	298.5	17.5
60	276.1	302.3	12.8
120	287.8	309.9	13.3
180	274.2	297.6	13.5
210	275.2	303.7	13.7
240	245.1	282.4	15.2
300	243.2	283.8	13.9

Figure 7 presents the engineering stress-strain curves of the aluminium 6061 alloy at various aging times. Regarding the solid-solution treated sample, the ultimate tensile strength (UTS) and yield strength (YS) were 81.1 MPa and 169.5 MPa, respectively. Figure 8 shows the UTS and YS values against aging times for the solid-solution-treated aluminium 6061 alloy samples. According to this figure, the UTS and YS increased continuously up to 120 minutes and, then, decreased with increasing ageing time.

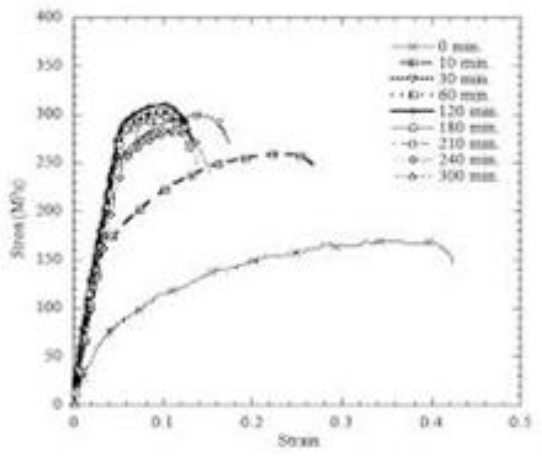

Figure 7.

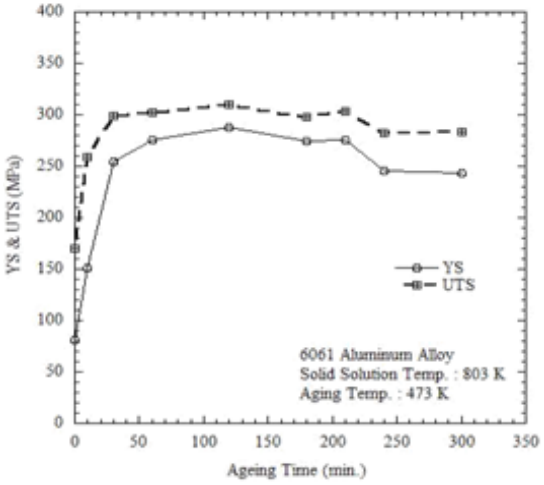

Figure 8.

The maximum UTS of the aged treatment of aluminium 6061 alloy was 309.9 MPa, which is close to that of aluminium 6061 T6 tempered alloy (Kaufman, 1999.). Therefore, from Figure 7, the optimal aging time for obtaining the highest UTS was found to be close to 120 minutes. Compared to the solid-solution-treated sample, the UTS and YS of the aged sample with an aging time of 120 minutes both increased dramatically by 83.9% and 254.9%, respectively. However, the degree of elongation decreased from 42.3% to 13.3%. The difference in the strength and ductility is attributed to the precipitation strengthening effect from the heat treatment. From these experiments, students could

understand the effect of a heat treatment on mechanical properties and could learn how to acquire the UTS, YS and elongation of materials from tensile tests.

CONCLUSION

This article described a method to evaluate material properties using a miniature tensile testing machine with a miniature specimen through a simple experimental setup. A portable miniaturised tensile testing apparatus was designed and developed. The newly designed specimen is small in size and easy to prepare. Finally, the developed testing system can be used as an instructional experimental apparatus to assist students in their efforts to understand the basic mechanical properties of materials.

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LIFE MANAGEMENT OF POWER PLANTS USING NON-DESTRUCTIVE EVALUATION

UDC: 621.311:005

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ABSTRACT

Life cycle engineering and life management of power plants, and consequently of turbo generator rotors, involves a number of critical factors one of which is non-destructive evaluation (NDE) of quality and integrity. Early detection of damage is critical to maintain safety operation of plants and, consequently, NDE is usually carried out. NDT for power plant life assessment deals with application of NDT techniques to detect discontinuities in an industrial manufacturing process that can affect the mechanical strength of a product and may cause its premature failure. Assessing the condition and remaining life of power plant components operating at high temperatures and at high stresses is necessary to optimize inspection and maintenance schedules, to make "RUN, REPAIR, REPLACE" decisions and to avoid unplanned outages. In this paper is present non-destructive testing on the turbine shaft of Aggregate A10 at the hydroelectric power plant "Djerdap II" with methods: magnetic particles (MPI) and ultrasonic inspection (UT).

Key words: Power plants, non-destructive evaluation, life management, safety, quality

INTRODUCTION

Nondestructive Evaluation (NDE) is a term that is often used interchangeably with NDT. NDE is used to describe measurements that are more quantitative in nature. NDE method would not only locate a defect, but it would also be used to measure something about that defect such as its size, shape, and orientation, as well as its effect to the remaining life of structures and components. NDE may be used to determine material properties such as fracture toughness, formability, and other physical characteristics. NDT allows parts and materials to be inspected and measured without damaging them. Because it allows inspection without interfering with a product's final use, NDT provides an excellent balance between quality control and cost-effectiveness. Generally speaking, NDT applies to all kind of industrial inspections, including metallic and non metallic structures (NDT, 2005).

In recent years, the role of NDE has become even more important considering that the strong competition in the energy industry and the compromise between the demand of electricity (overcapacity) and the new environmental regulations have made more economically advantageous to keep older power plants running beyond their design life (considering also technological and economic revamping or conversion to different power generation methodologies and combined cycles) in respect to build new structures. In particular, the traditional demand for useful life was fixed to 200000 hours (about 25 years) plus a set number of start/stop cycles, while the requests of the today market can be longer than 400000 hours plus a proper number of start/stop cycles (Crespi, 2008).

There are many international, regional and national standards applied in NDT field so far. They are approved by the American National Standards Institute (ANSI) mostly in North America and part of Asia, and by International Organization for Standartization (ISO) in cooperation with International Electrotechnical Commission (IEC) in Europe and part of Latin America and Africa. In fact, ISO and IEC form the specialized systems for worldwide standartization.

At present, in the NDT field the international standards ISO 9001 and ISO/17025 are applied, in particular for accreditation and services. In the field of qualification and certification of personnel the ISO 9712:1999 NDT seems to be well accepted worldwide. (NDT, 2005).

NDT technology as applied for plant life assessment (PLA) is a trend in many developed and developing countries. NDT for plant life assessment deals with application of NDT techniques to detect discontinuities in an industrial manufacturing process that can affect the mechanical strength of a product and may cause its premature failure. Plant life assessment in many cases means the remaining life assessment of a structure, component or product.

METHODOLOGY

The non-destructive testing (NDT) methodologies traditionally applied during the production stage are: visual testing (VT), magnetic particles (MPI), dye penetrant (PT) and ultrasonic (UT); in most recent years, MPI has been substituted by arrays of eddy currents (ET) probes in automatic production lines (Stubbs, 2004; ASNT, 2007).

The most dangerous (and stressed) section of a rotor is the bore where cracks can initiate during both steady state regime due to creep fatigue and cyclic plasticity (low cycle fatigue) and start/stop cycles due to thermal fatigue and centrifugal forces. Possible defects not removed during the production stage or characterized by a size below a given level of acceptance can also initiate cracks due to high cycle fatigue. Other critical sections are blades (stress corrosion cracking, erosion, unexpected impacts), blade root fixings and grooves and stress concentrations (creep, thermal fatigue and stress corrosion cracking). The goal is then to localize and size (in terms of length and depth) such cracks in order to apply dedicated design or life prediction techniques for the determination of residual life and proper inspection intervals. From this point of view, the choice of the proper NDT technique is critical. The NDT methodologies traditionally applied during service are the same already seen for manufacturing: VT, MPI (or ET), PT and UT.

Remote Visual Inspection

The simplest investigation techniques are based on visual checks, which are mainly devoted to locate surface or, in some cases, sub-surface cracks and to evaluate their surface extension (but not their depths).

In Industrial applications, there are certain regions that can't be accessed through the naked eye and there Remote Visual Inspection methods prove to a promising solution. Even the facts recorded by these instruments can be further utilised for the purpose of R&D analysis. At Thermal Power Stations Visual Inspections are mostly performed manually. But however, in recent years with prosper of technology certain advanced methods are used (Bachschmid et al., 2010).

Magnetic Particle Test (MPI)

This NDT technique is based on the concept that when the continuity of a magnet is broken (due to cracks, non-ferromagnetic inclusions, etc.), a north and south pole will form at each edge of the discontinuity.

Consequently, a so-called "flux leakage field" due to this double localized polarity is generated. If magnetic particles are sprinkled, they will be attracted, by magnetic field gradients, to and cluster not only at the poles at the ends of the magnet, but also at the poles at the edges of the crack. This cluster of particles is much easier to see than the actual discontinuity and this is the basis for magnetic particles inspection.

It is then obvious that, for a successful application of MPI, the material has to be ferromagnetic. It is useful to remember that some stainless steels have a magnetic permeability too low to allow the use of this technique.

It is also worth noting that MPI permits to reveal not only surface breaking defects but also sub-surface ones, at least until the flux leakage, and not the defect, is surface breaking.

The steps for the inspection are the following (Bachschmid et al., 2010):
- preparation of the surface to be inspected;
- magnetisation of the component to be inspected;
- sprinkling of magnetic particles;
- visual inspection;
- demagnetization of the component (if needed).

Different methods are available for the magnetization of the component: permanent magnets, magnetic yokes, electrical prods, coils and conductive cables. The most important aspect to be remembered is that magnetic inspection is more sensitive to discontinuities that are orthogonal to the magnetic flux direction. In the case of rotors, this means that the inspection, to be fully effective, should be carried out considering both longitudinal and circular magnetization. Just like liquid penetrants, also magnetic particles can be coloured or fluorescent.

Liquid (or dye) penetrant method (PT)

Liquid (or dye) penetrant testing is a non-destructive method used to detect surface breaking defects in any non-porous material. The steps are the following (Bachschmid et al., 2010):
- the surface is cleaned and prepared for inspection;
- liquid penetrant is applied to the surface and is drawn into cracks and pores by capillary action;
- after a preset dwell time, the liquid penetrant surplus is wiped off and the surface is dried;
- a developer (usually a chalk powder suspension) is sprayed on the surface in order to extract the liquid penetrant from possible defects;
- after a proper time for the development of indications, visual inspection is carried out in order to reveal defects;
- final cleaning of the surface.

If liquid penetrants are of the coloured type, they are visual checked in white light and the indications are revealed by the strong contrast between the colour of the penetrant (typically red) and the white colour of the chalk. If they are fluorescent, they are checked in black light (realised by means of a Wood's lamp) which evidences the yellow-green ultraviolet (UV) shade of the penetrant. The fluorescent type of penetrant is more sensible than the coloured one, but it also requires higher investments (curtains in order to shadow the inspected parts and the lamp) in order to be carried out.

Ultrasonic Inspections

Ultrasonic inspections are based onto the measurement of the time of flight of high frequency sound waves introduced into the component at various surface locations. In particular, these beams of sound waves (that can be longitudinal, shear, surface, etc.) are transmitted from a probe and detected by the same or other probes. The interpretation of the reflection, refraction and diffraction echoes at particular boundaries leads to information about the discontinuities in the test piece. Since sound

travels into many materials, the UT inspection method is the most widely used NDT technique and the only one, in particular, able to detect deep volumetric discontinuities and in conditions of difficult accessibility. The use of these techniques does not have limitations related to materials, except for those particularly porous or characterised by an inherently discontinuous structure (Bachschmid et al., 2010).

RESEARCH RESULTS ANALYSIS

Magnetic Particle Test (MPI)

On the turbine shaft of Aggregate A10 at the hydroelectric power plant "Djerdap II" it was necessary to make a measurement using MT method zone of the radius R80, at the transition from the cylindrical part of the shaft to the flange according to the hub of the impeller, as well as the cylindrical part of the shaft 200 mm in length from the radius.

The test consisted of linear individual indications of lengths 3 to 15 mm, which extend at the passage from the cylindrical part of the shaft to the radius R80, to the extent shown in Figure 1 (RE, 2007).

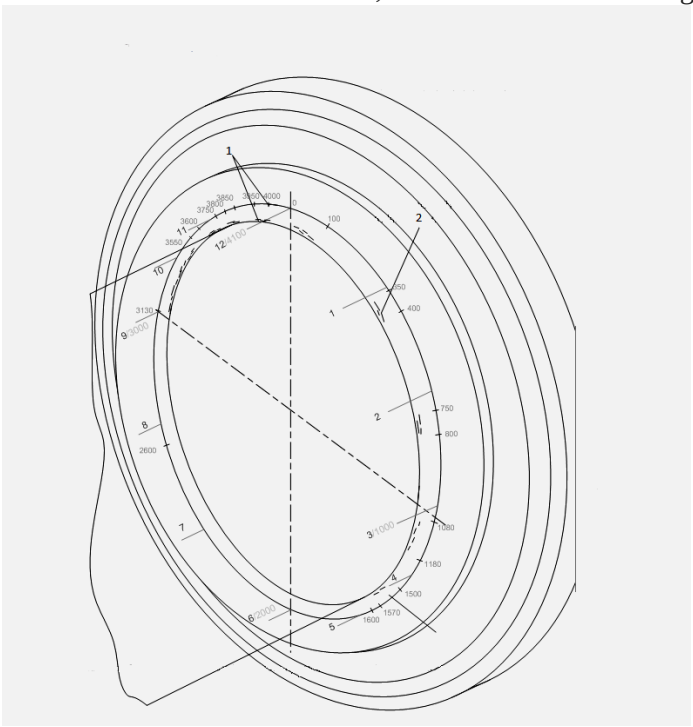

Figure 1: Position of linear indications
(1- the boundary of the transient radius R80; 2-zones of linear indications)

Linear indications extend transversely to the axis of the shaft. Flange radius zone in the area from 1600 to 2600 mm was not tested due to inadequate preparation of test surfaces. The appearance of the tested surface after cleaning is shown in Figure 2 and appearance linear indications is shown in Figure 3 (RE, 2007).

Figure 2: Appearance of the tested surface after cleaning

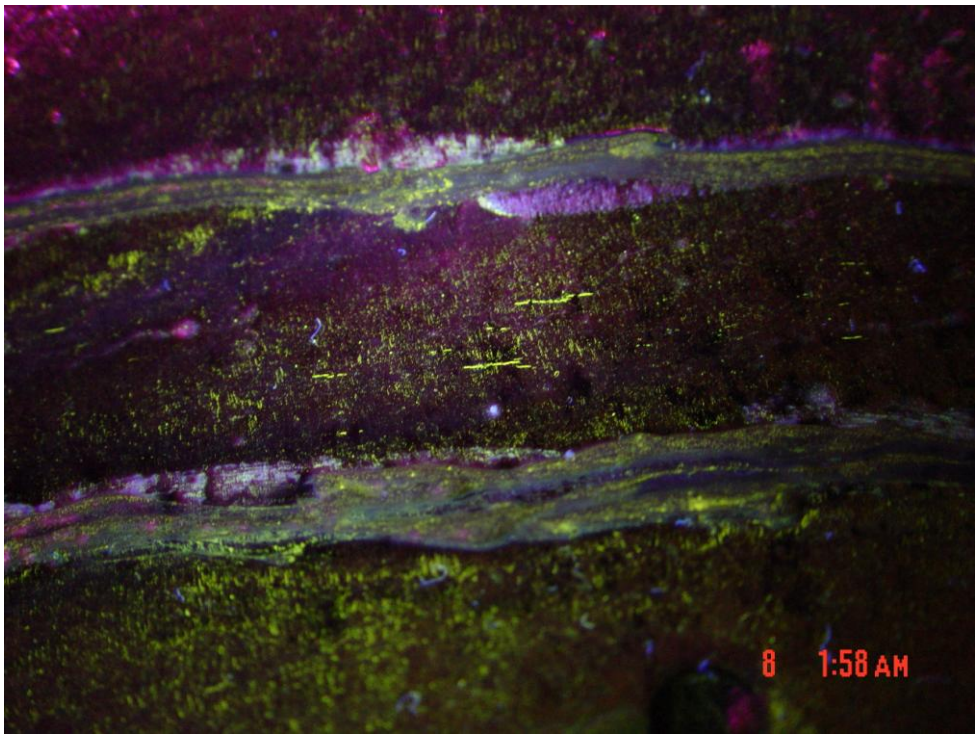

Figure 3: Appearance linear indications

Ultrasonic inspection

Using Krautkramer USM-35S device and impuls-echo method, the cracks parameters are defined in the passage zone of the cylindrical part of the shaft and flange, on the turbine shaft of Aggregate A10 at the hydroelectric power plant "Djerdap II" (RE, 2006).

Based on the findings established by the Report no. LAB 02-MT-07-20 / 1 of 12-Feb-07, the test homogeneity of the passage zone of the cylindrical part of the shaft and flange was carried out.

The existence of non-homogeneity by cross-section has not been determined in relation to the flange. Surface cracks in the radius zone, due to location, character and density, have not been detected by this method, which indicates a relatively small depth.

CONCLUSIONS

Power plant life management and performance improvement critically reviews the fundamental degradation mechanisms that affect conventional power plant systems and components, as well as examining the operation and maintenance approaches and advanced plant rejuvenation and retrofit options that the industry are applying to ensure overall plant performance improvement and life management.

There are times when a single test method does not provide enough information about the material integrity and thereby combination of different methods is essential. Non destructive testing is widely applied in power plants.

In this paper are present measurements on the turbine shaft of Aggregate A10 at the hydroelectric power plant "Djerdap II".

It should be noted that advanced inspections are a key tool in aiding the analysis for the life analysis of components as accurate inspection data can help place older equipment back into service.

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THE APPLICATION OF THE MAINTENANCE METHOD ACCORDING TO THE CONDITION WITH PARAMETER CONTROL IN THE ENERGY SECTOR

UDC: 620.9:681.518.54

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ABSTRACT

Technical diagnostics as a constituent part of the process of the maintenance according to the condition should determine the technical condition of the constituent part of the system with particular precision at a particular moment. Maintenance system is a system of managing the technical condition and the reliability of the machines within the exploitation process. Depending on the time of the receipt and use of the information, as well as on the source of its receipt, by combining the kinds of information, it is possible to discern a number of maintenance methods. The application of the maintenance method according to the condition with parameter control will be shown on the example of the technical system (technological water pump) in the energy sector.

Key words: maintenance, method, diagnostic, parameter control, energy sector.

INTRODUCTION

The development and application of the maintenance methods must depend on universal knowledge of the characteristics of the constituent parts reliability of the system, a good organization of providing necessary information, widespread use of the means and methods of technical diagnostics as well as providing a good technology of exploitation of the system.

Condition Monitoring and Fault Diagnosis (CMFD) has been playing an increasing role in maintenance research (Rao, 1996) so that a new term-condition based maintenance (CBM) is now used. CBM is currently the best preventive maintenance strategy because it enables maintenance decisions to be made based on the current status of the equipment, thus avoiding unnecessary maintenance and thus facilitating timely maintenance when there is a strong indication of impending failure (Sun, 2006). Condition monitoring is popular and has a wide range of applications. In techniques, CMFD are concerned with vibration detection, lubricants analysis, infra-red scanner, ultrasonic-pulse echo technique in data processing, with Fast Fourier Transform (FFT), Discrete Wavelet Transform (DWT), demodulation, debris counting, data fusion, image processing, etc, and in measurements, with vibration, wearing debris, acoustic emission, temperature, strain, torque, power. New methodologies or philosophies continue to emerge. For instance, Chanda et al. (2003) wavelet multi-resolution analysis for location of faults on transmission lines and the knowledge-based diagnosis used in a case study on rolling bearing of a pump Shiels, S. (2001). The determination of the best sensor positions is one of the main research goals in the field of CMFD (Bogard et al., 2002). Image processing techniques were used for identifying frequency regions which have a high discriminative power between the different classes, or Regions Of Interest (ROI) Ellwein et al, (2002). Recently it was reported that infrared thermograph is an appropriate method to identify the condition of railway track ballast (Clark et al., 2002) and a Ground Penetrating Radar (GPR) can be thought of as a suitable and economical alternative to the other methods (Hugenschmidt, 2002). The internal condition of a line can be assessed by a combination analysis of its dynamic response and temperature and pressure readings (Snodgrass and Smith,

2001). It should be noted that cost-effective and reliable damage detection is critical for the utilization of monitoring techniques. For example, non-destructive evaluation techniques (e.g. ultrasound, radiography, infra-red imaging) are available for use to composite materials during standard repair and maintenance cycles. However by comparison with the techniques used for metals these are relatively expensive and time consuming (Kessler et al., 2001).

METHODOLOGY

The maintenance according to the condition with the control of parameters has the planning-forestalling character. The periodical performance and the amount of work for the technical diagnostics are determined, whereas the forestalling character is provided by a constant control of the technical condition of the system (technological water pump) in order to find the condition leading to a failure (ε_1) and the wear-out limit ($\varepsilon_2 = \varepsilon$) .

In order to find out the conditions ε_1 and ε_2 the principle of determining the tolerance for diagnostic parameters (the diapason between the maximum parameter level and the one before the failure occurs) can be used, whereby the system (technological water pump) failure occurs at the moment when the parameter of the system condition reaches the bordering level (ε_2).

If the condition parameter reaches the value ε_1, it means that it is necessary to perform some maintenance activity in order to escape the failure of the pump (replacement or repair of the constituent part of the pump should be performed at the moment of the diagnostic control when $\varepsilon < \varepsilon_1$) whereby the value of the forestalling tolerance ($\Delta\varepsilon = \varepsilon_2 - \varepsilon_1$) is connected with the value of the periodical performance of the diagnostic control ($\Delta T = T_2 - T_1$).

A correct or incorrect technical system can be presented as a dynamic system, whose technical condition is at any moment determined by the values of input, internal and output parameters, i.e. this problem can be solved by the cybernetic principle of 'the black box'.

The performed operations of the technical diagnostics can be divided into three stages: the transformation of the physical phenomena which follow the operation of the examined technical system into a diagnostic signal (electrical value), measuring (registering) certain parameters of the diagnostic signal (e.g. a certain relative value), comparing the values of the measured parameters of the diagnostic signal with the allowable values of the determined technical norms ($\boldsymbol{\varepsilon}_2$).

If $\boldsymbol{\varepsilon < \varepsilon_2}$, the technical system (technological water pump) can operate properly, but if $\boldsymbol{\varepsilon > \varepsilon_2}$, the system is out of order, so the exploitation process must be either interrupted or further performed under special control.

The choice of the diagnostic control parameters of the technical condition and searching for the failure of each part of the system are carried out on the basis of the following:

- studying their function, way and conditions of operation,
- analysing the level of their functioning,
- making logical schemes of cause-related connections of the parameters and factors influencing the operational ability of the technical system (technological water pump) ,
- analysing the failure etc.

The chosen parameters of the technical condition (vibrations, temperature, pressure etc.) should completely define the condition of the constituent parts of the system, which enables predicting the moment of the deviation of the basic characteristics of the constituent parts and/or the pump from the nominal (allowable) values.

When choosing the parameters it should be taken into account that their number is to be as small as possible (it is most desirable that there is one, two or three parameters). According to all the above mentioned, it is possible to form a model of maintenance according to the condition with the control of parameters (1) which involves the application of the method for (Figure 1):

Defining the legitimacy of the technical condition alteration on the basis of the history of the condition alteration, such as: (Figure 2) where are:

- Module M1 – Analysing the factors determining the alteration of the technical condition and determining the parameters of the technical condition of the pump,

- Module M2 – Determining the legitimacy of the alteration of the technical condition of the pump,
- Module M3 – Determining the mathematical model of the process of the alteration of the technical condition of the pump,
- Module M4 – Determining the limit value of the parameters of the technical condition of the pump;

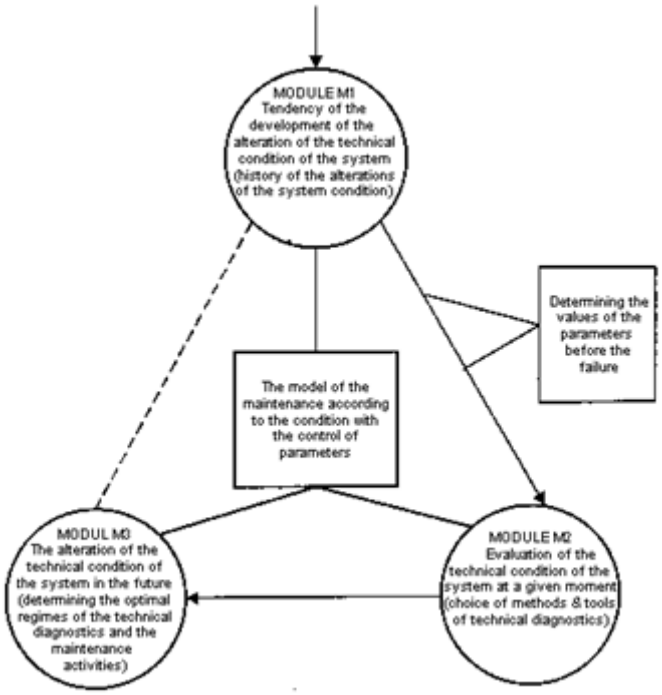

Figure 1: The stages of the development of the maintenance according to the condition with the control of parameters

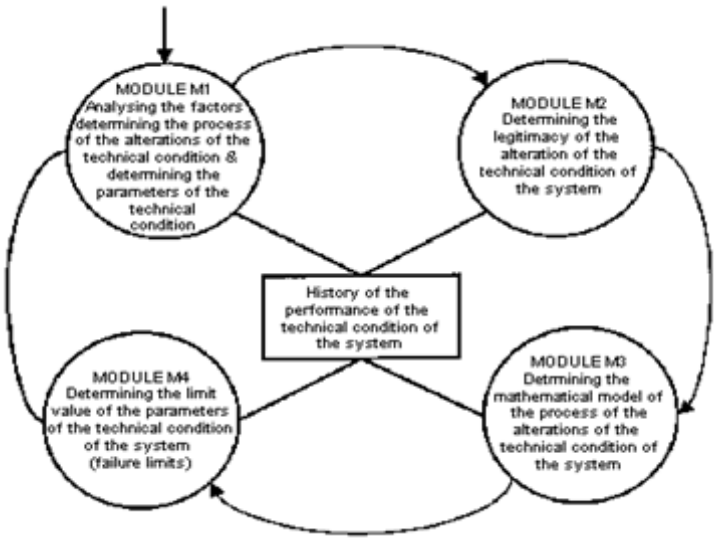

Figure 2: Research into the history of the alteration of the technical condition of the system

Defining the diagnostic pump of the system condition (Figure 3) where are:

- Module M1 – Defining and choosing the diagnostic parameters,
- Module M2 – Choice and elaboration of diagnostic methods,
- Module M3 – Choice of instruments (tools) for diagnostics,
- Module M4 – Evaluation of diagnostic parameters;

Defining the anticipation system of the system condition (getting ideas about the technical condition in the future or prognostication ('usability reserve'), such as in Figure 4, where are:

- Module M1 – the moment of the first diagnostic control,
- Module M2 – determining the limit value of the condition parameters,
- Module M3 – the moment of further diagnostic controls,
- Module M4 – the moment of performing the maintenance activities.

Figure 3: Modules of technical diagnostics within the process of the maintenance according to the condition

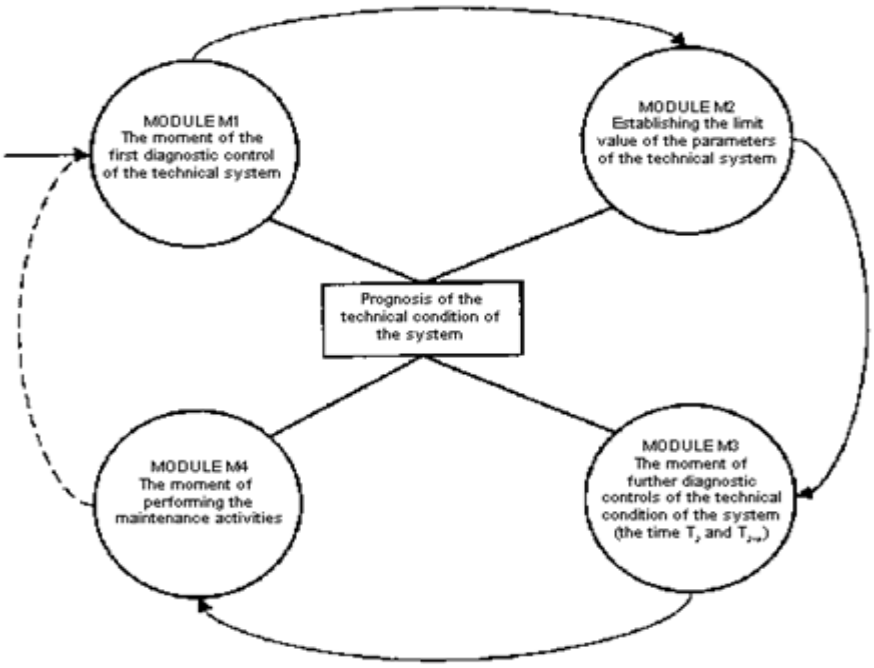

Figure 4: The modules of the prognosis of the technical condition of the system

After solving the problem of determining the diagnostic regime (defining the anticipation of the condition of the pump), i.e. determining optimal periodical diagnostic controls for the constituent parts of the pump, with respecting

the signalization tolerances for the controlled parameters, there is a new problem of grouping periodical performances of diagnostics and the maintenance activities for the constituent parts of the technological water pump within the optimum type of standard diagnostics. The optimum variant of standard diagnostics can be determined according to the criterion of the minimal average annual costs of the maintenance pump together with taking into account the costs due to the production failure.

RESEARCH RESULTS ANALYSIS

Anticipation is the last stage of the application of the model of the maintenance according to the condition with the control of parameters, which answers the question what is going to happen with the constituent part and/or the pump in the further exploitation process, after the performed diagnostics, aiming at providing the necessary efficacy of the exploitation process. Determining the usability reserve of the constituent part and/or the system in energy sector (technological water pump) is necessary in terms of its optimal reduction, as well as determining the moment of performing the necessary maintenance activities. Therefore, the anticipation results are the basis for making decisions.

As the input value concerning the prognosis of the usability reserve of the constituent part and/or the technological water pump, the necessary reliability level occurs ($\boldsymbol{p_Z = R_Z}$). It is expressed by the quantile of normal distribution ($\boldsymbol{u_{1-p}}$), whose tabulir numerical value can be taken from literature.

The moment of the first diagnostic control of the technical condition

The moment of the first diagnostic control of the technical condition can be derived from the condition that the constituent part and/or the system fulfils the required reliability ($\boldsymbol{R}_Z$). The moment of the first diagnostic control of the technical condition can thus be obtained for the normal distribution (for the linear alteration of the system condition) (2) (Adamovic and Radovanovic, 2012):

$$\boldsymbol{T}_1 = \frac{1}{m_b - \delta_b u_{1-p_0}} \left(\varepsilon_2 - \delta_a \cdot u_{1-p_0} - m_a \right)$$

where: u_{1-p_0} - is the quantile of the normal distribution (cumulative frequency) which is correspondent with the probability of the continuous operation $\boldsymbol{p}_Z$ for the time ΔT, m_a – mathematical expectation at the moment t = o, m_b – mathematical expectation at any moment, $\boldsymbol{\delta_a}$ – average square deviation at the moment t = o, $\boldsymbol{\varepsilon}_2$ - the highest limit of the system condition.

The moment of the further diagnostic controls

If the measured value of the parameter of the technical condition is under the defined limit value, then it is necessary to search for the moment when the following diagnostic control of the condition should be performed (T_2). Thus, on the basis of (3) the following (Adamovic and Radovanovic, 2012):

$$T_2 = \frac{T_1\left(m_a\delta_b - m_b\delta_a\right) + \delta_a \cdot \varepsilon_1 - \left(\delta_a + \varepsilon_b\right)\varepsilon_2}{m_a \cdot \delta_b - m_b \cdot \delta_a \cdot \delta_b \varepsilon_1} \text{ can be obtained, i.e. } T_2 = \frac{1}{u}\left[\varepsilon_1 + \Delta\varepsilon\left(T_1\right)\right]$$

where $\boldsymbol{\varepsilon}_1$ – is the level before the failure.At the moment T_2 the same procedure is repeated as with the moment T_1. Calculating the moment of the following diagnostic control of the condition (T_{2+n}), if the measured value has not exceeded the prescribed allowable value, can be performed by the interpolation method. Firstly, the average expected value of the parameter of the technical condition is calculated $\varepsilon(T_2) = uT_2 + \varepsilon_o$. Then $\Delta\varepsilon(T_2) = \varepsilon(T_2) - \varepsilon(T_2)$. In that way it comes to $T_{2+n} = f(T_{1+n})$, for the speed of the condition alteration 'u'.

$$T_{2+n} = \frac{1}{u}\left[\varepsilon_1 + \Delta\varepsilon\left(T_{1+n}\right)\right]$$

The process is repeated until the moment when the value of the measured parameter of the technical condition becomes $\varepsilon(T_n) \geq \varepsilon_1$. Then certain maintenance activities should be performed (repair, replacement etc.)

The moment of performing the maintenance activities

The maintenance activities, besides the mentioned cases, can also be performed when the constituent part and/or the technological water pump are demanded to operate longer than it is expected by the calculated moments of the following condition controls. This refers to the technical systems in energy sector operating within a continuous production process, so there is no possibility of frequent failures. Such cases are presented $T_Z \geq T_2 - T_1$ i.e. $T_Z \geq T_{2+n} - T_{1+n}$ whereby within the negative case the operation of the system in energy sector is continued until the moment T_{2+n} when the next diagnostic control of the condition is performed.

CONCLUSIONS

Developed models of the maintenance according to the condition can be applied in all industrial branches, specialy in energy sector. They are very simple, without special mathematical patterns and do not require complex information systems. In this paper the application of the maintenance method according to the condition with parameter control has shown on the example of the technical system in the energy sector (technological water pump).

Analytical expressions, which were reached by the application of the linear alteration of the technical condition of the system (other alterations can also be accepted), indicate the influence of the quantiles of normal distribution, mathematical expectation and average square deviation.

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MODERN APPROACH TO RISK ASSESSMENT BASED ON DYNAMIC ANALYSIS AND PERFORMANCE BENCHMARKING

UDC: 005.334:006.91

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ABSTRACT

There are different ways to achieve safety. Modern safety systems in safety critical organizations become very complex socio-technical systems existing in a changing environment. Risk assessment and performance measurement in these systems is critical part in the process of achieving efficiency. Risk metrics enable simpler performance and achievement description, or benchmarking. This paper presents risk metrics application and how they are useful in describing risks and safety performance measurement. The main advantage is simpler description of achieved safety level. However, risk metrics are usually outcome-oriented, and must be used in addition to indicators enabling or describing preventive actions guiding safety improvement. This problem can be solved by dynamical updating of existing risk models and introducing new risk descriptions.

Key words: risk, risk metrics, safety, performance

INTRODUCTION

Safety system is a combination of resources - people, material, equipment, hardware and software components, data, information, knowledge, and services. It integrates goals of realizing certain needs related to the protection of people, material and immaterial goods. Safety system can be considered as a complex socio-technical phenomenon based on the following basic premises (Walker et al., 2008): complex, non-linear relation between the social and the technical subsystem as a prerequisite for successful functioning; more dynamic social subsystem; and the need for simultaneous optimization of both subsystems to achieve effectiveness.

The main goal of safety systems is to prevent the occurrence of unwanted events and eliminate or reduce the consequences of these events on individuals, groups, organizations, environment or society. In order to fulfill this goal, it is necessary to standardize working environment and activities, define and monitor potential hazards and potentially harmful events, as well as to make preventive actions to avoid adverse or unpredicted consequences for protected values. The most important in modern risk assessment is risk perception and definition, dynamic risk management and safety system integration.

RISK PERCEPTIONS AND DEFINITIONS

Risk definitions are the basis for risk identification, as well as corresponding risk assessment and risk management. Based on the ISO Guide 73: 2009, risk is the effect of uncertainty on goals. Aven gives an overview of risk definitions which contains nine determinants for risk definition (Aven, 2012). Based on them, the risk is described by: expected value of loss; probability of an unwanted event; uncertainty of objectives; uncertainty; potential or possibility of loss; event described by probability and consequences; event or consequence; consequences, damage, seriousness and uncertainty.

There are various interpretations of risks in various scientific disciplines. Based on these interpretations, there is no single perspective of risk observation (Althaus, 2005). Each discipline applies a special form of knowledge of uncertainty in order to describe the risk. In economics, the risk is the phenomenon of decision making or a means of avoiding loss, and different principles of decision-making and postulates are applied to avoid it. In linguistics, it is a concept having some terminology and meaning. Mathematicians treat risk as a phenomenon that can be calculated, and apply a variety of mathematical and statistical approaches for its description or approximation. Science and medicine view risk as an objective reality, and apply principles, postulates, and calculations to describe it.
Basic approach to describe a risk is based on consequences and likelihood of occurrence of unwanted (or adverse) events. The concept of expected risk value is used to link probability and loss measure. In general, the term "consequence" describes loss, dysfunction, effects, outcomes and unwanted outcomes, while the term "probability" describes uncertainty, possibility, opportunity and potential.

The risk is most often described as the expected value of the loss and likelihood of an unwanted event, but is also described as the uncertainty of the targets or an event assessed by frequency and consequences (Aven, 2012). The expected value of the risk is the product of the probability of a risk event and the extent of its caused loss: $R = P_{rd} \cdot G$. In practice, for the expected value of risks the term risk is often used. However, a distinction should be made between risk as a state of a system from which loss can emerge and expected risk values as risk measures. Risk assessment has become the main part of the analysis of all systems.

SAFETY SYSTEM

Different management systems in the organization, which are treated as independent entities, can be an obstacle for establishing an effective safety system. They could even increase potential risks. The significance of integration of different safety systems (fire protection, workplace safety and health, environmental protection, emergency situation management, and information protection) and corresponding integration performance indicators are described in (Janackovic, 2013). The need for integrating separate management systems is due to the need for more efficient management, since similar activities in different management systems are performed completely independently of each other.

Safety System Integration

An integrated management system combines all important components into one system to optimize the achievement of organization goals, user satisfaction, fulfillment of legal obligations and obligations assumed by acceptance of standards. The integration of the management system is considered strategically and tactically: making a strategic decision on integration, defining the essence of integration, integrating system elements, defining goals and strategies; and developing plans and programs of integration, monitoring, and decision-making at critical and control points of development and reporting (Janackovic, 2013; Vasovic et al., 2017).

Integration of safety systems is necessary for more efficient use of available resources and to achieve required safety level. A notion of the significance of the safety system integration is presented in a number of standards describing and/or are associated with safety management (Janackovic, 2013). Among others, significant standards describe quality management, environmental protection, safety and health at work, food safety, information security and risk. Some representative safety standards, valid in Serbia, are presented in Table 1.

Table 1: Standard management systems related to safety

Standard name	**Abbrev.**	**Available Serbian version**
Quality Management System	QMS	SRPS ISO 9001:2015
Environmental Management System	EMS	SRPS ISO 14001:2015
Occupational Health and Safety Management System	OHSMS	SRPS OHSMS 18001:2008
Social Responsibility Management System	SRMS	SRPS ISO 26000:2011
Risk Management	RMS	SRPS ISO 31000:2015
Energy Management System	EMS	SRPS EN ISO 50001:2015
Business Continuity Management System	BCMS	SRPS ISO 22301:2014
Food Safety Management System	FSMS	SRPS EN ISO 22000:2007
Security Management System	SMS	SRPS ISO 28000:2010
Information Security Management System	ISMS	SRPS ISO/IEC 27001:2011
Competence of the Testing and Calibration Laboratories	CTCL	SRPS ISO/IEC 17025:2017
Dependability Management System	DMS	SRPS EN 60300-1:2017

In order to integrate independent management systems and the need for more efficient management of different organizational risks, the PAS99 (Publicly Available Specification) specification defines common system requirements, and forms the basis for their unification, starting with common requirements and specifications in an integrated way (BS PAS99, 2012), with the aim of applying in combination with standards and specifications of independent management systems, such as ISO 9001, ISO 14001, ISO 20000 and OHSAS 18001, as well as in all types of organizations, regardless of their size and scope.

A modern approach to the integration of the safety system implies that it is not treated as an independent entity, but that it is inherently involved in all organizational processes, obtaining effective use of available safety resources. Particularly important aspects in the process of managing an integrated safety system are team work and collaboration, as well as inclusion of safety in every step of the organization's lifecycle, to be able to analyze risk dynamically (Janackovic et al., 2013; Janackovic, 2015; Villa et al., 2016). In this regard, it is essential to define key performance indicators, their limit values and criteria for integrating individual safety systems and processes into every organizational activity, so that safety is not considered as completely independent activity.

Safety Performance Assessment

Certain organizations have the goal of achieving best possible business outcomes. Evaluating the performance of any business process, as well as the safety system, can help in achieving top business results. Assessing safety performance is a planned process in which an organization compares the processes and safety performance with others in order to reduce the number of incident and work-related illnesses, improve the application of legal norms related to safety, reduce unforeseen costs and the effects of adverse events.

Performance evaluation is not just a comparison of data or repetition of successful competitors' actions. It means continuous education and training, learning about organizational advantages and disadvantages in the process of risk management, and acting on the basis of identified organizational or individual shortcomings. The main goal is to achieve improvement in the safety system.

RISK ASSESSMENT

The framework for risk management according to ISO 31000:2018 standard is presented in Figure 1 (ISO, 2018). The basic management principles enable the creation and protection of values against potential risks. They are based on continuous improvement connected to best available information, taking into consideration the dynamic nature of identified risks, human and cultural factors. Therefore, the approach must be inclusive, cautious, structured and comprehensive. An important principle is an integrated character, where safety is not considered as an independent entity, but as an inherent part of all organizational activities. Also, the integration of safety system is necessary in order to achieve the desired results.

The proposed framework has iterative character. Risk itself is treated as the effect of uncertainty on goals, where the change can be positive (which is described by the term "opportunity") or negative (which is described by the term "risk") (ISO, 2018). The working framework is based on leadership and commitment of management, is a cyclical character, and it implies integration, design, implementation, evaluation and continuous improvement, supported by performance assessment.

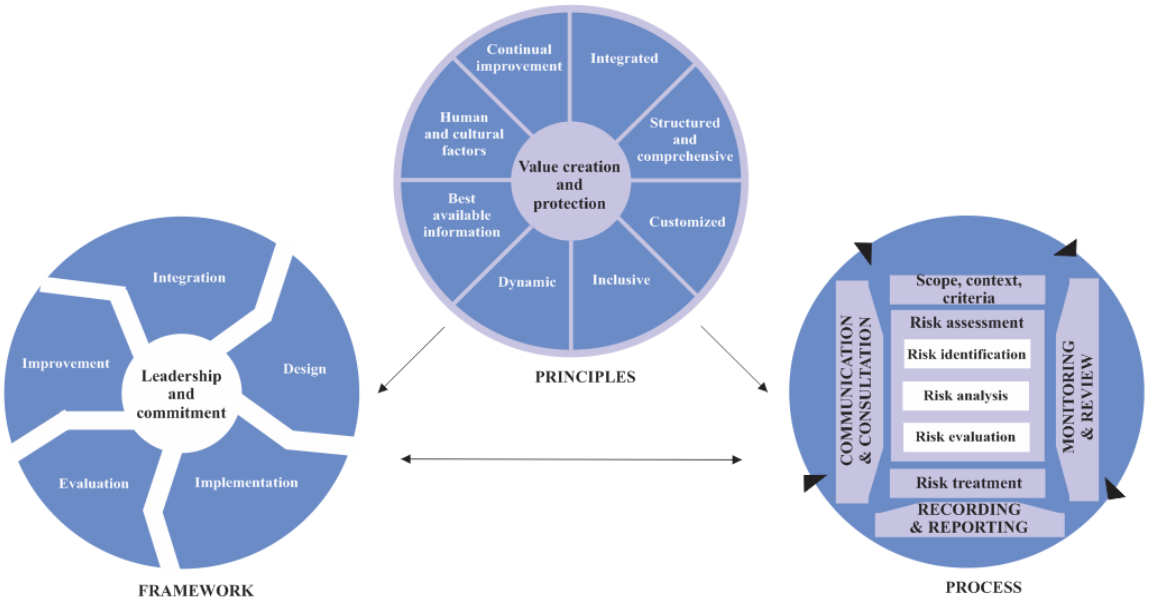

Figure 1: Framework for risk management (ISO 31000:2018)

The most significant processes taken into consideration are communication and consultation, recording and reporting, monitoring and reviewing. After defining the scope, context and evaluation criteria, the risk is assessed (risk assessment consists of identification, analysis and risk evaluation processes), and then treated if necessary. Special significance is given to risk quantification, and initiating actions based on obtained quantitative values.

Dynamic Risk Management

The way how the risk is defined, affects the way of managing risk. Contemporary social organization and environment is characterized by dynamic character. Changes are quick and fast, and timely response is necessary. The main property of classical quantitative risk assessment is its statical character, that is, the inability to update the system model to describe its functions in a variable environment. It is not possible to change corresponding model structure or values of safety critical parameters. The variability of the environment implies that some dynamics in models have to be introduced, which is implementing by updating existing risk descriptions or identifying new risks.

In order to overcome the limit of classical methods of quantitative risk change, a new, dynamic approach can be applied, which takes into account the dynamic change of conditions in the system and

its environment, which significantly influences the results of risk assessment. Dynamic character can be introduced by expanding classical, statical methods (e.g. event sequence diagram or event tree) to describe dynamic situations and scenarios, represent time dependences and dynamic perspectives, as well as random variables. These approaches are initial points for dynamic risk-based analysis of complex systems.

Risk Metrics

The method of risk assessment depends on the definition of risk itself. It is termed as a qualitative measure or concept, objective reality, concept model, event and its consequences, uncertainty, a means of balancing different attributes, or a manner of describing unwanted consequences (Aven, 2012). The risk quantification for each risky event includes: identification of a risky event; determining the probability of a risky event; determining the extent of the loss that this event would produce; and determining corresponding measure.

Table 1 shows metrics that refer to individual (personal) risk, group risk and social risk (Johansen and Rausand, 2012, 2014; Aven, 2012). They take into account the loss of life and the indirect danger to which individuals, groups or the whole society are exposed.

Table 2: Representative risk metrics (Johansen and Rausand, 2012, 2014; Aven, 2012)

Abbrev.	***Full name***	***Type***	***Subtype***
IRPA	Individual risk per annum	Individual risk	Loss of life
LIRA	Localized individual risk	Individual risk	Indirect danger or loss
IR	Individual risk of dangerous dose	Individual risk	Indirect danger or loss
FIE	Frequency of intermediate events	Individual risk, Group risk	Indirect loss
PLL	Potential loss of life	Group risk	Loss of life
FAR	Fatal accident rate	Group risk	Loss of life
SRI	Scaled risk integral	Group risk	Loss of life
PEF	Potential equivalent fatality	Group risk	Loss of life
FN	FN diagram	Societal risk	Loss of life
RI	Weighted risk integral	Societal risk	Loss of life
TR	Total risk	Societal risk	Loss of life
FE	FE diagram	Societal risk	Economic loss
EL	Expected economic loss	Societal risk	Economic loss
CED	Conditional expected damage	Societal risk	Overall loss
MCR	Monetary collective risk	Societal risk, Group risk	Combined loss

Risk metrics are sorted by type. Almost all metrics describe the results of the occurrence of unwanted events, or corresponding outcomes. Their character does not allow them to be used for preventive actions, as they describe the outcomes of the previously realized adverse events. Their values can be used only to assess the past performance of safety system in the risk management process and select preventive measures that would be applied in the future to reduce the risk to an acceptable level.

Efficient risk management in complex organizations is possible only if priorities or key performance indicators are identified. The approach based on group multi-criteria ranking of key indicators has proven useful in the process of identifying potential risks in various complex organizations (Janackovic et al., 2013, 2017; Kovacevic et al., 2016). As important aspects, among others, organizational and human factors are identified. Active participation of all organizational structures and understanding of cultural and other differences in an organization significantly reduce the possibility of manifesting the consequences of adverse events.

CONCLUSION

Rapidly changing complex environment is the cause of many organizational risks and opportunities. This recognizes the ISO 31000 standard, and requires organizations to identify not only potential

problems, but also possibilities of improving the existing system even when there are no identified shortcomings. Therefore, static character of risk assessment is not adequate for application in a dynamic environment. Dynamic changes require new models and methods for assessing risks and opportunities, as well as interpreting their effects on organizations or systems.

Important processes in modern risk assessment are communication and consultation among different stakeholders, safety recording and reporting of all unwanted or unexpected events, and monitoring and reviewing. After defining the scope, context and evaluation criteria, at the level of organizational top management, the risk has to be assessed dynamically, starting from risk identification, to risk analysis and risk evaluation, with the main goal to treat it to achieve desired level of risk, acceptable for all stakeholders involved in the decision-making process.

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THE EFFECTS OF THE APPLICATION OF THE LEAN CONCEPT TOOLS ON THE LENGTH OF THE PRODUCTION CYCLE

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ABSTRACT

The paper presents the application of the Lean tool on the length of the production cycle of complex product for special purposes, which is a part of the production program of the Company JSC "Sloboda" Cacak. The goal of the paper is to present the possibilities of reducing the production cycle using the appropriate Lean concept tool. Since the series production is analyzed in the paper and, as far as, the complex product consisting of a large number of positions, with the determining "Takt" time Lean concept tool thus achieved the daily improvement of the performance of all production processes and technological procedures. In this case, a significant decrease in the production cycle is shown in relation to the previously planned time.

Key words: Lean concept, production cycle, „Takt" time, technological procedures

INTRODUCTION

In industrial systems, the Lean concept is mainly based on designing a workflow that is applicable, flexible, consistent, and sustainable in space and time (James and Frederick, 2001). (Womack et al. 1991) first coined the term "Lean production" in their seminal book, The Machine that Changed the World. However, the origin of lean thinking is generally attributed to Toyota, whose production system was originally referred to as just-in-time (JIT), but is now commonly called the Toyota Production System (TPS) (Fullerton et al., 2014).

Application of the Lean concept is caused by the demands of customers and demands the continuous improvement of work and production processes in accordance with the given circumstances. Lean manufacturing is a management philosophy derived mainly from the Toyota Production System (TPS) in which the focus is on improving the "flow" or smoothness of work (Krafick, 1988). How would the Lean concept be implemented in a particular production system, it is necessary to manage the management within the enterprise with this concept. Also, employees within this system must be willing and able to operate and use the Lean system. If the desire for continuous improvement and improvement of the work process with the manager, even with employees is greater, the effects of the Lean concept will be even greater. The organization is transformed from a traditional structure characterized as top-down with project driven improvement led by middle managers into one where continuous improvement is conducted throughout the company by locally empowered teams (Fullerton et al., 2014). The Lean concept represents a systemic approach to the management and organization of industrial and manufacturing enterprises, that is, the way of interaction between human potential, production resources, means of work, organizations and technologies within the production

system. It is a systematic method to eliminate waste within a manufacturing system (Nagi et al., 2017). This change in manufacturing strategy is associated with increased operational efficiency and effectiveness, which positively impact firm performance (Fullerton and Wempe, 2009; Hofer et al., 2012; Kaynak, 2003; Yang et al., 2011).

This paper presents the application of the Lean tool on the length of the production cycle of complex product for special purposes, which is a part of the production program of the Company JSC "Sloboda" Cacak. Applying one of the Lean concept tools in the serial production of the P-1 product, a shorter duration than the previously planned time was achieved.

APPLICATION OF LEAN CONCEPT IN PRODUCTION COMPANIES

Many companies tend to meet market demands in terms of products with different characteristics, high quality, shortening the production cycle time, and short delivery times. With the advent of Lean production system is not completely disregard of traditional production methods, but found a solution to the increasingly difficult survival of the company in a very demanding, rapidly changing and completely unstable modern market. Lean manufacturing and related tachniques and tool have been popularized over the last two decades since they can bring forth remarkable improvements in all segments of manufacturing system (Behrouzi and Wong, 2011). Lean production methods are not new technologies, but they are a compilation of many production techniques that have been used and known in the past. Lean production is able to manufacture a larger variety of products, at lower costs and better quality, with less of inputs, compared to traditional mass production: less human effort, less space, less investment, and less total cycle time as it utilizes optimal skills of the workers, by giving them multiple task, by integrating direct and indirect work, and by encouraging continuous improvement activities (Dankbaar, 1997). As evidence of the paradigmatic nature of lean production, it is interesting to note how these originally counter-intuitive principles have become mainstream managerial concerns (Lewis, 2000).

Lean concept generates prosperity, new customers, market penetration and all other good things (Singh et al., 2009). Lean production methods allow significantly more efficient production per unit of product, while eliminating waiting times or other types of delays. Lean manufacturing gives the manufacturers a competitive edge by reducing cost and improving productivity and quality (Bhamu and Sangwan, 2014). Production begins with the launch of the task, based on the results of the planning system The goal of this concept is that the product moves through all production processes without delay. The total time required to guide the product during the production process greatly depends on the requirements of the customers.

The advantage of this method is in the consolidation of these techniques into a powerful set of methodologies, as well as their application in practice. Lean concept is a powerful tool that achieves significant organizational and financial results. The task of Lean production is to eliminate the emergence of extra time and waiting time. The goal of Lean production is to establish and design a production line capable of serial production, using as much time as it takes to create the product. On the other hand, in some cases, certain problems can arise in the planning of production capacities, which can cause imbalance between production processes. Frequent changes can lead to the employment of workers for a certain period or the release of a certain number of employees in an effort to align production capacities with customers' demands. One major critique of the Lean concept is that it is generally weak concerning the employees' perspective (Pettersen, 2009). It is precisely by using Lean production that the organization of the work of the production processes is enabled ie, it is achieved that the tasks and technological processes are achieved in a sequential and progressive manner.

THE INFLUENCE OF THE APPLICATION OF THE LEAN TOOL ON THE LENGTH OF THE PRODUCTION CYCLE

The goal of each production company is to shorten the production cycle, or to find a way to minimize the production time at all stages of the production process, from the initial to the final phase. Theoretical and practical studies have shown an increasing interest in the application of different methods and techniques for solving the problem of reducing the length of the production cycle and optimizing the utilization of the capacities of a production (Radojicic et al, 2012a; Klarin et al, 2010; Cala et al, 2011; Agrawal et al 2000; Radojicic et al, 2012b; Bhat, 2008, Wang et al. 2010, Radojicic et al, 2012c). The possibilities for shortening the production cycle are numerous, especially in serial production, where at different intervals the time duration of certain operations and waiting time is changed. However, the duration of the production cycle does not affect only these times, but also the very way of moving objects through production operations, as well as planning and replacing these operations. The Lean Concept represents one of the most effective ways of reducing the production cycle.

Table 1: The duration of each position of the product P-1

Name of assembly/position	Time from the technological process [days]	Duration of the position [days]	Duration of the position after applying Lean tool [days]
Bullet casing			
Ordering materials	45	**45**	**45**
Receiving materials	2	**2**	**2**
Creating bullet casings - mechanical processing	25.07	**26**	**23**
Making a joint of a bullet casing and a capsle	11.13	**12**	**11**
Testing	2	**2**	**2**
Lighter			
Ordering materials	30	**30**	**30**
Receiving materials	2	**2**	**2**
Making a lighter body	50.01	**51**	**46**
Making the guies	76.93	**77**	**70**
Making the plug	12,80	**13**	**12**
Making bracket caps	22.73	**23**	**21**
Preparation of carrier segments	20.01	**21**	**19**
Making the segment	45.40	**46**	**41**
Making the spring	25.01	**26**	**23**
Making the needle	16.13	**17**	**15**
Making the batter	25.93	**26**	**24**
Laboration of lighter	14.27	**15**	**13**
Testing	2	**2**	**2**
Grenade			
Ordering materials	30	**30**	**30**
Receiving materials	2	**2**	**2**
Creating a rotating band	11.13	**12**	**11**
Making liner molded article	16.67	**17**	**16**
Preparation of the comp. liner and rotating band	138.07	**139**	**125**
Laboration of grenade	62.47	**63**	**57**
Testing	2	**2**	**2**
Completion of bullet			
Completing the bullet	21.74	**22**	**20**
Testing	2	**2**	**2**
Packing a bullet			
Ordering materials	15	**15**	**15**
Receiving materials	2	**2**	**2**
Making cartridges - lateral	1.33	**2**	**2**
Making cartridges - front-back	0.95	**1**	**1**
Making cartridges - top-bottom	0.95	**1**	**1**
Making bags for packing	1.60	**2**	**2**
Packing a bullet	5.01	**6**	**5**

In the first part of the paper, an analysis of the product life cycle of the product P-1 consisting of 5 assemblies and 34 positions was performed. The duration of the production cycle determines the possible deadline for the delivery of the final product. The required surveys were carried out in the company, in the period of time of one month, during which the following data, from detailed analyzed technological procedures, were obtained: the number of shifts during the working day, the number of working minutes per shift, and the production time in cmh for one piece. The data obtained from the performed recording were applied to each assembly, and the position of the product P-1. Table 1 shows the duration of the production process for each position are calculated using the parallel type of organization of manufacturing operations, on the basis of the obtained data from technological procedures, using the following expression (Radojicic, 2007):

$$T_{cp} = \sum_{i=1}^{m} t_i + (q-1)t_{i,max} \tag{1}$$

By using the MS Project application (Figure 1.), the comparative Gantt Chart shows the duration of all positions, before and after the application of the Lean concept tool. The parallel type of organization of the order of execution of production operations, calculated using Equation (1) with the initial and final times for each operation, where days are used as measuring units. The production cycle started 05.03.2018. It was calculated that the total lifetime of the production cycle of the P-1 product is 255 days, for a production volume of 100000 pieces, which is required to be made on a monthly basis, in accordance with the required order and agreed delivery deadlines. When defining the production process on Saturday and Sunday, they were treated as non-working days, so the production process was completed on 14.11.2018.

The continuation of this work shows the application of the one Lean concept tool, which defines the rate of progress of the product cycle time of a product, which is called determinig „Takt“ time (Hobbs, 2004; Hobbs, 2011). The main advantage of Lean production is that the application of any model results in a reduction in the production cycle time. Determinig „Takt“ time of the product is expressed in such a way that the complete tasks are grouped into production units and then balanced in relation to the calculated and pre-formulated time and is expressed in minutes.

Hobbs (2004) calculates „Takt“ time using the following expression:

$$\text{Takt} = \frac{\text{Work Minutes per Shift} \cdot \text{Number of Shifts per Day}}{\text{Throughput Volume per Day}} \tag{2}$$

The total duration of the production cycle must be consistent with the work tasks and technological processes. Each partially completed product is forwarded to the next technological process through the line where the next „Takt“ of the work tasks is executed. Throughout all production processes, the product progresses sequentially until all operations are completed. The production process of the P-1 product is carried out in two shifts, while the time of production by shift is taken from technological procedures.

$$\text{Throughput Volume per Day} = \frac{\text{Total Throughput}}{\text{Makespan}} \tag{3}$$

	Name	Duration: Current	Duration: Previous	Durat: Diff	Start: Current	Start: Previous
1	**Bullet casing**	**73 days**	**66 days**	**7d**	**Mon 3/5/18**	**Mon 3/5/18**
2	Ordering materials	45 days	41 days	4d	Mon 3/5/18	Mon 3/5/18
3	Receiving materials	2 days	2 days	0d	Mon 5/7/18	Tue 5/1/18
4	Creating bullet casings - mechanical processing	26 days	23 days	3d	Wed 5/9/18	Thu 5/3/18
5	Making a joint of a bullet casing and a capsle	12 days	11 days	1d	Tue 5/29/18	Mon 5/21/18
6	Testing	2 days	2 days	0d	Tue 6/12/18	Fri 6/1/18
7	**Lighter**	**111 days**	**101 days**	**10d**	**Mon 3/5/18**	**Mon 3/5/18**
8	Ordering materials	30 days	27 days	3d	Mon 3/5/18	Mon 3/5/18
9	Receiving materials	2 days	2 days	0d	Mon 4/16/18	Wed 4/11/18
10	Making a lighter body	51 days	46 days	5d	Wed 4/18/18	Fri 4/13/18
11	Making the guies	77 days	70 days	7d	Wed 4/18/18	Fri 4/13/18
12	Making the plug	13 days	12 days	1d	Wed 4/18/18	Fri 4/13/18
13	Making bracket caps	23 days	21 days	2d	Wed 4/18/18	Fri 4/13/18
14	Preparation of carrier segments	21 days	19 days	2d	Wed 4/18/18	Fri 4/13/18
15	Making the segment	46 days	41 days	5d	Wed 4/18/18	Fri 4/13/18
16	Making the spring	26 days	23 days	3d	Wed 4/18/18	Fri 4/13/18
17	Making the needle	17 days	15 days	2d	Wed 4/18/18	Fri 4/13/18
18	Making the batter	26 days	24 days	2d	Wed 4/18/18	Fri 4/13/18
19	Laboration of lighter	15 days	13 days	2d	Fri 7/13/18	Tue 7/3/18
20	Testing	2 days	2 days	0d	Fri 8/3/18	Fri 7/20/18
21	**Grenade**	**173 days**	**156 days**	**17d**	**Mon 3/5/18**	**Mon 3/5/18**
22	Ordering materials	30 days	27 days	3d	Mon 3/5/18	Mon 3/5/18
23	Receiving materials	2 days	2 days	0d	Mon 4/16/18	Wed 4/11/18
24	Creating a rotating band	12 days	11 days	1d	Wed 4/18/18	Fri 4/13/18
25	Making liner molded article	17 days	16 days	1d	Wed 4/18/18	Fri 4/13/18
26	Preparation of the compound liner and rotating b	139 days	125 days	14d	Wed 4/18/18	Fri 4/13/18
27	Laboration of grenade	63 days	57 days	6d	Thu 8/2/18	Wed 7/18/18
28	Testing	2 days	2 days	0d	Tue 10/30/18	Fri 10/5/18
29	**Completion**	**24 days**	**22 days**	**2d**	**Tue 10/2/18**	**Tue 9/11/18**
30	Completing the bullet	22 days	20 days	2d	Tue 10/2/18	Tue 9/11/18
31	Testing	2 days	2 days	0d	Thu 11/1/18	Tue 10/9/18
32	**Packing a bullet**	**25 days**	**24 days**	**1d**	**Thu 10/11/18**	**Wed 9/19/18**
33	Ordering materials	15 days	14 days	1d	Thu 10/11/18	Wed 9/19/18
34	Receiving materials	2 days	2 days	0d	Thu 11/1/18	Tue 10/9/18
35	Making cartridges - lateral	2 days	2 days	0d	Mon 11/5/18	Thu 10/11/18
36	Making cartridges - front-back	1 day	1 day	0d	Mon 11/5/18	Thu 10/11/18
37	Making cartridges - top-bottom	1 day	1 day	0d	Mon 11/5/18	Thu 10/11/18
38	Making bags for packing	2 days	2 days	0d	Mon 11/5/18	Thu 10/11/18
39	Packing a bullet	6 days	6 days	0d	Wed 11/7/18	Mon 10/15/18

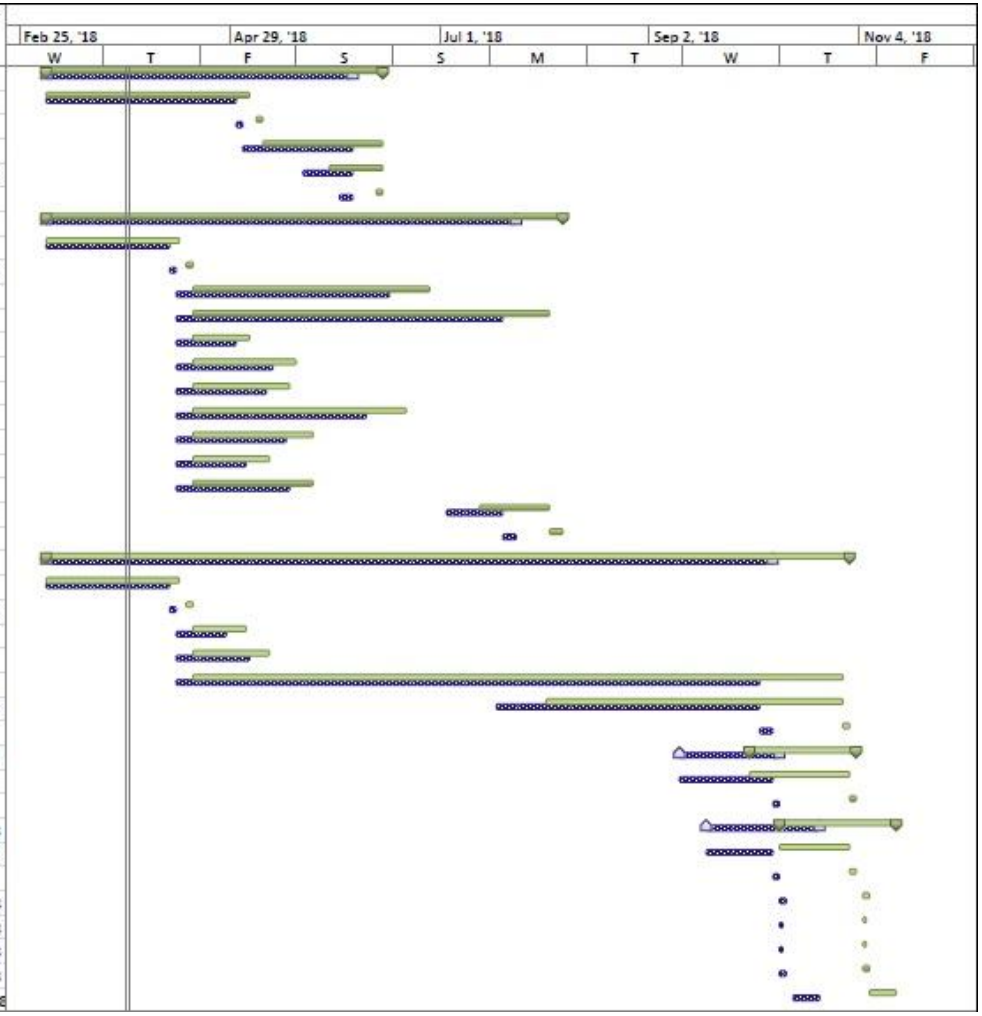

Figure 1: Comparative Gantt Chart of Parallel type of performing organization of manufacturing operations

Using the formulated „Takt“ time, the company within Lean production has the ability to regulate the production cycle cycle daily in accordance with the requirements of the customers. The application of this tool analyzes the relationship between the total available production time at the daily level and the daily quantities produced. The total available time for each position at the daily level was obtained from technological procedures. Customer demand is defined by the required order at the monthly level, so the average daily demand is 5000 pieces. The average overall efficiency of the production capacities is 82%, which makes it possible for progress.With the use of this Lean concept tool, it's significantly increased efficiency by 10%. The „Takt“ time is calculated using the Equation (2) for each position within the production cycle of the product P-1, and new duration of the position were obtained, this is shown in Table 1.

Since the product production process P-1 consists of 34 positions, that is, the same number of „Takt“ times, managed by one manager. Within the production process of each position, employees are directed towards their managers. During the production process management, with the application of this Lean concept tool, they are able to change the output data in order to align them in a more precise manner with the requirements of the customers. On the basis of the Gantt Chart (see also Figure 1), we have noticed that by applying the method of "Stroke" Lean time the concept of a significant reduced the production process of the P-1 product. The previously planned length of the production cycle of the production line P-1 was 255 days, while using the Lean concept reached the time of 234 days.

CONCLUSION

Since all production processes are balanced and connected in sequences, the products can be produced according to „Takt“ time, where the time of each sequence, one by one, is modified, through all production processes. By grouping tasks, all technological processes are interconnected. On the one hand, there is an increase in the efficiency of the final results of all production processes, and at the same time, on the other hand, the production cycle of the product is significantly reduced.

This paper presents the application of one Lean concept tool in serial production within a production line. This Lean concept tool is based on common work tasks, the same amount of resources involved, common technological processes, and the duration of all production processes within the product cycle of the product P-1. A reduction in the production cycle duration in the amount of 21 days. This ability of daily change in the rate of progress of the production cycle time, according to customer requirements, has proven to be a powerful tool in managing production processes.

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THE PRIORITIZATION OF THE PLM IMPLEMENTATION FACTORS BASED ON MCDM APPROACH

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ABSTRACT

This paper presents a MCDM-based framework for identifying and prioritizing PLM implementation factors, as an initial step in the process of designing and introducing PLM concept within enterprises. The paper utilizes the Fuzzy ANP method to assess the impact of the identified factors on the success of the PLM implementation process. The ANP method enables interpretation of complex non-linear relationships among considered factors, also the integration of the Fuzzy set theory within the conventional ANP method allows dealing with the problem of ambiguities of human perceptions, so this approach provides a rational results, and enables support to the effective implementing of PLM.

Key words: PLM implementation, key implementation factors, ANP method, Fuzzy set theory**.**

INTRODUCTION

The PLM concept includes the entire process of effectively managing and connecting all information related to the product needed to design, produce, support, maintain and ultimate disposal of products. Implementation of the PLM strategy represents a huge challenge for enterprises. According to Paavel et al. (2017), implementing PLM does not mean only software implementation, but it also means a new way of thinking for people within enterprise, and requiring adopting of new knowhow, also it might be necessary to change current activities and processes to support effective implementation of PLM.

The specificity, main challenges, issues and influence factors associated with implementing PLM strategy are the interest field of many researchers. Paavel et al. (2017) introduced a new PLM maturity model in order to simplify and optimize PLM implementation within small and medium enterprises. Bokinge and Malmqvist (2012) examine how a real PLM implementation project was conducted, mapping out the rationale for different courses of action and the effects they had, while in the paper (Bokinge and Malmqvist, 2011) they are exploring challenging requirements management issues in PLM implementation. The authors Salehi and McMahon (2015) tried to define method and systems implementation approaches and identify the challenges, problems and weaknesses involved in the implementation of PLM systems. The paper (Cantamessa et al., 2012) presents a framework for investigating PLM implementation effects at three key levels: individual, organizational, and strategic, also it indicates that PLM implementations must be designed, combining the introduction of new technology with organizational changes. Hewett (2010) examines the primary organizational challenges associated with implementing PLM such as cultural issues, deficiency of standardized engineering processes and the failings of the PLM technology.

Identifying and prioritizing factors that determine the success of PLM strategy implementation is an initial step in the process of designing and realization a PLM concept in enterprises. This paper utilizes the Fuzzy ANP to assess the importance of factors that influence on PLM implementation success. The Fuzzy ANP allows modeling of complex interrelationships among decision levels, and can handle with the uncertainty of decision makers` in expressing their subjective preferences. The Fuzzy ANP methodology has been widely applied in handling with numerous of issues associated with business doing, such as: digital marketing (Kaltenrieder et al., 2015), mechatronics based product development (Parameshwaran et al., 2015), performance measurement of a manufacturing company (Öztayşi and Sari, 2012), strategies prioritization in a manufacturing firm (Babaesmailli et al., 2012), supply chain management performance evaluation (Li 2009).

PROPOSED METODOLOGY

Based on the review of the relevant literature and the studying the specificity of the PLM implementation process, the basic factors that have a significant influence on this process success, will be determined. These factors, further will be evaluated using the ANP methodology, which will provide considering the interdependence among the established factors, also the implementation the fuzzy set theory within the ANP process, the problem of vagueness will be successfully avoided.

The Concept of the Fuzzy Analytic Network Process

ANP is MCDM method, developed by Saaty (1996), this method enables interpretation of complex non-linear relationships among decision levels and attributes, instead of establishing a simple linear hierarchy. The integration of the Fuzzy set theory within the conventional ANP method allows dealing with the problem of ambiguities of human perceptions. The Fuzzy ANP process consists following steps:

Step 1: Construction of the ANP model hierarchically – structuring the decision attributes and modeling of the complex non-linear interdependencies among decision levels and attributes.

Step 2: Determination the local weights of the factors and sub-factors – That requires creation of a pair-wise matrix ($\tilde{A}$), which elements (a_{ij}) represent the preference of the factor i over factor j. In order to deal with the vagueness of decision makers' subjective preferences, preferential relationships will be expressed by linguistic expressions that will be further represented by triangular fuzzy numbers $(a_{ij}^l, a_{ij}^m, a_{ij}^u)$.

$$\tilde{A} = \begin{pmatrix} (1,1,1) & (a_{12}^l, a_{12}^m, a_{12}^u) & \cdots & (a_{1n}^l, a_{1n}^m, a_{1n}^u) \\ \left(\frac{1}{a_{12}^u}, \frac{1}{a_{12}^m}, \frac{1}{a_{12}^l}\right) & (1,1,1) & \cdots & (a_{2n}^l, a_{2n}^m, a_{2n}^u) \\ \vdots & \vdots & \vdots & \vdots \\ \left(\frac{1}{a_{1n}^u}, \frac{1}{a_{1n}^m}, \frac{1}{a_{1n}^l}\right) & \left(\frac{1}{a_{2n}^u}, \frac{1}{a_{2n}^m}, \frac{1}{a_{2n}^l}\right) & \cdots & (1,1,1) \end{pmatrix} \quad (1)$$

The triangular fuzzy number (Figure 1) has a linear membership function and belongs to closed interval $[0,1]$.

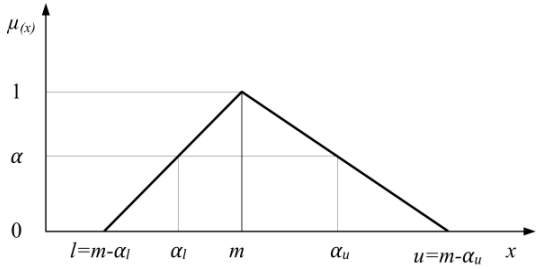

Figure 1: The triangular fuzzy number

Fuzzification of the linguistic expressions will be performed using the most frequently used scale, established by Kahraman et al. (2006), which is shown in Table 1 and Figure 2.

Table 1: Fuzzified scales for difficulty and importance (Kahraman et al., 2006)

Linguistic Scale for Difficulty	Linguistic Scale for Importance	Triangular Fuzzy Scale
Just equal	Just equal	(1,1,1)
Equally difficult (ED)	Equally important (ED)	(0.5,1,1.5)
Weakly more difficult (WMD)	Weakly more important (WMD)	(1,1.5,2)
Strongly more difficult (SMD)	Strongly more important (SMD)	(1.5,2,2.5)
Very strongly more difficult (VSMD)	Very strongly more important (VSMD)	(2,2.5,3)
Absolutely more difficult (AMD)	Absolutely more important (AMD)	(2.5,3,3.5)

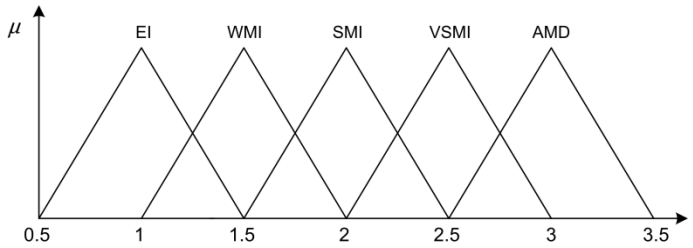

Figure 2: Fuzzification of linguistic scale for relative importance

It is possible to obtain the priority vectors from the pairwise comparison matrix by the normalization of the fuzzy function ($\widetilde{H}$).

$$\widetilde{H} = \sum_{i,j} \widetilde{log}\left(\frac{\tilde{w}_i}{\tilde{w}_j} - \tilde{a}_{ij}\right)^2 \tag{2}$$

According to Chen et al. (1992), that further requires the application of the Logarithmic Least Squares (LLS) method:

$$\sum_{ij} max\left\{log\left(\frac{w_i^L}{w_j^U} - a_{ij}^L\right)^2, log\left(\frac{w_i^M}{w_j^M} - a_{ij}^M\right)^2, log\left(\frac{w_i^U}{w_j^L} - a_{ij}^U\right)^2 \rightarrow min\right\} \tag{3}$$

$$w_i^U \geq w_i^M \geq w_i^L \geq 0, i = 1,2,\dots,n$$

The problem can be solved by:

$$\tilde{w} = \left(w_k^l, w_k^m, w_k^u\right), k = 1,2,3,\dots,n$$

Where is:

$$w_k^s = \frac{\left(\prod_{j=1}^n a_{kj}^s\right)^{\frac{1}{n}}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{ij}^m\right)^{\frac{1}{n}}}, s \in (l,m,u) \tag{4}$$

Step 3: Determination the factors interdependent weights – The local weights obtained in the previous step does not consider the interdependence among the factors. Interdependence weight among the factors is determined by analyzing the impact of each factor on every other factor using pair-wise comparisons. The LLS method can also be applied to the calculating of those weights.

Step 4: Determination the sub-factors global weights – The sub-factor global weights is obtained by multiplying the sub-factor local weight and the interdependent weight of the factor to whom the considered sub-factor belongs.

THE PROCESS OF ESTIMATION OF THE PLM IMPLEMENTATION FACTORS

In this section will be implemented the proposed model for the evaluation of the PLM implementation factors. The proposed model based on Fuzzy ANP methodology is presented in the Figure 3.

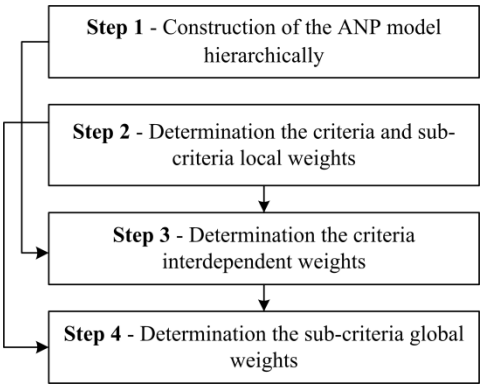

Figure 3: The proposed model for the evaluation of the PLM implementation factors

Step 1: Based on the review of the relevant literature and the studying the specificity of the PLM implementation process, the basic factors that have a significant influence on this process success, are determined. These factors include Management, Strategy and Planning, Financial, Organizational and Processes, People and Culture and Information Technology. Each of those categories is explained in several sub-factors (Figure 4). By analyzing the interdependent among the factors the ANP model hierarchically is constructed, this model is shown in Figure 4.

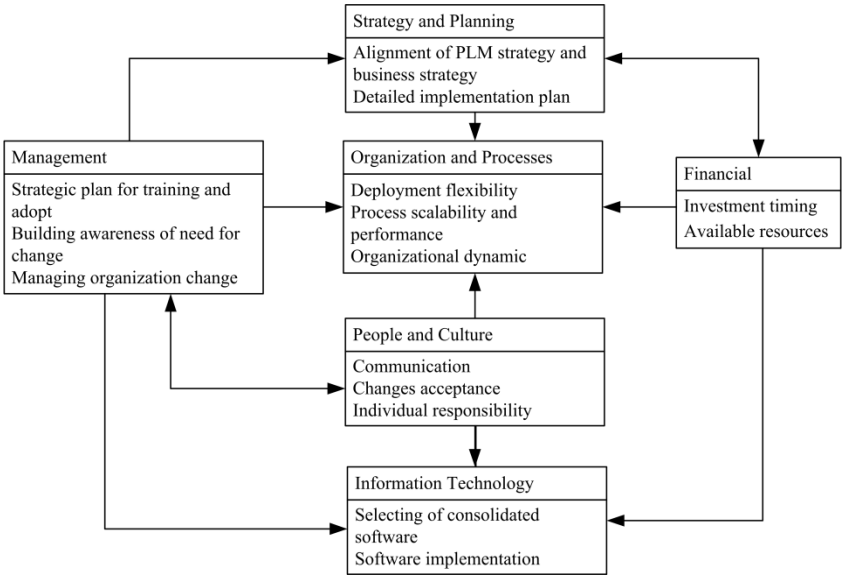

Figure 4: ANP network for PLM implementation factors

Step 2: By the language expressions represented with the TFN (Table 1), established according to the opinion of the group of five experts, the fuzzy aggregation comparison matrices are constructed, first for the factors, and then for each sub-factors. The local factors and sub-factors weights are derived from those matrices according to the Equation (4). The pair-wise matrix and the factors local weights are presented in the Table 2. The Table 3 presents the results for the sub-factors of factor People and Culture, defined on the basis of the opinion of the relevant expert. Results for all sub-factors are presented in Table 6.

Step 3: In this step, interdependent weights of the factors are calculated according the analyzing the dependencies among the factors. For this purpose, six pair-wise comparison matrices were constructed. Interdependent weights matrix based on factor Organization and Processes are presented in Table. The final results of these matrices are presented in Table 5. The interdependent weights are obtained by multiplying the matrix given in Table 5 with factors local weights (Table 2), those results are presented in Table 5, too.

Table 2: Local weights and pair-wise comparison matrix of factors

Factor	F	SP	M	OP	P	IT	Local Weights
F	(1,1,1)	(0.32,0.37,0.46)	(0.31,0.36,0.44)	(0.41,0.53,0.74)	(0.54,0.74,1.22)	(0.59,0.92,1.64)	(0.074,0.093,0.126)
SP	(2.16,2.67,3.17)	(1,1,1)	(0.5,0.74,1.19)	(0.72,1.25,1.76)	(1.76,2.27,2.77)	(2.16,2.67,3.17)	(0.184,0.242,0.304)
M	(2.26,2.77,3.27)	(0.84,1.35,1.99)	(1,1,1)	(1.08,1.5,1.86)	(1.35,1.86,2.37)	(1.66,2.24,2.78)	(0.199,0.26,0.32)
OP	(1.35,1.9,2.43)	(0.57,0.8,1.4)	(0.54,0.67,0.92)	(1,1,1)	(0.72,1.25,1.76)	(1.35,1.72,2.06)	0.132,0.175,0.231)
P	(0.82,1.35,1.86)	(0.36,0.44,0.57)	(0.42,0.54,0.74)	(0.57,0.8,1.4)	(1,1,1)	(0.72,1.25,1.76)	(0.094,0.127,0.172)
IT	(0.61,1.08,1.68)	(0.32,0.37,0.46)	(0.36,0.45,0.6)	(0.48,0.58,0.74)	(0.57,0.8,1.4)	(1,1,1)	(0.08,0.102,0.137)

Table 3: Local weights and pair-wise comparison matrix of sub-factor People and Culture

Factor	Communication	Changes acceptance	Individual responsibility	Local Weights
Communication	(1,1,1)	(0.5,0.67,1)	(1.5,2,2.5)	(0.286,0.347,0.428)
Changes acceptance	(1,1.5,2)	(1,1,1)	(1.5,2,2.5)	(0.361,0.455,0.539)
Individual responsibility	(0.4,0.5,0.67)	(0.4,0.5,0.67)	(1,1,1)	(0.171,0.199,0.241)

Table 4: Interdependent weights matrix based on factor Organization and Processes

Factor	F	SP	M	OP	P	Interdependent Weights
F	(1,1,1)	(1,1.5,2)	(1.5,2,2.5)	(1.5,2,2.5)	(0.5,1,1.5)	(0.196,0.274,0.345)
SP	(0.5,0.67,1)	(1,1,1)	(1.5,2,2.5)	(2,2.5,3)	(0.5,1,1.5)	(0.181,0.244,0.311)
M	(0.4,0.5,0.67)	(0.4,0.5,0.67)	(1,1,1)	(2,2.5,3)	(2,2.5,3)	(0.175,0.21,0.253)
OP	(0.4,0.5,0.67)	(0.33,0.4,0.5)	(0.33,0.4,0.5)	(1,1,1)	(1.5,2,2.5)	(0.122,0.133,0.161)
P	(0.67,1,2)	(0.67,1,2)	(0.33,0.4,0.5)	(0.4,0.5,0.67)	(1,1,1)	(0.109,0.139,0.203)

Table 5: Degree of relative impact for criteria and factors weights

Factor	F	SP	M	OP	P	IT	Weights
F	(0.35,0.5,0.61)	(0.26,0.38,0.47)	(0,0,0)	(0.2,0.27,0.34)	(0,0,0)	(0.31,0.39,0.46)	(0.125,0.225,0.364)
SP	(0.41,0.5,0.71)	(0.3,0.36,0.45)	(0,0,0)	(0.18,0.24,0.31)	(0,0,0)	(0,0,0)	(0.109,0.177,0.297)
M	(0,0,0)	(0.21,0.26,0.36)	(0.64,0.71,0.78)	(0.18,0.21,0.25)	(0.68,0.75,0.81)	(0.24,0.28,0.34)	(0.272,0.41,0.604)
OP	(0,0,0)	(0,0,0)	(0,0,0)	(0.11,013,0.16)	(0,0,0)	(0,0,0)	(0.015,0.023,0.037)
P	(0,0,0)	(0,0,0)	(0.26,0.29,0.32)	(0.11,0.14,0.2)	(0.23,0.25,0.27)	(0.19,0.22,0.28)	(0.103,0.154,0.234)
IT	(0,0,0)	(0,0,0)	(0,0,0)	(0,0,0)	(0,0,0)	(0.09,0.1,0.12)	(0.007,0.011,0.016)

Step 4: In the final step the sub-factors global weights were calculated. Those values are obtained on the base of local factors weight and interdependent weight of the factor to whom the considered factor belongs. Those results are presented in Table 6.

Table 6: Sub-factors global weights

Factor	**Sub-factor**	**Local Weights**	**Global Weights**	**Non-fuzzy value**
Financial	Investment timing	(0.298,0.333,0.385)	(0.037,0.075,0.14)	0.0819
	Available resources	(0.577,0.667,0.745)	(0.072,0.15,0.271)	0.161
Strategy and Planning	Alignment of PLM and business strategy	(0.346,0.4,0.49)	(0.038,0.071,0.145)	0.0812
	Detailed implementation plan	(0.49,0.6,0.693)	(0.054,0.106,0.206)	0.1178
Management	Strategic plan for training and adopt	(0.17,0.227,0.28)	(0.046,0.093,0.169)	0.1005
	Building awareness of need for change	(0.445,0.528,0.604)	(0.121,0.216,0.365)	0.2297
	Managing organization change	(0.199,0.245,0.34)	(0.054,0.1,0.205)	0.115
Organization and Processes	Deployment flexibility	(0.248,0.313,0.394)	(0.004,0.007,0.015)	0.0082
	Process scalability and performance	(0.394,0.486,0.568)	(0.006,0.011,0.021)	0.0124
	Organizational dynamic	(0.172.0.201.0.248)	(0.003,0.005,0.009)	0.0053
People and Culture	Communication	(0.286,0.347,0.428)	(0.029,0.053,0.1)	0.059
	Changes acceptance	(0.361,0.455,0.539)	(0.037,0.07,0.126)	0.0757
	Individual responsibility	(0.171,0.199,0.241)	(0.018,0.03,0.056)	0.0337
Information Technology	Selecting of consolidated software	(0.639,0.714,0.782)	(0.005,0.008,0.013)	0.0081
	Software implementation	(0.261,0.286,0.319)	(0.002,0.003,0.005)	0.0033

According the obtained results the factor *Building awareness of need for change* has the strongest influence on the success of PLM strategy implementation, also a great influence on this process have factors: *Available resources, Detailed implementation plan, Strategic plan for training and adopt* and *Alignment of PLM and business strategy*, while factors such as *Organizational dynamic* and *Software*

implementation has a less significant impact. The basic advantage of the proposed model is the possibility of taking into account the dependencies that exist between the basic factors, which provides more rational results.

CONCLUSION

The methodology proposed in this paper, based on Fuzzy ANP methodology, provides strong support to the process of determining the influence of various factors on the success of the PLM strategy implementation. On the other hand, using the language expressions represented by triangular fuzzy numbers enables avoiding the problem of decision makers` vagueness in expressing their subjective preferences. According to the opinion of the experts involved in evaluation process, the most influential factors on the PLM implementation success are: *Available resources, Detailed implementation plan, Strategic plan for training and adopt* and *Alignment of PLM and business strategy*. The results obtained from the evaluation process which was carried out in the paper, might be of considerable help in designing a strategy for the implementation of the PLM.

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OPTIMAL PRODUCTION LOT SIZE CONSIDERING TO CONTINUOUS QUALITY INSPECTION AND SAFETY LEAD TIME POLICY

UDC: 005.932

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ABSTRACT

This research concentrates on the EPQ model with consideration of inspection policy as a part of product quality cost. An incorporated model for the joint determination of production lot size under continuous quality inspection policy is developed for a deterioration production process. We study two heuristic policies for the change in production system. Based on the classic EPQ model, the inventory level under safety lead time policy and economic production quantity policy are analyzed. We determine the optimal inspection policy and economic production quantity. Numerical analysis is used to analyze the influence of continuous inspection policy on the total cost and optimal lot size of a production process..

Key words: Defective Product, Inspection, Inventory, Deterioration Production Process.

INTROUCTION

The traditional EPQ model has been widely used as an important tool to inventory management (Hou, 2007). The main purpose for the inventory management is effectively utilizing inventory in the manufacturing system to meet customer requirements and bring about minimum total cost (Tersine, 1994). The classic Economic Production Quantity (EPQ) model is a mathematical model, which determines the lot sizing in a production process so that minimizes the total inventory holding cost and set up cost (Hall, 1983). The classic EPQ model is assumed that the product quality is always perfect; therefore, the quality cost is not considered as an issue to influence the production lot size (Hayek and Salameh, 2001). The neglect of quality cost in the inventory model is presented inaccuracy of the total cost and optimal lot size of the classic EPQ model. Thus, the quality cost is one good aspect to be added to the traditional EPQ model (Wang et al., 2007). Inspection cost is a remarkable quality cost in the manufacturing system. Inspection cost as an appraisal cost influences the failure (internal and external) and warranty costs in a deterioration manufacturing system. Furthermore, an inspection policy influences the percentage of defective items, penalty costs, and production cycle time (Kume, 1985).

Lee and Rosenblatt (1987) investigated the optimal inspection policies for imperfect processes. Fine (1988) used a stochastic dynamic programming model to characterize optimal inspection policies and added the quality-based learning effects in the EPQ model. Porteus (1990) stated that the production lot size should be reduced to compensate for poor quality if no effective inspection is possible. Zhang and Gerchak (1990) studied a joint lot sizing and inspection policy under an EPQ model where a random proportion of units are defective. Lee and Park (1991) developed a model to determine the production cycle time and process inspection intervals jointly. Ohta and Ogawa (1991) and Liou et al.

(1994) studied the joint determination of production cycle and inspection schedules, considering inspection errors.

Ben-Daya and Rahim (2000) studied the effects of deteriorating production processes on economic production quantity, inspection schedules. Lin et al. (2003) integrated production-inventory model for imperfect production processes under inspection schedules. Yeh and Chen (2006) developed a new EPQ model to calculation of the optimal number of products to be inspected under a last-K item inspection scheme.

The previous researches have not considered the field of the inventory policy for a production process under the continuous quality inspection policy. The purpose of this paper is to develop a mathematical model for the joint determination of production lot size and continuous inspection policy in a single product production system. Problem definition in the new situation of production system is presented in the third section. The details of the proposed model and the mathematical model are given in the fourth section. The fifth section deals with an example to illustrate its application. The conclusions drawn from this research are presented in the final section.

NOTATIONS

Here is the notation in our model.

P:	Unit production cost
S:	Inspection cost
H:	Holding cost per unit per year
C:	Setup cost per production run.
C_R:	Rework cost per unit item
I_S:	Inspection cost per item
Q:	Lot size
Q*:	Economic production quantity in the classic EPQ model (quality is perfect)
p:	Production rate
d:	Demand rate
R:	Annual demand in units
L:	Scheduling and production lead time in days
q:	Defective percentage
Q_S and Q_E:	Lot size in the safety lead time policy and economic production quantity policies
TC_S and TC_E:	Total annual cost in the safety lead time and economic production quantity policies

PROBLEM DEFINITION

We review a production system for a single product that production system is in the ‘in-control’ state, and it may go ‘out of- control’ during the production of a product. The manufacturer produces and simultaneously inspects the production lot during its production run. It is assumed that the inspection process of a produced lot screening is also perfect. After the production of each lot, the production process is inspected and if the process is found to be ‘out-of-control’, then it is restored to the ‘in-control’ state for the production of the next lot. Since the production process is not perfect, the production lot contains imperfect items. After a production run, all the defective products are sent to the repair process to modify to the perfect items. Since all the products are sold with warranty, the continuous product inspection scheme is proposed here to improve the outgoing product quality. Under this inspection scheme, all produced items of each production lot are inspected to screen out the nonconforming products. Then, any nonconforming products found by inspection process are reworked. For the deterioration production system the lot size plays an important role in determining the fraction of conforming products of a production lot, and the continuous product inspection policy is required to further screen out nonconforming products. Therefore, the objective of this paper is to

derive an optimal lot size so that the expected total cost per unit time is minimized. It is assumed that no shortage or backorder is allowed.

MATHEMATICAL MODEL

It is assumed that the production rate is larger than sum of the demand rate and the defect rate. There is an inspection station at the end of the production line and I_S presents the inspection cost. In the classic economic production quantity model, the quality of product is assumed to be perfect and the defective percentage, *x*, is zero. The behaviour of the inventory level over time can be drawn as Figure 1.

The total annual cost of the classic economic production quantity model can be written as (Tersine, 1994):

$$TC(Q) = (C_P + I_S)D + \frac{KD}{Q} + \frac{HQ(p-d)}{2p} \tag{1}$$

The economic production quantity, *Q**, that minimizes the total annual cost can be written as (Tersine, 1994):

$$Q^* = \sqrt{\frac{2KDp}{H(p-d)}} \tag{2}$$

After describing the classic EPQ model with perfect product quality, we will make an assumption that some variances occur in the production process. These variances affect the quality of product and defective items are produced. We suppose all imperfect products are identified during the inspection process of the production system. The imperfect items are reworked and modified to the perfect items. In this research, we compared the safety lead time policy with economic production quantity policy as two heuristic solutions for this problem.

Safety Lead Time Policy

The reorder point is one of the basic concepts of inventory control models. If the manufacturer does not change the lot size in each batch as usual and prepares to produce next batch as the inventory to reach the reorder point, we call this the safety lead time policy. The reorder point is the inventory amount that is large enough to support the demand during the time to prepare for the next production. Safety lead time policy is the best policy when the management has difficult to adjust the lot size and can only prepare to produce next batch as the inventory reaching the reorder point. In this policy, the management does not need to pay any attention to control and only have to set a reorder point in the inventory level. It is the easiest way to manage the change in the production system and can save the most manpower and resource to control. The production reorder point is equal to $d \times L$, where L is the production lead time and *d* is the demand rate. The behaviour of the inventory level in the safety lead time policy can be drawn as in Figure 2.

In this policy, the lot size is the same as the lot size in a perfect quality production line.
This can be written as

$$Q_S = Q^* \tag{3}$$

The total annual cost in the safety lead time policy consider to rework cost of imperfect items can be expressed as

$$TC_S = \frac{(C_P + I_S)D}{(1-x)} + \frac{KD}{Q^*(1-x)} + \frac{HQ^*(p-d-px)}{2p} + C_R Qx \tag{4}$$

Economic Production Quantity Policy

The classic EPQ model is generally used to find the optimal production quantity in order to minimize the total inventory cost. The total annual cost of the economic production quantity policy consider to rework cost of imperfect items can be written as a function of *Q*:

$$TC_E = \frac{(C_P + I_S)D}{(1-x)} + \frac{KD}{Q(1-x)} + \frac{HQ(p-d-px)}{2p} + C_R Qx \tag{5}$$

To obtain the economic production quantity, Q_E, take the first derivative of the total annual cost with respect to the production quantity, *Q*, and set it equal to zero:

$$\frac{dTC_E(Q)}{dQ} = -\frac{KD}{Q^2(1-x)} + \frac{H(p-d-px)}{2p} + C_R x = 0 \tag{6}$$

Solving equation (6) for *Q*, we can find the minimum cost production order quantity, Q_E as

$$Q_E = \sqrt{\frac{2KDp}{(1-x)(H(p-d-px)+2pC_R x)}} = Q^* \sqrt{\frac{H(p-d)}{(2pC_R x + H(p-d-px))(1-x)}} \tag{7}$$

Since *(p-d)>(p-d-px)* and *1-x<1* , we get

$$\sqrt{\frac{1}{\frac{2pC_R x(1-x)}{H(p-d)} + \frac{(p-d-px)(1-x)}{p-d}}} > 1 \tag{8}$$

and $Q_E > Q^*$. Substituting Q_E into equation (5), it can be found that the total annual cost in the economic production quantity policy can be expressed as

$$TC_E = \frac{(C_P + I_S)D}{(1-x)} + \frac{KD}{Q^*(1-x)} + \frac{HQ^*(p-d-px)}{2p} + C_R Qx \tag{9}$$

The behaviour of the inventory level in the economic production quantity policy can be drawn as in Figure 3.

Comparison of two policies

In this section, we compare the lot size and the total annual cost of the two policies. In sections 4.1 and 4.2, it has already been found that. From equation (6), $Q_S = Q^*$, hence it can be concluded that $Q_E > Q_S$. To compare the total annual cost of the two policies, since TC_E is the minimum value of the total annual cost, it can be concluded that $TC_S > TC_E$.

MATHEMATICAL MODEL

In order to verify the policy and relationship we proposed, a numerical example is used to demonstrate the usefulness of these two policies. It is assumed that a manufacturing system with continuous inspection policy to its production line, and the inspection cost is $0.2 per unit. The production cost of each product is $6.8. The setup cost is $500 per batch. The holding cost per absorber is $2 per year. The production rate is 2000 units per day, and the demand rate is 500 units per day. The annual demand is 100000 units. There are 250 working days in a year. The scheduling and production lead time is 3 days. In the initial stage, we propose that the quality is perfect and no defective products are produced in the production line. From the classic economic production quantity model, the economic production quantity, Q*, can be calculated as Q*= 8165 units/batch. When the batch size maintains the economic production quantity, the total annual cost in this production line can be calculated as TC(Q*)= $71224.

Now, we assume that some unknown variances occur in the production process and the defective percentage of product increases from 0 to 3%. All defective parts have been detected by the continuous inspection section in the production process. According to the solution we proposed, there are two different ways.

Safety Lead Time Policy

In this policy, the manufacturer keeps the lot size in each batch the same as the defective percentage is zero and prepares to produce next batch as the inventory reaches the production reorder point $r \times L$. In this case, $r \times L = 500 \times 3 = 1500$ units. Since the lot size is the same as the production line with zero defective percentage. The lot size in this policy *'Q'* is equal to 8165 units/batch. From equation (4), the total annual cost can be found as $TC_S = 734331$.

Economic Production Quantity Policy

In the economic production quantity policy, the management accounts the economic production quantity again in the new production situation. From equation (7), we can find that the lot size is equal to $Q_E = 8094$. Based on equation (9), the total annual cost is equal to $TC_E = 722141$.

CONCLUSION

In this research, we have considered a continuous product quality inspection process in a production line. The inspection site in the production process can detect the quality of defective products. Two heuristic policies have been proposed for management when defect products were found in the production process. The total inventory cost and optimal lot size of these two different policies have been studied. From our analysis, the safety lead time policy gives the smallest optimal lot size. Furthermore, the economic production quantity policy can produce the smallest total cost and the total cost of the safety lead time policy depend on the parameters of the production system.

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HYBRID METHOD OF ERP PROJECTS PERFORMANCE EVALUATION USING DATA ENVELOPMENT ANALYSIS AND BALANCED SCORECARD

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ABSTRACT

This paper, using the balanced score card compilation method and through the data envelopment analysis process, evaluates the ERP project in a virtual organization, and ultimately the project's performance will be measured. This study apply the Balanced Scorecard are considered as leading and adherent factors. Then, using the data envelopment analysis model, the performance of the factors in the decision-making units Analysis will be calculated. The effectiveness of the ERP project for each of the sub-units of the organization was examined and then the performance of each organization was measured in comparison with other virtual organizations. The data relates to the performance of 20 virtual sales organizations analyzed in relation to the four BSC views and the results of the input and output amount at each stage of the decision as the sum of the costs or time taken to achieve the goals. A model presented with the lower and upper bounds for the outputs and inputs, respectively. These constraints ensure that any score produced by the model reflects the desired balance among the output cards and among the input cards. By using this method, internal processes were examined in detail, which showed a more accurate assessment of the status of an organization. The method of data envelopment analysis, while its power is highly valued, is sometimes overlooked by some of the internal activities of the organization. The results of combining two model are very suitable for considering the weaknesses of each of these methods in analyzing the performance of complex organizations. In addition, considering the analysis of the lower and upper bounds, these constraints ensure that each score produced by the model shows the balance between the output cards and the input cards. This method can be used to create value in virtual or to traditional organizations that have been focusing on online business activity to achieve their goals.

Key words: Enterprise resource planning, Performance Evaluation, Virtual Organizations, Balanced Scorecard, Data Envelopment Analysis.

INTRODUCTION

All Enterprise Resource Planning (ERP) systems provide a standardized and seamless integration of all the information flowing through the various business functions. Electronic transformation has changed business in various ways. Traditional organizational structures can no longer be compatible with these developments. The ever-increasing speed of globalization and extreme changes, has made it vital for a business structure that can best utilize these conditions. The strategy of Virtual Organizing of ERP enabled organizations as they extend their scope across three vectors to enable virtual encounters. A virtual organization is a network-based organization. In order to make an organization out of the existing structure and become virtual, it requires organizational changes and restructuring in organizational processes and practices, which will be very difficult for the natural resistance of individuals to change. With a more complete definition, virtual organization can be said to be a particular type of network organization that allows the use of the latest communication and information technologies, such as the Internet and Intranet, and collaboration with individuals and organizations outside the space, time, and organizational boundaries. Ultimately, organizations that have tangible fixed assets that go beyond the traditional boundaries are called virtual organizations. Such organizations use foreign partners in their business, which they call the virtual organizations. Competitive privileges of the past are no longer durable, cost-based strategies will hardly survive and lasting. Organizations and companies that had a wide range of activities in an organization have given their place to small companies focused on specific activities to satisfy their customers. The lack

of attention of many companies to these new conditions has made them bankrupt. The new market requires consistent, adaptation and immediate responses. Speed is now a competitive indicator, and as a result, the old and classic old-fashioned model will lose its situations. An organization is the virtual task of delivering its work in different places and working cycles. In such organizations, the range of activities extends from enterprise resource planning to the three vectors of virtual confrontation, virtual discovery, and virtual work (Venkatraman & Henderson, 1998). The ERP project is a tool for quick response to project risks. Virtual organizations the structure network is the organization for responding promptly to project risks in project management organizations.

In the new market and era, organizations that use knowledge, specialists and day-to-day technologies are more successful. Performance appraisal is one of the approaches companies use to measure value-added activities on them. With the value of the analysis and performance and the measurement of efficiency, different methods are presented for performance evaluation (Charnes, Cooper, & Rhodes, 1978). Nowadays, performance appraisal is monitored by improving performance and using methodologies to achieve this strategy using best practices. Organizations compete for resources and customers and should somehow evaluate the results of their decisions and actions. Organizational performance is does not mean a simple phenomenon, but rather a complex and multidimensional concept. In order to execute a BSC score, 20 online Store for online shopping are selected as case studies projects, and then appropriate criteria for assessing the BSC method are used to determine the weights of the main criteria and the sub criteria of the BSC model. Organizational performance is inherently contradictory, because when a viewer performs well, another perspective may show the result of the image. Often the performance index can only be improved at other costs. Additionally, individuals may have different tastes about relevant aspects that have a large relationship with the definition and evaluation of performance, and as a result, it may be that of the scales used the level of importance of determining the indicators, and how to interpret the results together do not agree (Cameron, 1986). Due to the complexity of this phenomenon, several researchers have supported the application of different perspectives and multiple scales in organizational performance. Kaplan and Norton developed a conceptual framework and performance measurement, BSC (BSC), which explicitly includes various dimensions of performance (Bentes, Carneiro, da Silva, & Kimura, 2012). Despite the generality of the BCS and DEA evaluation approaches, quantitative studies have been done to evaluate performance and integrity. In this paper, the purpose is extending the application of this method operationally (Ackoff, 1979).

LITERATURE REVIEW

Certainly traditional virtual methods cannot be managed by both the new and innovative methods and mechanisms, as well as the latest management and monitoring software and technologies. The management of a truly virtual organization must forget having a permanent establishment in his office and in a manner that fully and coherently covers all activities and developments within the organization under his management everywhere. Meanwhile, the use of intelligent software and monitoring programs and data analysis that is sent from different parts of the organization for management is considered indispensable. The managers of such organizations must be given a thorough and intelligent mandate and responsibilities, and each section of the supervisory activities should be delegated to the specialized experts of that field. They should also not be reluctant to delegate decision-making to their employees and to strengthen the foundations of self-management throughout the organization, as virtual agency staff strongly desire to be independent and free to decide on how to operate and perform their duties, and from any kind of Survive under the control or receipt of instructions from their superiors. On the other hand, managers of virtual organizations should remember that the control or collision of the police with employees who do not have a permanent and specific place of work, and whoever works in one corner of the world, in practice, is very difficult and in a more literal sense impossible. Fully virtual organizations are "self-managing" and "self-representing" organizations whose main function of management in them is not to manage, but to lead, after gathering the best people and forces.

Balanced Scorecard

The Balanced Scorecard was proposed in early 1990 to explore new methods for assessing the performance of organizations at the Harvard Business School by Kaplan and Norton (Cooper, 1999). This is a military approach that has been developed in the management of new methods for measuring the performance of organizations. The BSC, as a guide, is a tool that provides obtainable strategies that will create a competitive advantage for managers. Financial analysis will provide significant reports to managers, but financial dimensions alone will not be sufficient to assess the performance and strategic management of the organization (Kaplan & Norton, 1996). The BSC examines and categorizes the organization's strategy from four key aspects of finance, customers, internal processes, and growth and learning, and then compares them to predetermined goals. These four key criteria are summarized as follow (del Sordo, Orelli, Padovani, & Gardini, 2012):

1) Financial criteria: The results of organizational activities that are measurable with financial dimensions. Measures that have obvious consequences on company profitability, return on investment and its economic added value are included in the financial dimension.
2) Customer Criterion: This criterion relates to actions that are of particular importance in the strategies of an organization to differentiate their competitors in order to attract and maintain relationships with their customers.
3) Internal Process Criterion: This criterion evaluates the internal processes of an organization in order to achieve any desired and predetermined goals.
4) What measures should be taken in order to develop the employees' learning and training, in order to achieve the desired status for the stakeholders and clients.

Data Envelopment Analysis

An assessment of the performance of organizations to guide their future decisions plays an essential role. In this regard, the efficiency and productivity of the organizations are calculated to take decisions in the future of the economic growth process. Data Envelopment Analysis is an appropriate and efficient tool in this field that is used to calculate the efficiency of decision makers. This approach provides a theoretical framework for analyzing the measurement of efficiency. The model includes sets of linear programming techniques that create boundaries for performance limits using observed data, and then assess and measure the performance of a flexible decision maker. Data Envelopment Analysis is a nonparametric technique for measuring the efficiency of decision-making units in situations where multiple inputs are converted to multiple outputs.

Integrating Data Envelopment Analysis and Balanced Scorecard

The advantage of combining multiple approaches in the performance evaluation framework will be a significant increase, which has recently been of interest to researchers (Cook & Seiford, 2009). Several authors have focused on both the DEA and the BSC approaches, and, of course, some authors of the DEA and the BSC have used it separately for evaluation. With a different look on performance evaluation, Min et al (2003) has also developed the BSC in relation to Karin hotels. The financial and economic efficiency will increase with the results of data envelopment analysis and with a clear view on this issue (Min, Min, & Joo, 2008). Rouse, Putterill, and Ryan (2002) has also developed the initial model of DEA by targeting the vision of the BSC. However, limited research has been done in this area in recent years that has integrated the DEA and BSC seamlessly.

Enterprise resource planning

ERP is usually referred to as a category of business-management software typically a suite of integrated applications- that an organization can use to collect, store, manage and interpret data from these many business activities. ERP provides an integrated and continuously updated view of core business processes using common databases maintained by a database management system. ERP systems track business resources cash, raw materials, production capacity and the status of business commitments: orders, purchase orders, and payroll. The applications that make up the system share data across various departments that provide the data (Almajali, Masa'deh, & Tarhini, 2016). ERP can be defined as an integrated application that has components or modules for planning, producing, selling, marketing, distributing, accounting, human resource management, project management, service management, maintenance and repair, transportation management And electronic commerce. The architecture and structure of ERP is such that integration and population information provides the level of the organization and provides a fluid flow of information between different departments of the organization. A method of planning and effective control of all resources required to receive, produce, send and meet customer needs in a manufacturing, distribution, and service company. ERP is a commercial software package that aims to integrate information and flow of information across all parts of the organization, including financial, accounting, human resources, and supply chain and customer management. ERP relates independent and old fashioned computer systems such as financial, human resources (HR Resource), production and warehouse, in an integrated and unified software program. In fact, after installing ERP, the financial, manufacturing, and warehouse sectors still have their own software, with the help of ERP, the computer systems of different sectors are linked together. ERP systems are variable and customizable information systems that integrate information-based information processes within an organization within and between organizational units. ERP is a database, an application and an integrated interface throughout the organization. ERP is a computer-based system designed to process organization transactions, aimed to facilitating the planning, production and timely response to customers in an integrated environment. ERP is a standard software package that includes several interrelated and integrated modules that support all business processes of organizations, including production, human resources, finance, marketing, sales, and etc., which results in the integration of functions in the organization. ERP is an IT-based system solution that manages the organization's resources quickly and accurately and in a high-quality system to control the various levels of management of the organization to properly manage the organization's planning and operations process. ERP as an information backbone of an organization is considered as an

enterprise data bank, and it serves as a software support for the internal processes of the organization. The ERP bundle is a collection of ready-to-use modules that cover all business processes of the organization. These "business processes" can be very extensive and include management of production, purchasing parts, sending raw materials to manufacturing units, controlling market inventory and tracking orders, etc. Usually ERP systems have the following components: financial - accounting, human resources, manufacturing and manufacturing, supply chain management, project management, customer relationship management, data warehouse, access control

RESEARCH METHODOLOGY

The data analysis model looks at the internal processes as a black box, which, regardless of inputs and outputs in an internal process, a number of inputs are converted to outputs, thus providing specific information about Resources and inefficiencies within the decision-making units are difficult for decision-maker units .The standard models of data envelopment analysis tend to summarize overall computations to achieve efficiency, but this will eliminate some important information that decision makers may not follow (Fitzgerald & Storbeck, 2002).

Compilation model

Data Envelopment Analysis works without considering inputs and outputs and internal processes. In this way, it is difficult to provide useful information about resources and inefficiencies within decision-making units for decision-maker units. In the performance evaluation, using the data envelopment analysis method, due to compilation summaries, some of the important information lost is lost and is hidden from the viewpoint of the decision making units of the organization. In this regard, useful information regarding the weaknesses, strengths, and effects of processes and sub-processes cannot be deduced. Balanced Scorecard alone cannot identify inefficiencies in organizational units and use resources, and one of the weaknesses of a balanced scorecard is the inability to recognize the relationship between different criteria (García-Valderrama, Mulero-Mendigorri, & Revuelta-Bordoy, 2009) by integrating the data envelopment analysis approach Balanced Scorecards try to evaluate their goals and performance in their entirety. In the compilation model provided based on management strategies, the views of the Balanced Scorecard are considered as leading and adherent factors. Then, using the data envelopment analysis model, the performance of the factors in the decision-making units Analysis will be calculated.

DATA ANALYSIS

In Table 1, organizational resource planning goals are classified under the heading of a balanced scorecard. For factors, that are of a positive nature, reaching a higher value and, for negative factors, achieving lower values. In the proposed model, the financial sector due to its high sensitivity and its decisive and strategic role, this view has been supported by other evaluated activities in the BSC. After obtaining the model and solving it, information was obtained in relation to each decision unit.

Table 1: ERP aims to improve the company's performance from the perspective of BSC

Card Label	Card title	Measures	Measures used	Goals
1	Financial	Asset utilization Optimization of working capital	The cost of the warehouse	Reduce warehouse costs (Million Rails per year)
			The cost of orders	Reduce the cost of orders (Million Rails per year)
			Cost of production	Reduce production costs
			The cost of financial operations	Reduce the cost of financial operations Million per year
			transport cost	Reduce shipping costs (Million Rails per year)
			The cost of stopping	Reduce the cost of stopping the production line (Million Rails per year)
			Cost of error	Reducing the cost of errors caused by poor coordination between different organizational units (Million Rails per year)
2	customer	Enhance customer satisfaction	Number of responsive personnel	Increasing transparency and tracking production processes for the customer (Points 1- 100)
			Number of customer complaints	Increasing customer satisfaction from increasing engagement in jobs from order to product receipt
		Target customers who make the most profit Timely delivery of goods		Enhance customer matching (Points 1- 100)
3	Internal business			Reduce the completion time and finalize the product (Points 1- 100)
		Optimize technology		Increasing sales and eventually growing organization (Points 1- 100)
		Effective relationship with key stakeholders		Reduce the amount of investment required (N-hours per year)
4	Learning and groth	Enhancing skills and adaptability		Extending knowledge management in the organization (Million Rails per year)

		The amount of discretion		Increasing innovation and creativity (Points 1- 100)
				Growth and learning through dynamic and constructive interaction in the environment (Points1- 100)

The data relates to the performance of 20 virtual sales organizations from Iran is analyzed in relation to the four BSC views and the results of the input and output amount at each stage of the decision as the sum of the costs or time taken to achieve the goals is considered in Table 1, is collected in Table 2.

Table 2: The case study data

card	Inputs		Outputs					
	1		2		3		4	
Project	financial		Customer		Internal processes		Learning and growth	
	Use Assets	Optimization of working capital	Enhance customer satisfaction	Target lucrative customers	Timely delivery of goods	Optimize technology	Increase skill and adaptability	The amount of discretion
1	432	143	43	32	12	153	35	43
2	321	165	98	92	18	278	75	62
3	546	186	56	12	12	256	44	32
4	482	231	73	25	15	281	21	36
5	543	188	45	35	14	184	55	56
6	249	153	75	88	17	193	79	76
7	369	147	82	91	25	175	11	21
8	438	141	84	54	16	180	94	97
9	536	213	49	65	19	203	10	18
10	367	147	52	35	24	177	17	28
11	443	176	94	90	15	186	88	16
12	236	189	93	97	12	236	45	54
13	458	243	74	69	19	251	39	33
14	592	172	75	38	26	134	94	2
15	568	256	48	55	31	216	78	17
16	325	212	43	65	24	243	38	41
17	358	156	37	33	13	182	63	79
18	375	198	86	76	28	196	85	84
19	317	176	89	98	233	206	97	93
20	493	259	91	91	16	159	90	91

Table 3 shows the results of the implementation. The first pillar of the column shows the results of financial performance, the second column of the column of results from the efficiency of the customer perspective, the third column of efficiency from the perspective of internal processes and the fourth column of efficiency from the perspective of learning and growth.

Table 3: calculated efficiency for each decision unit using the model presented from DEA–BSC results

Project	Efficiency from a Financial Perspective		Efficiency from customer perspective		Efficiency from the perspective of internal processes		Efficiency from the perspective of learning and growth	
	Score	Rating	Score	Rating	Score	Rating	Score	Rating
1	0.765	5	0.596	11	0.789	6	0.536	14
2	0.508	14	1	1	0.754	7	0.856	7
3	0.734	7	0.453	13	0.968	2	0.665	12
4	0.691	9	0.691	10	0.340	18	0.470	16
5	0.718	8	0.385	15	0.624	11	0.631	13
6	0.939	3	0.963	3	0.509	14	0.705	8
7	1	1	0.965	2	0.634	9	0.361	18
8	0.584	13	0.762	8	1	1	1	1
9	0.790	3	0.873	6	0.962	3	0.874	6
10	0.654	12	0.926	5	0.631	10	0.369	17
11	0.956	2	1	1	0.459	16	0.965	3
12	0.336	16	1	1	0.367	17	0.692	10
13	1	1	0.858	7	0.826	4	0.478	15
14	1	1	0.746	9	0.691	8	1	1
15	0.757	6	0.453	13	0.526	13	0.876	5
16	0.689	10	0.478	12	0.569	12	0.689	11
17	0.766	4	0.396	14	0.473	15	0.709	9
18	0.459	15	0.962	4	0.805	5	0.964	4
19	0.657	11	1	1	0.635	8	1	1
20	1	1	1	1	1	1	0.986	2

The score column in each pair yields the presented model as a score, while the rating column gives the rating scores. Different units can increase their utility by increasing their efficiency and considering their behavior. The mathematical model was implemented through a MATLAB procedure that was developed as a software decision support tool (DSS).

CONCLUSIONS

Improvement in processes is one of the most important strategic goals of organizations. Performance evaluation will ultimately lead to the overall effectiveness and effectiveness of the organization. Therefore, staying on track for long-term organizational goals is the result of a continuous evaluation of the various units of an organization. This research uses a multi-criteria approach to assess the performance of the ERP project based on a data integration compilation model and a balanced scorecard. In the end, to demonstrate the validity of the model and the efficiency of the method, an application example from twenty virtual sales organizations was presented and analyzed. Through the process of data envelopment analysis, the ERP project was evaluated in these virtual organizations, and ultimately, considering each of them as a project, performance was measured. In this method, the effectiveness of the ERP project for each of the sub-units of the organization was examined and then the performance of each organization was measured in comparison with other virtual organizations. By using this method, internal processes were examined in detail, which showed a more accurate assessment of the status of an organization. The method of data envelopment analysis, while its power is highly valued, is sometimes overlooked by some of the internal activities of the organization. The results of combining the balanced scorecard model and data envelopment analysis are very suitable for considering the weaknesses of each of these methods in analyzing the performance of complex organizations. In addition, considering the analysis of the lower and upper bounds, these constraints ensure that each score produced by the model shows the balance between the output cards and the input cards.

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CONTEMPORARY CONCEPT OF MANAGEMENT OF MANUFACTURING

UDC: 658.512

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ABSTRACT

The authors analyze the requirements of the modern market, the contemporary concept of production management with the aim of achieving perfection, fit production, enviable level of productivity and competitiveness. . Numerous competition and consumer demands set the conditions and impose a pace that can be monitored only with the application of new technologies, methods and concepts. The emphasis is on flexible production systems, on lean production as one of the possible modern concepts for achieving the desired state of production. A large number of factors affect the time of production, production and productivity. The goal is to respond as soon as possible to the customer's request, quality products.

Key words: production management, lean concept, JIT, flexible manufacturing systems

INTRODUCTION

By observing and analyzing today's modern market and the trends that are imposed and become necessary, we can see that it had changed much - not only compared to the previous fifty or twenty years, but even compared to a year or two before. Technologies and business strategies are changing, skills become obsolete at an incredible rate, competition is becoming more numerous, and user requirements are high. Modern organizations can become and remain successful by timely responding to all these demands. The company is in constant motion as well as the economy and should not be considered static. A number of factors affect changes and only a small number of them are under the control of the company. The task of management is to understand the nature of the change, to accept them and to direct them properly. Knowledge, innovation, flexibility and new, modern technology and concepts are essential not only for growth, but also for the survival of new, modern organization.

Changes in the business environment that have taken place over the past two decades had hugely influenced the change of companies' attitudes towards the environment in which they exist. The company carries out its activity in macro environment in which there are six forces that affect the behavior of the company (Kotler, 1996). According to the same author, those are: technology, nature, economy, population, politics and culture. Technological environment causes major changes for the company. Technological environment is characterized by a rapid rate of technological change, high budget for research and development activities, concentrated efforts in small improvements of existing solutions and increased state regulation in the field of new technologies.

Today, in the corporate business world, the term lean is used to indicate modern, successful business philosophy, ie. production of the world class characteristic of the modern era of business. The goal of this philosophy is to enable In the face of rising competition, falling consumer loyalty, constant technological innovation, drastic shortening of life expectancy product, achieve a satisfactory, if not a leading, market position. Secret or The key to success is the lean concept of managing production operations lies in "... the aspiration for eliminating all forms of loss and wastage of production resources, at the same time improving the quality, flexibility and speed of response to the impulses coming from turbulent environment "(Sekerez,2009).

FLEXIBLE MANUFACTURING SYSTEMS

Today, this prospect of automation and flexibility presents the possibility of producing nonstandard parts to create a competitive advantage. The concept of flexible manufacturing systems evolved during the 1960s when robots, programmable controllers, and computerized numerical controls brought a controlled environment to the factory floor in the form of numerically-controlled and direct-numerically-controlled machines. For the most part, FMS is limited to firms involved in batch production or job shop environments. Normally, batch producers have two kinds of equipment from which to choose: dedicated machinery or unautomated, general-purpose tools. Dedicated machinery results in cost savings but lacks flexibility. General purpose machines such as lathes, milling machines, or drill presses are all costly, and may not reach full capacity. Flexible manufacturing systems provide the batch manufacturer with another option—one that can make batch manufacturing just as efficient and productive as mass production.

A flexible manufacturing system (FMS) is a group of numerically-controlled machine tools, interconnected by a central control system. The various machining cells are interconnected, via loading and unloading stations, by an automated transport system. Operational flexibility is enhanced by the ability to execute all manufacturing tasks on numerous product designs in small quantities and with faster delivery. It has been described as an automated job shop and as a miniature automated factory. Simply stated, it is an automated production system that produces one or more families of parts in a flexible manner. Today, this prospect of automation and flexibility presents the possibility of
producing nonstandard parts to create a competitive advantage.

The potential benefits from the implementation and utilization of a flexible manufacturing system have been detailed by numerous researchers on the subject. A review of the literature reveals many tangible and intangible benefits that FMS users extol. These benefits include (www.referenceforbusiness.com):

1. less waste
2. fewer workstations
3. quicker changes of tools, dies, and stamping machinery
4. reduced downtime
5. better control over quality
6. reduced labor
7. more efficient use of machinery
8. work-in-process inventory reduced
9. increased capacity
10. increased production flexibility

LEAN AND JIT

JIT is a metod of planning and control and an operations philosophy that aims to meet demand intstantaneously with perfect quality anf no waste. Lean Operations philosophy replaces the past methods of mass production where there were batches of produced goods sold as mass, generating economies of scale. The recent trend in operation management era has shifted this to Just In Time production where goods and services are produced upon the receipt of order with customizations, resultant being a drastic reduction of inventory cost (Hutchins, 1998)

Though lean manufacturing can result in improved organizational performance, challenges do exist. Convincing managers and employees to think and act in ways that are foreign may be difficult. Employees may resist the tools of lean manufacturing or may experience difficulty thinking in new terms such as customer value and waste. It may also be difficult to adequately manage external relationships with customers and suppliers. Suppliers may be unable to deliver the smaller quantities of parts or subassemblies that are required for pull production. Customers may be unable to place predictable orders, causing the organization to stockpile inventory to meet demand (Womack and Jones, 1994). Though the challenges may be difficult to manage, lean manufacturing has nevertheless been embraced in many sectors of manufacturing.

The goal of lean is to eliminate waste—the non-value-added components in any process. Unless a process has gone through lean multiple times, it contains some element of waste. When done correctly, lean can create huge improvements in efficiency, cycle time, productivity, material costs, and scrap, leading to lower costs and improved competitiveness. And remember, lean isn't restricted to manufacturing. It can improve how a team works together, inventory management, and even client interaction (Crawford, 2016).

It is important to build a Company production system based on this philosophy. Lean Manufacturing has endeavored to rationalize production by (Piatkowski, www.twinetwork.com):

1. Completely eliminating waste in the production process
2. To build quality into the process
3. To reduce costs - productivity improvements
4. To develop its own unique approach toward corporate management
5. To create and develop integrated techniques that will contribute to corporate
6. operation.

Lean manufacturing, lean enterprise, or lean production, often simply, "lean thinking", is a production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination. Working from the perspective of the customer who consumes a product or service, "value" is defined as any action or process that a customer would be willing to pay for. Essentially, lean is centered on preserving value with less work. Lean manufacturing is a management philosophy that focuses on reduction of the original seven wastes to improve overall customer value, but there are varying perspectives on how this is best achieved. Lean Implementation, and Training for Lean is therefore focused on getting the right things to the right place at the right time in the right quantity to achieve perfect work flow, while minimizing waste and being flexible and able to change. These concepts of flexibility and change are principally required to allow production leveling, using tools like SMED, but have their analogues in other processes such as research and development (R&D). The flexibility and ability to change are within bounds and not open-ended, and therefore often not expensive capability requirements. More importantly, all of these concepts have to be understood, appreciated, and embraced by the actual employees who build the products and therefore own the processes that deliver the value. The cultural and managerial aspects of lean are possibly more important than the actual tools or methodologies of production itself. There are many examples of lean tool implementation without sustained benefit, and these are often blamed on weak understanding of lean throughout the whole organization (www.pmtrainingclass.com).

LEAN CONCEPT IN PRACTICE

Optimization of production and business processes has become a target point where all companies more difficult. Traditional analytical tools used to increase the efficiency of the process and reduce the costs have been focused primarily on the physical processes involved in each stage of production, while the alternative methods of increasing the efficiency of the process as a whole observe and optimize the integration of each stage of manufacture.

The benefits of implementing Lean can be broken down into three broad categories; operational, administrative, and strategic Improvements. Some of Lean's benefits, operational improvements :

– Lead Time (Cycle Time) reduced by 90%

- Productivity increased by 50%
- Work-In-Process Inventory reduced by 80%
- Quality improved by 80%
- Space Utilization reduced by 75%

A new, original method for monitoring the production cycle and its time elements by using a stochastic work sampling method - a modified work sampling method, will enable the determination of the participation percentages of working time elements against the total duration of the production cycle and production. As this method is statistic and is based on a certain number of instantaneous observations of a certain activity, it is simpler to use and more efficient than the continual streaming method. Monitoring within the production cycle will involve technological time with lead time and manufacturing time, non-technological time with times for transport, control and packing, while non-production time includes stoppage due to poor production organization, lack of materials, lack of tools, including the failure or breakdown of machinery and other types of stoppage, their interdependence, as well as impact factors such as series size, organizational level and product characteristics pertaining to the factors mentioned (Stanisavljev et al.,2017).

Practical application of establishing the mentioned elements of PC time is reduced to instantaneous observations of time elements, where the object of labor is moving through the production operations list. A series of units is distinctly marked by this document and an analyst (recorder) can readily identify it.

In this paper we present some of the results obtained by surveying result in a car company in Serbia.
The first most extensive experiment concerns an enterprise owned by a large German firm engaged in manufacturing car components. Table 1. and Figure 1. showing elements of working time in the production cycle.

Table 1: Elements of working time in the production cycle

t_{pt}	t_m	t_c	t_{tr}	t_{pk}	t_{mr}	t_{tl}	t_o	t_b	t_{to}
76	176	83	108	76	38	3	18	5	117
10.86 %	25.14 %	11.8%	15.43 %	10.86 %	5.43 %	0.43 %	2.57 %	0.71 %	16.71 %

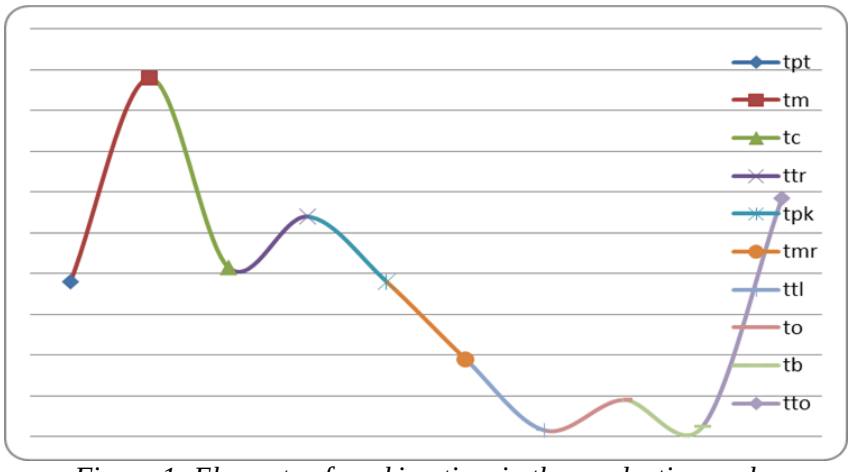

Figure 1: Elements of working time in the production cycle.

Monitoring included 47 cycles of different series sizes (4 – 10 units) and the time duration ranged from the shortest (240 min) to the longest (420 min), with 10 - 30 instantaneous observations. There were 932 observations in total, while the total time for all cycles amounts to 15,293 min. The average production cycle time - tpc is 325 min and the average production cycle time per unit tpc is 56.2 min.

Investigations related to the coefficient of running time as a function of the series size and where the PC was analytically monitored from the plant's records did not include an in-depth analysis of the relationships between the series.

Many organizations are attempting to implement lean manufacturing programs. Unfortunately, managers may fail to recognize that multiple variables contribute to a lean manufacturing success or failure. Executive management also may fail to understand how the lean manufacturing implementation can impact aspects of the organization, such as communication. Too often, lean manufacturing is thought of as a set of tools that can be implemented anywhere at anytime (Allen, 2000; Alavi, 2003; Bamber and Dale, 2000).

CONCLUSIONS

Lean Production is an integrated set of activities designed to achieve high-volume production using minimal inventories. Lean thinking is applicable to all business processes within the process industries. The challenge, if we decide we want to be lean, is whether we know enough about our ways of working, what customers of the business processes truly value, and how our businesses operate and need to operate.

The next essence of the lean business philosophy, the companies that adopt and properly implement this concept of business are able to respond faster and better to the requirements and market needs, as well as to eliminate all sources of wastage in the production process.

Reduced cycle time can be translated into increased customer satisfaction. Quick response companies are able to launch new products earlier, penetrate new markets faster, meet changing demand, and make rapid and timely deliveries. They can also offer their customers lower costs because quick response companies have streamlined processes with low inventory and less obsolete stock. The PC is the most significant technical-technological indicator in production and it is necessary to steadily monitor and reduce it: PC reduction is possible by influencing the factors related to the duration of individual working time elements.

Lean manufacturing, an approach that depends greatly on flexibility and workplace organization, is an excellent starting point for companies wanting to take a fresh look at their current manufacturing methods. Lean techniques are also worthy of investigation because they eliminate large capital outlays for dedicated machinery until automation becomes absolutely necessary.

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REVIEW OF SERBIAN WATER SUPPLY AND SEWERAGE SYSTEM FUNDING

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ABSTRACT

Water resources (particularly drinking component) as a common and inalienable right requires special observations and managing activities. It is a process determined by the enormous importance of appropriately attributed users and a large number of laws and by-laws apply to this issue. Water is the most important resource for the survival of humanity, and the shortage of drinking water is the most significant problem of the 21st century. That is why all EU efforts are directed towards more responsible water management in order to use resources more efficiently and effectively, and in order to improve its quality, and hence the health of mankind. As a specific element of public utility activities, the paper focuses on the importance of economic side of sustainable exploitation of water resource throughout the analysis of tariff elements influencing the formation of the price of drinking water, as well as sewerage fees, which aims to provide the necessary water quality and quantity for the current generation without jeopardizing the needs of the next generation.

Key words: water supply, sewerage, Republic of Serbia, funding, tariffs

INTRODUCTION

One of the biggest problems in the modern world is the scarcity of drinking water. In significant parts of the world, existing water supply resources are not sufficient to meet all the requirements of urban, industrial and agricultural users. The primary condition that determines whether a region has limited water resources or is experiencing scarcity is whether the precipitation exceeds potential evaporation. In areas where potential evaporation exceeds precipitation, there is a minimal flow that can be intercepted and stored for later use, which leads to a critical dependence on time and precipitation. As the world population increases by billions or more, in the next thirty years, market forces will cause a significant reorientation of available water resources from the agricultural and ecological sectors to the urban sector. This will result in an intensification of stress on water ecosystems and food production capacity in the world (UN, 2017).

Drinking water is the source of life, and as such, a valuable resource for the living world. Although highly valuable, drinking water supplies per capita are reduced not only because of population growth, but also due to pollution and climate change, which are becoming more drastic every day. Although the water covers two-thirds of the Earth's surface, drinking water represents only 2.5% of its total quantity, and less than 1% of it useful for drinking purpose. Since the human body consists of 70% of water, it is clear that water is one of the primary elements responsible for life. Man's brain consists of

85% of water, 90% of blood is water, whereas the liver, one of the most important organs, contains 96% of water. For every human cell, tissue and organ, water is necessary. This data also shows that the quality of the water we drink is an important factor in human health (USGS, 2017). Another illustrative distribution of available water resources is shown in Table 1.

Table 1: World fresh water resources (Shiklomanov, 1993)

Water source	Water volume, in cubic miles	Water volume, in cubic kilometers	Percent of freshwater	Percent of total water
Oceans, Seas, & Bays	321,000,000	1,338,000,000	--	96.54
Ice caps, Glaciers, & Permanent Snow	5,773,000	24,064,000	68.7	1.74
Groundwater	5,614,000	23,400,000	--	1.69
Fresh	2,526,000	10,530,000	30.1	0.76
Saline	3,088,000	12,870,000	--	0.93
Soil Moisture	3,959	16,500	0.05	0.001
Ground Ice & Permafrost	71,970	300,000	0.86	0.022
Lakes	42,320	176,400	--	0.013
Fresh	21,830	91,000	0.26	0.007
Saline	20,490	85,400	--	0.006
Atmosphere	3,095	12,900	0.04	0.001
Swamp Water	2,752	11,470	0.03	0.0008
Rivers	509	2,120	0.006	0.0002
Biological Water	269	1,120	0.003	0.0001

A human body without water can survive just a few days before it collapses. The water in our body acts as a carrier of oxygen to the cells, and in addition it also transfers nutrients such as vitamins and minerals. If there is no water in the body, there would be poisoning because by toxins released from the body. In addition, water moistens the eyes, mouth and nasal canals and is an important source of minerals in traces such as manganese, magnesium, cobalt and chromium. The most valuable role of water in the human body is to ensure the transport of body components, bringing and discharging nutrients from cells, securing media for intercellular reactions and transporting metabolic products to blood, as their redistribution or elimination through urine. In addition to the amount of water entering the body at the daily level, water quality should also be considered (Murray, 2003).

CURRENT WATER TARIFING AND FUNDING SYSTEM

According to EU Directives on water management and wastewater treatment (EU Directive 91/271/ EEC), organized sewerage of all municipal sewage is a permanent obligation of the state i.e. local communities. In 2016, the Serbian Parliament adopted the latest version of Water Law ("Official Gazette of RS", No. 30/2010, 93/2012 and 101/2016), which largely harmonizes domestic regulations with EU regulations and introduces long-term obligations for the collection and treatment of urban wastewater.

The goal of establishing a water utility charge and a drainage fee is to recover costs associated with water intake or water contamination. Fees are designed in order to provide funds for water resources management or for the protection of the river basin, i.e. in order to improve the quality of water in the given environment. They represent an integral part of the price of water and the price of sewage in the public water supply and public sewerage system. Fees are based on two principles:

1. polluter pays and
2. user pays.

The reference price is prescribed by the Water Law for the calculation category used to determine the amount of compensation for the use of the water property and the fee for the discharged wastewater, when such compensation is paid by the person performing the communal activity of supplying

drinking water and collecting, draining and purifying wastewaters, water supply and sewerage. The sum of the water use fee and the fee for the discharged wastewater cannot be less than 10% of the specified reference water price (Water Law, 2016).

1. The elements for determining the reference water price are:
2. operational costs of water supply and operating costs of collection, drainage and treatment of wastewater by the system of public water supply and sewage (costs of wages, materials, fuel and energy, non-material costs and other costs),
3. costs of maintaining water facilities for the collection, supply and treatment of wastewater and water protection,
4. costs of depreciation of water facilities, and
5. quantity of affected water.

In addition, criteria for the participation of individual elements in the reference price of water are taken:
1. 60% for operating costs,
2. 10% for maintenance costs of water facilities and
3. 30% for the costs of depreciation of water facilities.

The share of water usage fees and water drain fees in the water price is below 1% and amounts to approx. 0.445 rsd/m^3. This fee has not been changed in the last few years. Therefore, the National water management strategy envisaged a water management, where the participation of water price charges would increase from the current 0.8% to 2.8% or 5%, which would increase water revenues from more than twice. The National water management strategy of Serbia aims to increase the price of water to approx. 1,35 €/m^3, which would allow the application of the statutory amount of water fee (10% of the reference water price with the ratio of water supply and water sewerage of 45%:55%). Although the situation has significantly improved over the past years, it is necessary to re-examine the criteria and their values, because the revenues on this basis should be one of the most important sources of water sector development after the adoption of the Strategy (National water management strategy, 2017).

The share of certain sources in the ten-year period is shown in Table 2.

Table 2: Sources of water sector development to the 2024, in millions of euros (National water management strategy, 2017)

Sector	***Republic of Serbia***	***PUC (water price)***	***Other sources***	***IPA and other funds***	***Local municip.***	***Investors***	***Total***
Water supply	210	105	53	175	105	53	700
Water protection	268	95	221	363	95	189	1231
Sewerage	60		280		260		600
Protection from water	203			68	68		338
Melioration	65		108	81	60	322	637
Total	806	200	662	687	587	564	3506
Share %	23	6	19	20	17	16	100

Priorities for development and financing in the overall period vary and change, depending on the objectives that are to be pursued in the areas of the water sector and the dynamics of achieving the economic price of water (the average projected price for the twenty-year period 1,35 €/m^3). The realization of the development programs under the Strategy in the first ten years requires the provision of funds in the total amount of about € 3.5 billion.

CONCLUSION

It is important for the water supply and sewerage sector to prevent the usage of higher prices due to the possible monopoly position in response to the inadequately established relationship of water related services compared with real (or lower) prices. The possible regulation, which is contained in the present rules of the water sector and other legal frameworks, requires the strict application of regulated bases and instruments that large companies will not use to generate extra-income and profit at higher prices. The established rules must contain elements of water supply and demand based on real water management processes and the use of water for which it seeks equalization or balance.

One of the ways to solve pricing problem in the water supply and sewerage sector is to apply the parity pricing model. Parities are the relative price relationships between different water management services and areas, and the relationship between service prices and water use values with certain services and user products. Special parities are determined for service relations and domestic prices with the prices of the same services in the countries of the region, or with other selected areas. From the determination of the parity, the levels of the average realized service price for the population and certain economic sectors can be determined, and especially for certain types of users according to tariffs (conditions). On the basis of parity relations between prices and services, the boundaries for individual and total services can be determined, indicating realistic supply and demand relationships in the water sector.

The essence is that after the changed tariff, the same income is provided, which in practice means that although the prices did not really increase, the citizens are getting significantly bigger accounts while at the same time it leads to the reducing the economy account. In order to avoid a turbulent reaction by the public, this principle should be implemented a bit by little and heading towards the equalization of tariffs.

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Session B: HUMAN RESOURCE MANAGEMENT

Papers (pp. 149-180):

IDENTIFYING RESEARCH KEY OPINION LEADERS

UDC: 005.322:316.46

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ABSTRACT

This paper developed a new scheme for identifying research Key Opinion Leaders. The developed methodology is an approach for evaluating Average Percentile Rank of individual researcher by measuring their collaborative strength through their published works. The study considered and introduced new parameters useful in measuring collaboration, and Average Percentile Rank. With these parameters, a new relationship to quantify Percentile Rank was introduced and applied to evaluate the Research Key Opinion Leader status of individual research staffs of INGENIO, the joint research institute of the Spanish National Research Council (CSIC) and the Polytechnic University of Valencia (UPV), Spain. Overall, the result shows that, number of persons collaborating in a particular research, and the relative positions of the collaborators among their peers and within their organization are relevant and important in determining the KOL status of a researcher.

Key words: Co-authorship, authorship order, research collaboration, rising star, key opinion leader

INTRODUCTION

Becoming great and successful organization requires great leaders, and the best organizations understand that deliberately cultivating leaders for the organization is pivotal in this important endeavour (Rihal, 2017). One of the ways to remain innovative and successful in present day highly competitive and regulated work-life is connection to expertise from individuals commonly referred to as Key Opinion Leaders (KOLs) (Carlsson, 2016). Rising stars are emerging KOLs that outshine their peers in many ways, showing great potential for the future (Carlsson, 2016; Zhang et al., 2016). Therefore, one of the key management strategies to ensure organization success at present, and in the future is identification of KOLs and rising stars in the fields relevant to the business of the organization (Ready et al., 2010).

In academics, performances in research have been used as indicators of academic rising stars. Zhang et al.,(2016) studied and reported on how to identify academic rising stars. Specifically, the work of Zhang et al., (2016) dwelled on how to effectively predict the top k% researchers who achieve the highest citation. The Weighted Fractional Count (WFC) of Nature Index is also widely applied, and can be used to identify the rising stars performers in the research world (Philips, 2016; Nature Index, 2016; Nature Index, 2015; Grayson & Pincock, 2016). Although, the Nature Collaboration metric is already in use to evaluate scientific collaboration worldwide, however, the methodology of this metric is significantly flawed. It does not take cognizant of the total number of collaborators and the order of collaborator per publication. It is a fact, generally known in scientific publishing that the order of author listing is indicative of the extent of contribution/influence of the authors as per the published research.

In this present study, a measure of collaborative strength, used to determine percentile position ranking of scientists at INGENIO, the joint research institute of the Spanish National Research Council (CSIC) and UPV - the Polytechnic University of Valencia is presented.

METHODOLOGY

The co-authorship pattern of research staff at the INGENIO, Valencia in Spain was studied by measuring the collaborative strength of individual researcher at the institute. To determine the collaborative strength of individual researcher, the co-authorship of each publication as recorded against the researcher at the website of the following link: http://www.ingenio.upv.es/en/researchers#.WIXwZBJYvMw was obtained. The information used was as obtained at this link as at 23rd January, 2017. A simple count of the total number of authors listed on a particular publication was made, and recorded as *n*; the position of the researcher in the author list is recorded in ascending order as *r*; starting with the first author listed. A record of distribution of *n* and *r* was obtained for all the research staff of INGENIO who had publication records. The collaborative strength of individual researchers was determined using the relationship expressed as follows:

$$C_S = \sqrt[4]{\sum_{i=1}^{P}(n_i - r_i + 1)} \quad (1)$$

Where C_S is the collaborative strength, P is the total number of publications of the scientist and i is indicative of a particular publication of a scientist. The mean of the number of persons collaborating per paper (n_{mean}) and mean of the positions of a specific research staff (r_{mean}) were calculated using the following expressions:

$$n_{mean} = \frac{\sum_{i=1}^{P} n_i}{P} \quad (2)$$

$$r_{mean} = \frac{\sum_{i=1}^{P} r_i}{P} \quad (3)$$

The percentile ranks of each researcher were also evaluated. The percentile ranks for each researcher within the organization (P_{Org}); and among research peers were determined (P_{Peer}). A schematic representation of P_{Org} and P_{Peer} is presented in Figure 1. P_{Org} is indicative of the rank of the researcher as measured by the collaborative strength relative to collaborative strength of other researchers within the organization. P_{Peer} indicates the rank of the researcher relative to other researchers with which s/he has worked/collaborated. This includes all research peers within and outside the organization. The position of the researcher in the author list is indicative of the weight of the opinions of the researcher in the published work.

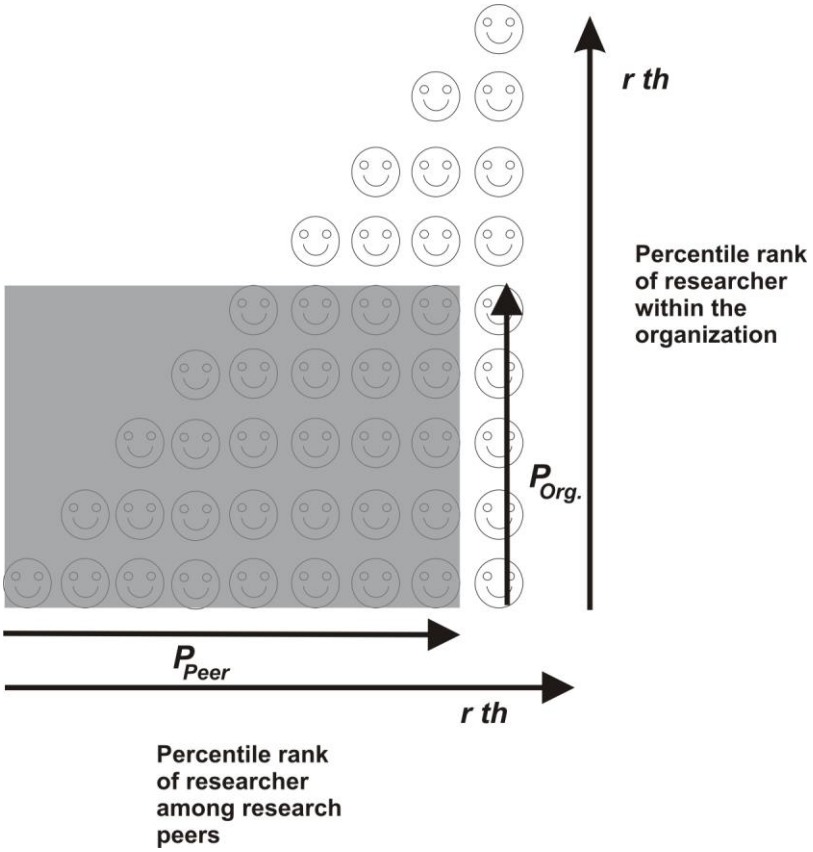

Figure 1: A Schematic representation of relative positions of researchers within organization and among peers

The overall average percentile *($P_{Avg.}$)* ranks was also determined. P_{Org}. was determined by finding the relative position of the researcher when the measured collaborative strength of all researchers in the organization was ordered in ascending order. P_{Peer} was determined as a function of the mean of the number of persons collaborating per paper (n_{mean}) and mean of the positions of a specific research staff (r_{mean}). The functional relationship used to determine P_{Peer} is expressed in equation (4) while equation (5) was used to determine as follows:

$$P_{Peer} = \frac{n_{mean} + 1 - r_{mean}}{n_{mean}} \quad (4)$$

$$P_{Avg} = \sqrt{P_{Org}.P_{Peer}} \quad (5)$$

The product of P_{Org} and P_{Peer}, as illustrated in Figure 1, indicates area of influence of opinion of researchers. It corresponds to area of rectangle with breath and length equal to P_{Org} and P_{Peer} respectively.

RESULTS AND DISCUSSION

Information on the full names of the researchers at INGENIO, the initials corresponding to the full name of each researcher, the total number of publications of each researcher, the n_{mean}, r_{mean}, the collaborative strength *(C_S)* of each INGENIO researcher, the P_{Org}, P_{Peer}, and P_{Avg} is presented in Table 1.

Table 1: Full names of CSIC-UPV (INGENIO) Scientists Investigated

S/N	Names	Initials	Number of Papers	n_{mean}	r_{mean}	C_s	P_{org}	P_{peers}	P_{Avg}
1.	Rafael Aleixandre Benarent	RAB	28	4.25	2.79	2.88	65th	58th	*61st*
2.	Joaquin Maria Azagra Caro	JMAC	96	2.70	1.28	3.90	94th	90th	*92nd*
3.	Sergio Belda Miquel	SBM	28	3.18	1.39	2.93	68th	88th	*77th*
4.	Alejandra Boni Aristizabal	ABA	60	3.13	1.82	3.43	82nd	74th	*78th*
5.	Elena Castro Martinez	ECM	129	3.15	2.06	4.09	97th	66th	*80th*
6.	Teresa de la Fuente Espinosa	TFE	1	4.00	3.00	1.19	6th	50th	*17th*
7.	Teresa Escrich Gallardo	TEG	6	2.17	1.33	1.82	29th	85th	*50th*
8.	Adela Garcia Aracil	AGA	122	2.18	1.41	3.82	91st	81st	*86th*
9.	Antonio Gutierrez Gracia	AGG	82	3.48	2.63	3.51	85th	53rd	*67th*
10.	J. Felix Lozano Aguilar	JFLA	9	2.22	1.56	1.97	32nd	75th	*49th*
11.	Monique Leivas Vargas	MLV	2	4.5	2.5	1.57	15th	67th	*32nd*
12.	Francisca Javier Ortega Colomer	FJOC	16	1.88	1.50	2.19	38th	73rd	*53rd*
13.	Victoria Pellicer Sifres	VPS	5	2.80	2.00	1.73	26th	64th	*41st*
14.	Francois Perruchas	FP	9	3.78	2.44	2.14	35th	62nd	*47th*
15.	Ismael Rafols	IR	30	3.33	2.23	2.82	62nd	63rd	*62nd*
16.	Nicolas Robinson-Garcia	NRG	4	2.75	1.75	1.68	18th	73rd	*36th*
17.	Enrique Tortajada Esparza	ETE	14	2.93	1.86	2.32	47th	71st	*58th*
18.	Richard Woolley	RW	20	3.20	2.50	2.41	50th	53rd	*51st*
19.	Jose David Barbera Tomas	JDBT	39	2.64	1.41	3.04	71st	84th	*77th*
20.	Carlos Benito Amat	CBA	15	2.53	2.00	2.19	41st	60th	*50th*
21.	Carolina Canibano Sanchez	CCS	17	2.59	1.47	2.45	53rd	82nd	*66th*
22.	Davide Consoli	DC	70	2.39	1.69	3.30	74th	71st	*72nd*
23.	Pablo D'Este	PDE	86	2.97	1.74	3.79	88th	75th	*81st*
24.	Ignacio Fernandez de Lucio	IFL	166	3.04	2.19	4.19	100th	61st	*78th*
25.	Monica Garcia Melon	MGM	19	3.74	1.95	2.70	59th	75th	*67th*
26.	Fernando Jimenez Sacz	FJS	62	3.21	2.29	3.30	76th	60th	*68th*
27.	Aurora Lopeh Fouges	ALF	2	2.00	1.5	1.32	9th	75th	*26th*
28.	Maria Luz Lopez Terrada	MLLT	1	2.00	2.00	1.00	3rd	50th	*12th*
29.	Jordi Molas Gallart	JMG	75	2.45	1.68	3.40	79th	72nd	*75th*
30.	Julia Osca Lluch	JOL	4	3.00	2.00	1.68	21st	67th	*38th*
31.	Jordi is Blanes	JPB	21	3.95	2.62	2.65	56th	59th	*57th*
32.	Irene Ramos- Vielba	IRV	3	3.67	1.67	1.73	24th	82nd	*44th*
33.	Carolin Schmitz	CS	2	1.50	1.00	1.32	12th	100th	*35th*
34.	*Enrique Tortosa Martorell*	*ETM*	*24*	*1.79*	*1.75*	*2.24*	*44th*	*58th*	*51st*

From the same Table 1, Ignacio Fernandez de Lucio has the highest collaborative strength. He has a total of 166 publications. This means he has been able to utilize about 166 collaborative opportunities. His average collaborations per publication (n_{mean}) and average position rank (r_{mean}) are 3.04 and 2.19 respectively. This implies that ordinarily, Ignacio Fernandez de Lucio collaborates with about three persons per publication and is mostly either the first or the second author listed. Although in Figures 5 and 6, Monique Leivas Vargas has the highest average collaborations per publication while Carolin Schmitz has the strongest position rank, however, the total number of publications by these staffs is rather very small, and the reason for their observed weak collaborative strength.

Considering Davide Consoli and Fernando Jimenez Sacz , these two staffs have the same collaborative strength despite that Davide Consoli has published 70 papers which is more than the total of 60 papers published by Fernando Jimenez Sacz. Ordinarily, Sacz collaborates mostly with about 3 persons per publication while Consoli collaborates mostly with 2 persons. The two staffs are mostly listed as the second author in their collaborative groups.

Ignacio Fernandez de Lucio has the highest Organization Percentile Rank (P_{Org}) of 100th Percentile, while Carolin Schmitz has the highest Peer Percentile Rank (P_{Peer}) of 100th Percentile.

Overall, Joaquin Maria Azagra Caro has the highest Average Percentile Rank ($P_{Avg.}$) of 92nd Percentile. Going by the study of Ready et al.,(2010) reported in the June issue of Harvard Business Review, that

research has shown that companies tend to think of the top 3 to 5% of their talents as the KOLs, this implies that there are NO research Key Opinion Leaders at INGENIO. Joaquin Maria Azagra Caro is only very close to being a KOL. However, if the definition of KOL permits the top 10 to 20 %, then Joaquin Maria Azagra Caro will be the most authoritative KOL at INGENIO, followed by Adela Garcia Aracil (P_{Avg} = 86th), Pablo D'Este (P_{Avg} = 81st) and Elena Castro Martinez (P_{Avg} = 80th).

CONCLUSION

A new scheme to identify research Key Opinion Leaders through evaluating research collaborations in published works has been introduced. The new scheme shows that the Key Opinion Leadership status of a researcher is directly related to the number of collaborators per publication, the relative position of the researcher in the author list, and the total number of publication of the researcher. The significance of total number of collaborations publications on the measure of collaboration as reported in earlier studies is upheld by the study. The role of number of persons collaborating in a particular research, and the relative positions of the collaborators among their peers and within their organization are also confirmed relevant and important in determining the KOL status of a researcher.

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INTELLECTUAL CAPITAL MANAGEMENT FOR NEW PRODUCT DEVELOPMENT

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ABSTRACT

In this paper intellectual capital management, and new product development is analyzed. Intellectual capital plays an important role in achieving high business performance, and sustaining a competitive market position. It represents the integrated whole of intangible assets, through which companies can effectively develop new products. These new products bring value to the company, and to the consumers. Now, the role of intellectual capital is investigated. The findings are concisely described through propositions. Further, the theoretical review, moderately contributes to the vast literature in this domain. The concise nature of this paper increases its readability. It can be practically implied in situations where a brief insight is required in the domain of intellectual capital management, and new product development. Managers can turn to this paper to find core suggestions regarding the influence of intellectual capital on new products. The results of this analysis, suggest that intellectual capital is crucial for new, and innovative products.

Key words: intellectual capital, management, business performance, new products

INTRODUCTION

In this paper a theoretical review of intellectual capital, and new product development, is conducted. Intellectual capital can be described as an integrated whole of intangible assets of an organization that includes knowledge, employee skills, patents, procedures, innovations, technologies, communication etc. These intangible assets are used to create value for the organization (Wu, Chang, & Chen, 2008). Furthermore, it was noted that intellectual capital has a key role in sustainable business development (Petty, & Guthrie, 2000). In the new economic era, intellectual capital, or intangible assets are a necessity for a sustainable development, and for strong competitiveness on the market (Chen, 2008). Modern markets are characterized by rapid changes, influenced by new technologies. Therefore, intellectual capital management is necessary for stable business performance.

It is interesting to note that according to Kianto, Hurmelinna-Laukkanen, and Ritala, (2010) service-oriented companies have a more developed intellectual capital management system, in opposite to product-oriented companies. This can be explained by the nature of products, and services. Intellectual capital as an intangible asset, is more complementary to the intangible nature of services, in opposite to material, showable, and physical products. However, this doesn't negate the positive effect of good intellectual capital management systems on product development.

New product development is an imperative for a company's survival on a specific market. Without new products, at the end of the life-cycle of old products, companies face the problem of lower sales,

and overall decrease in business performance (Chen, James Lin, & Chang, 2006). Undoubtedly, it is important to address all the intangible assets of a company, and to manage them according to strategic business goals. This way, through intellectual capital management, new products can be developed, which will bring value to customers, and increase customer loyalty (Kianto, Andreeva, & Pavlov, 2013). Creating value for customers increases the value of the company. Intangible assets of organizations, offer an advantage, and unique approach to new product design. Companies that don't have adequate knowledge, skills, patents, technologies, or overall intellectual capital resources, struggle to maintain a competitive position on the market.

The main goal of this paper is to concisely present the concept of intellectual capital management, and its use in new product development. Furthermore, the influence of intellectual capital on business performance is addressed. Next, propositions are made in order to concisely describe the results of the theoretical review. Based on the investigation, conclusions are drawn, and future research is suggested.

INTELLECTUAL CAPITAL MANAGEMENT

Intellectual capital can be presented as a notion through which knowledge in an organization is applied to various business metrics. Three main elements of intellectual capital are intangibility, value creation, and growth effect on practice of the organization's collective (Cabrita, & Bontis, 2008). Further, intellectual capital can be defined as collective knowledge, information, data, intellectual property rights, organizational learning, employee skills, customer relations, experience, and brands that can create value for the company (Chen, James Lin, & Chang, 2006). Intellectual capital management is crucial for achieving adequate business performance. However, a large percent of companies don't pay attention to their intellectual assets. This is mainly due to the low understanding of the importance of intellectual capital to business performance. It is necessary to address the critical factors of intellectual management, in order to allocate this type of resource in an effective way (Hormiga, Batista-Canino, & Sánchez-Medina, 2011). Companies often don't recognize the need, and purpose of intellectual capital management. This can result a rigid environment, where innovativeness is decreased.

The three basic dimensions of intellectual capital is human capital, structural capital, and relational capital. Human capital includes the knowledge, information, and skills of employees, thus it is not owned by the company. Structural capital includes process capital, and innovation capital. Process capital includes operation processes, business development plans, specific methods, techniques, information technologies etc. Innovation capital can be in the form of patents, trademarks, and copyrights. Finally, relational capital involves all values for customers, suppliers, and stakeholders (Hsu, & Fang, 2009).

Intellectual capital management is important, as knowledge is a strong basis for achieving competitiveness, and to create economic value. Knowledge suited for creating value for companies, and consumers, is regarded as intellectual capital. A vast amount of research is focused on defining, and analyzing the intellectual capital indicators. The majority of the research noted that organizations that held large intangible assets, experienced enhanced business performance (Kianto, Andreeva, & Pavlov, 2013). However, there are issues regarding extent in the research that analyzed the correlation between intellectual capital, and organizational performance.

Research results of Kianto, Andreeva, and Pavlov, (2013), argued that the most value in a company is generated through intangible assets (intellectual capital). Innovation, new technologies, and overall development of products is firmly based on intellectual capital. Effective management of knowledge, skills, patents, new technologies, and other intangible assets, creates a productive, and creative environment for product development. Intellectual capital is measured through several metrics. These metrics are total assets; market value; return on net asset value; revenue from new business operations; patents; market share; customer satisfaction; average customer size; number of sales, and customers;

customer rating; total costs, and revenue; processing time; investments; number of errors; research, and development of products; employee satisfaction; number of employees, and managers; profits per employee; average age of employees; and percent of managers with advanced degrees (Liebowitz, & Suen, 2000).

Intellectual capital management leads to a sustainable competitive advantage. It is necessary to address the positive effect of intangible asset management, in order to achieve higher business performance in various companies. Locating intellectual capital in various situations is crucial for further business development. The importance of intellectual capital is manifested in the revolution of information technologies; changes in interpersonal activities; importance of innovation; and the rising and importance of knowledge-based economy (Petty, & Guthrie, 2000). Based on the above presented arguments, the following propositions are suggested:

Proposition 1: *Intellectual capital brings a competitive advantage to the company.*

Proposition 2: *Adequate intellectual capital management is crucial for sustainable business performance.*

INTELLECTUAL CAPITAL MANAGEMENT AND NEW PRODUCT DEVELOPMENT

Hill, and Jones (2001), argued that more intellectual capital allows companies to develop better, more innovative products. This way, a more competitive advantage is secured on the market. The more diverse, unique is the intellectual capital of a company, the higher the new product development performance (Calantone et al., 2002). Information from customers, which is processed, is a great intangible asset that allows companies to modify, innovate, and design new products, or services more efficiently (Chen, James Lin, M. J., & Chang, 2006). Similarly, close relationships with suppliers, offer more information exchange, thus newer, and more innovative products can be developed (Walter, 2003). When companies can interact with customers through new products, the increase the probability that useful information will be exchanged, which will further help with product innovation (Chen, Liu, Chu, & Hsiao, 2014).

According to Hsu, and Fang, (2009), key factors for successful product development are human capital, structural capital, and relational capital. The learning ability of organizations is crucial for substantial innovation of products. If an organization doesn't have adequate learning capabilities, it struggles to achieve, and maintain good business performance. The three dimensions of intellectual capital should complement each other, therefore, the managers have to ensure synergy of different intangible assets (Hsu, & Fang, 2009).

Developing a new product is a complex process that includes generation of ideas; idea screening; concept development; concept testing; marketing strategy development; business analysis; prototype development; product development; testing; evaluation; and commercialization. The mentioned steps in new product development integrate various dimensions of intellectual capital, and without it, risk of failure is higher, and overall innovativeness is lower (Zeghal, & Maaloul, 2010). Based on the mentioned arguments, the following propositions are suggested:

Proposition 3: *Intellectual capital management is often an imperative for successful new product development.*

Proposition 4: *New product development is influenced by the intangible assets of the company, effective use of these assets is key to competitiveness on the market.*

Maditinos, Chatzoudes, Tsairidis, and Theriou, (2011) noted that intellectual capital is a significant strategic asset. It provides thrust towards new technologies, and innovative products. Communication, and collaboration between companies, customers, or company sectors, provide a good infrastructure

where knowledge, patents, new technologies, and intellectual capital overall, can have specific business applications (McAdam, O'Hare, & Moffett, 2008). To develop new products, companies have to address a strain of complex elements that are necessary to create value. Human capital is positively correlated to innovativeness (Chen, James Lin, & Chang, 2006). It is evident that intellectual capital has a major role in designing, researching, and prototyping new products that will bring value to customers. However, besides intellectual capital, companies have to possess excellent management systems, operation procedures, and knowledge management, in order to effectively develop new products (Chen, James Lin, & Chang, 2006). In the next section conclusions are drawn.

CONCLUSION

The conducted theoretical review gave insight to the relationship between intellectual capital management, and new product development. It can be concluded that high amounts of intellectual capital positively influence new product development. Results, and findings from credible literature sources provided sufficient qualitative data, through which the importance of intangible assets is presented. Intellectual capital management is important for adequate business performance. The measurable metrics of intellectual capital contribute to the creating of value for customers. It is necessary to note that intellectual capital is more complementary to service-oriented companies, in opposite to product-oriented companies. However, the positive effect of a good intellectual capital management system, is not discredited in manufacturing companies. Managers have to create a suitable environment, where intangible assets can be used for creating physical products.

The main limitation of this paper is the lack of a thorough systematic review in the domain of intellectual capital, and new product development. A systematic review requires significant number of pages, in order to be properly presented. The nature of this paper is more concise, and its use is to give an insight to the subject. The contribution of this paper is moderate, and scientific significance is low to moderate. However, this limitation is not severe, as the paper offers sufficient information based on credible literature in the domain of intellectual capital management, and its influence on new product development.

For future research a thorough systematic review is suggested. This review should include the intellectual capital metrics for each step in the new product development process. In addition, the dimension of intellectual capital should be investigated. Next, it is important to address a larger body of literature in the domain of intellectual capital management and its effect on business performance, and specific business performance metrics. This way a more complete picture is created.

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IMPORTANCE OF EDUCATION AND TRAINING IN HUMAN RESOURCE MANAGEMENT

UDC: 005.96

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ABSTRACT

Human resource management is one of the key departments in a company. Training and development should be the main focus in an enterprise striving to succeed on the competitive market. Different training techniques and methods that HR (Human Resources) practitioners use to improve their overall knowledge and experience. Agreements and Progress Report from EU training platform. Use of IT technologies in the field of science.

Key words: Education, Human resource management, Training.

INTRODUCTION

Training is the process of teaching the employees the basics skills they need to perform their jobs or for developing additional skills. If a company or organization wants to be successful over a long period of time, it is necessary to separate part of its resources into training and education of its employees. In a dynamic and uncertain business environment, the degree of success of the company is conditioned by its ability to understand, accept and respond in a timely manner to the advantages and threats of the external and internal environment.(Zubović, 2010). Due to the rapid development in the IT sector, more precisely to the education department, it is becoming easier to train employees. By gathering the most crucial information and best technology for evaluation, the end result should be a positive outcome for any company.

EDUCATION AND TRAINING IN HUMAN RESOURCE MANAGEMENT

Planning and programming education activities in the organization covers a set of planning activities that should enable good preparation for training realization and education. Training and education plans can not be isolated from a comprehensive human resource planning activity, based on needs and strategic plans of the organization (Pržulj 2007, 221)

Manufacturing or adopting a good learning and development framework and incorporating planned activities into said framework should be at the beginning of an HR long-term plan. A good long-term plan can is based on few steps (L&D Guidebook, 2014). At the start a company needs to identify their learning and development needs and prioritize them. This includes establishing a time frame that is suitable for delivering the program, determine the available resources and inventory, and obtain employee capabilities. In this step there is a lot of data gathering and analysing in which a good and developed IT infrastructure helps. Prioritizing can be determined buy setting a criteria by which urgency or seriousness is rated. Ratings are usually numerical or described with few words. Next step is the selection of interventions that should address learning and development needs. A set of methods

can be used such as on the job learning or group learning. And the final steps should be scheduling interventions and installing an HRD monitoring and evaluation framework. (L&D Guidebook, 2014).

There is an agreement (Svetlik, et al.,2010) that companies should hold HR development and training both for the practitioners and those are enrolling to become one. During the economic crisis a lot of people changed their careers which resulted in a lot of undeveloped and untrained new practitioners. Governments organized and held training courses to help people begin a new career. Below we can see the report from Romania

Table 1: Number of persons enrolled into continuing training courses in Romania (Blaga, 2010)

	2007	**2008**	**2009**
Total persons, of which:	**64093**	**59703**	**44347**
Unemployed	53651	50622	41306
Persons who accomplished their training in organized courses	4573	44490	36586
Unemployed who attended courses financed from unemployment insurance budget	25601	25241	24910
Unemployed attending courses organized from another founds	1432	2258	911
Persons who benefit of free vocational training services financed from unemployment insurance budget	3531	3504	659
Persons beginning the training in the previous year	11942	11643	9035
At the request of individual persons	2016	1513	960

By analysing Table 1. we can see that small percent of those who enrolled finished their courses and we can conclude that the courses had high standards and where using number of different methods to select through the trainees.

There is also an European Commission sector in Education and training program named “Western Balkans Platform on Education and Training”. It launched in 2012. And it’s the EU’s initiative for cooperation in education with Balkan countries. Although the countries in the region are committed to voluntarily converge with EU and international standards, the implementation of new policies and reforms is difficult. Each country is at a different stage and with limited resources they requested assistance. (EC.EUROPA, 2017.)

Meetings begun in 2012 between participants whom included representatives from ministries of education from every country. Some of the conclusions and agreements are:

- To conduct more monitoring of projects and incorporate criteria on quality of results, their sustainability and impact
- To establish a regional Charter for cooperation in building capacity for research in HE
- Accreditation and quality assurance mechanisms
- Linking higher education with the labor market and country strategic objectives
- Investing in higher education for innovation, mobility and transparency
- New Bi-Law and system of continuous professional development of teachers (Serbia)
- Criteria and tools for evaluating teacher performance (EC.EUROPA-Progress Report, 2017.)

TECHNOLOGIES USED IN HR EDUCATION AND TRAINING

HR technology can be defined as any technology that is used to attract, hire, retain, and maintain human resources, support HR administration, and optimize human resource management (Johnson & Gueutal, 2011).

According to (Bulmash, 2006) there are four stages in HR technology evolution. The first stage was “paper-based” in which systems operated independently and could not integrate in any other business

related systems. Data was collected and stored on mainframe computers. The second stage was in the early personal computer era and it consisted of transition from paper-based to personal computers and LAN (local area networks) systems. The third and fourth stages were electronic database and web-based systems and the focus is shifted to efficiency and effectiveness in automating transactions.

As each stage evolved level of access increased and all employees had access to the business system. Human resources information systems are a growing software industry and up-and-coming companies what the best HR software installed in their systems. A recent survey indicated that overall costs of system implementation ranged from US$1000 to US$12 million (Ijiras, 2017).

HR information systems are composed of subsystems. An example is of one can be seen below.

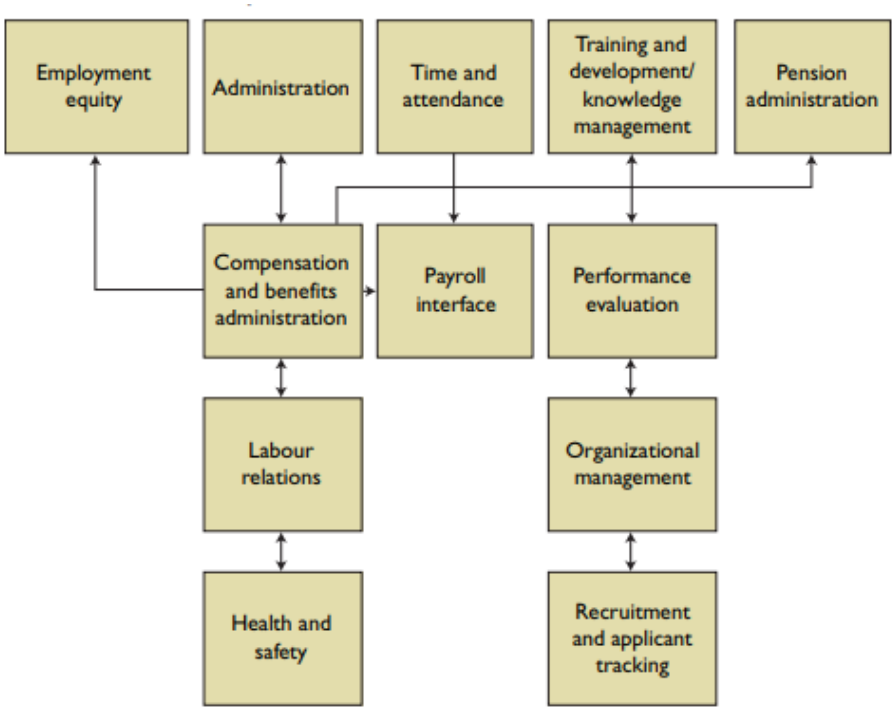

Figure 1: HRIS (Bulmash, 2006)

Features that should be implemented in an existing training software should be a choice of database platforms, benefits, attendance and compensation tracking, integrated payroll processing, quick implementation, easy data-import features, scalability to accommodate future business growth and ability to easily customize to fit your business needs (ACCPAC, 2010)

Technology is set to completely transform the way we approach Human Resources and recruitment. In our opinion the HR technology sector could use and improvement in foolproof dual factor authentication, which means that companies should improve their authentication technology and security by installing a second type of security check for their employees. Than can be a type of passcodes that should change during the day.

Also HR departments in companies should work on their social media coverage. LinkedIn recruiting service allows HR professionals to recruit and fined right candidates for the right position in the firm, thus saving a lot of money and time.

There is also and issue of data storage and collection. Collection and data storage have been so difficult until the evolution of cloud. All the information and forms, that some who is applying for a job, can be found on cloud systems and it can be easily used and shared. (Wang et al., 2016)

CONSLUSIONS

For conclusion we can say that education in the sector of HR is improving and development in the same sector is immensely improving. A strong human resource sector is crucial part of any growing or established business. Great amount of new ideas on how to further develop HR software can make some practitioners and users feel confident and will make their job easier. Importance of combining a great education and a well developed system is must-have if you are planning to start or improve your business. A company must also follow new trends and EU standards and practices if they want to stay relevant. Analysing your own data, country level data, and comparing it to neighbouring countries and more developed countries can lead to improvement and new ideas in the HR sector. Company should have a special view on usage of technologies and security that covers their systems so future and current employees can have an easier access to all the data.

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THE ROLE OF LEADERSHIP IN MANAGING ORGANIZATIONAL CHANGES

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ABSTRACT

The authors are analysing the role of leadership and organizational changes management with the aim to improve an organisation and its efficient business performance on the market. Change management is a big challange for top managers. The changes occur on daily bases and they are fast and permanent. They also ask for a new style of business in almost all current organisations. Rightly carried out changes can guarantee a company's success. Leadership also represents an approach to leading employees in modern organization management.

Key words: Leadership, change management, organisation, competitiveness

INTRODUCTION

The role of leadership is generally seen as essential during the implementation of organizational change (Voet et al. 2016). The leader is a person who has the skills, behavior and power to influence a group of people in order to achieve his vision (Petrović, et al. 2017). A real value of an organization cannot be seen through its long life but in its ability to change itself continuously. These changes enable the organization to make something new and different. ''Nothing is everlasting except the change.'' Change management can be defined as a maximum utilization of basic structures and tools for controlling any changes within an organization. It can be said that only those organization which are willing and ready for permanent changes are secure on modern markets. In order to understand the great role and importance of time required to implement changes, if we have realistic expectations, we need to look at the real picture and avoid undesired resistance (Stanisavljević, et al. 2015). Changes in modern business can be characterized as dynamic, constant and fast. They may be within the organization and the broader business environment..

Companies on the global market are facing numerous challenges referring to the establishment of competitive advantage (Đođrević, et al. 2018). Only the organizations which could accept changes, transform their business strategy in the current business environment and show readiness to be persistent in pursuing their goals could have competitive advantage. Otherwise, if they ignore potential threats, they will disappear from the market. The success of modern organizations is reflected in the ability to recognize changes, early diagnosis and assessment of results. It is also important to inform employees about the successful implementation of the change, the benefits of which have been

acquired, thus putting to know how the changes are significant and how they could strengthen their significance. (Stanisavljević, et al. 2015)

Leadership deals with changes, starting from generating a vision of the future to gathering people around the idea given in the vision, and motivating them to overcome all obstacles encountered on the way to achieving the goal generated in the vision (Sajfert, et al. 2012). Leadership implies an approach to people management in an organization based on one person's influence on another person independently of the formal right to realize that influence. It is an ability to create a vision, to inspire and motivate as well as to create enthusiasm and voluntary participation in the realization of goals (Bešić, et al. 2008). Without an influence, leadership does not exist (Northouse, 2008).

THE ROLE OF LEADERSHIP IN CHANGE MANAGEMENT

Business excellence represents the main goal of modern business and it results in the leadership competitive position (Đođrević, et al. 2018). In modern business, an organization must accept new business conditions in its environment, adopt new management processes, especially when it relates to their ability and readiness to respond faster to the competition. In modern business conditions, in company management, business functions stand out particularly. Due to their market orientation, they carry a strategic sign (Đorđević et al., 2011). They are marketing, quality and research and development (Đorđević & Ćoćkalo, 2010).

A leader is a person who has the power of persuasion to induce his employees to follow him, to do what he suggests. It represents a person who encourages people to follow his ideas, follows his decisions in achieving the desired goals and makes the necessary changes in the organization. Vision is a central component of all great leaders (Kotter, 1996). A leader is someone who has power, ability and knowledge. It is a person who needs to induce other people to follow him by doing the work he proposes. Leadership means having a certain approach to managing employees in an organization. It is the influence of one person on other employees regardless of his/her formal right to actually have that influence. A leader possesses the ability and knowledge to create a vision, inspire and motivate others to participate in the realization of the set goals. (Petrović, et al. 2017). Six foundations of a leader's power: 1. Power of reward; 2. Natural power; 3. Legitimate power; 4. Referential power; 5. Power of expertise and 6. Information power (Sajfert, et al. 2007).

There is a problem when a leader thinks that imitating another leader will also give him the effectiveness of his actions. The key elements of every leader are his strengths. A leader must be aware of every flaw and strength he possesses. A leader needs to know strengths as a carpenter knows his tools, or as a physician knows the instruments at his/her disposal. What great leaders have in common is the fact that each truly knows his or her strengths – and can call on the right strength at the right time. (Petrović & Bakator, 2013).

Leaders are the ones who need to possess the ability to lead, customize their approach to the team i.e. the employees in order to achieve the set goals and get the desired results. A leader's job is to make a transformation in his organization. He possesses the knowledge, personality and the power of persuasion. (Deming, 1996). A successful leader will have to define his goals and purpose clearly.He is the leader of the future in the global world which is constantly changing at the speed of light. He must be a role model to others inside and outside his organization. A leader must have good interpersonal skills, motivation and positive attitude which is the key to the efficiency of doing the right things with his team within his company (Petrović, et al. 2017). There are 5 types of behaviour of an effective leader:

- 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 (Sajfert, et al. 2012).

In modern business, organizations want their teams to be built within the organizational structure of the company, so the teams are built by several leaders, as one leader in the organization is not enough. The key to a modern organization is not its own capabilities, but the knowledge and capabilities of the leaders within the company. Leadership in the domestic economy is still tied to ownership, that is, the power deriving from ownership. Also, on the domestic market, the perception of leadership as inherent characteristic prevails (Bešić, et al., 2008). The differences between the leaders of private and public companies reflect the impact of the privatization on the management (Sajfert, et al., 2016).

Main courses of action in the field of education of local managers should be:
- Education for new conditions of entrepreneurship based on a market mechanism, private property and productivity as a factor of competitiveness,
- Promoting a new concept- the necessity of a struggle for productivity as the basis for survival on the market, market development and development of specific enterprises,
- Permanent learning from the experience of others- continuous application of benchmarking method in order to achieve business excellence (Bešić & Đorđević, 2007).

Strong and competent leadership improves the knowledge and skills of employees in the organization. Companies that haven't managed to develop an adequate level of leadership can face several issues, including lower process flexibility; higher risks of failure; and ineffective resource allocation (Bakator, et al. 2018). Leaders usually focus on the future, they are those who inspire their members in the organization and create the image of both organizations and companies (Petrović, et al. 2017).

CHANGE MANAGEMENT IN ORGANIZATIONS

Change management has been defined as 'the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers' (Todnem 2005). The introduction of changes to any part of the organization, carries with it uncertainty, fear, worry, anxiety and stress among employees. Today's business environment requires organizations to accept changes almost permanently if they want to remain competitive in their business environment. Business environment has been changing permanently. The changes are under the strong influence of technological progress and the process of global market unification. Changes are permanent and business organizations have to make models of behaviour in relation to the observed and anticipated changes (Đorđević, et al. 2016). The necessity for managing changes in the organization is due to dealing with the problems in the business environment.

Modern business conditions create huge and unknown changes which every organization faces on a daily basis. Global market brings great challenges and constant changes in business environment. An organization's survival on the competitive market will depend on its ability to adapt to changes (Petrović, et al. 2017). Organizational changes occur when a company wants to move from its current state to a desired future state. Traditional strategic approach implies a hypothesis according to which managers can predict future market trends precisely enough to choose a clear strategic direction just by using the set of analytical tools. On the other hand, when market flows are really turbulent and tend to become chaotic, this traditional approach is marginal and in real life even dangerous for the future of business organization (Đorđević, et al. 2016). An organization which wants to enter a new market segment has to make sure that the competition is not fierce, and has a strategically developed plan to ensure a strong position on the new market (Bakator, et al. 2016).

Here are given ten phases which can help managers to lead changes:
- Initiating changes,
- Diagnosis of organization's condition and the reason for changes,
- Creation of a vision and planning a new organization,
- Planning and organization of the change process,
- Motivation for a change,
- Implementation of changes,
- Managing the power structure and political processes,
- Managing personal transition,
- Stabilization – changes become a part of organizational culture,
- Monitoring and control of organizational changes (Janićijević, 2008).

CONCLUSION

The essence of the struggle for competitiveness lies in the acceptance of change.(Ćoćkalo, et al. 2015). In fact, only those customer-centerd organizations that can deliver value will survive in the modern business arena (Ćoćkalo, et al. 2011). According to some data, great efforts which are invested in the implementation of changes in the organization often show as unsuccessful. For example, 50 percent of quality improvement programs fail to meet their goals, and 30 percent of process reengineering efforts are unsuccessful. (http://www.referenceforbusiness.com).

The main and most frequent reason for the failure of changes are the employees, they do not usually want to change the current way of work in the organization. The most common problem of leaders who are implementing changes is how to gain employee support and maximum commitment in implementing changes. A leader who wants to successfully implement changes in the organization should have the knowledge, skills and power of persuasion. Organizations need employees who can contribute positively to the smooth implementation of changes. A prerequisite for success in the organization lies in the acceptance and adaptation to changes in the business environment.

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ETHICAL LEADERSHIP: RESEARCH OF FACTORS THAT MAKE AN EFFECTIVE LEADER

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ABSTRACT

This paper points to the factors that make an effective leader and their action in modern business. Leadership is one of the processes in which the leader realizes the goals of the organization by acting on the followers. The results of the survey have shown that only excellent leaders make a big difference in business. The effectiveness of the leaders and consumer satisfaction and effectiveness of the leader and the satisfaction of the follower were investigated. A contemporary approach has been investigated: improving strong competencies. Dramatic increase in effectiveness can be achieved by increasing strong traits. The result is that a leader becomes excellent when someone has a natural gift, and on the basis of practice, learning and experience.

Key words: ethical leadership, factors, modern business.

INTRODUCTION

Although individuals have for centuries theorized about the nature of effective leadership, military psychologists have discovered methods of selecting officers during the First World War. They formed the foundation for the post-war scientific research of the subject. Krech and Crutchfield (1980) state that some people tend to be leaders in a large number of situations, while others only in some. From numerous studies of leaders in various types of groups, it follows that such features as intelligence, domination, self-confidence, strong ambition, a strong sense of personal identity are very important. Krech, Crutchfield, and Balaki (1972) state that it was discovered that leaders were more intelligent than their followers.

Mann (1959), has shown in his studies that leaders are consistent in their tendency to be more harmonious, more dominant, masculine, less conservative, and have greater interpersonal sensitivity than ordinary members. Krech, Crutchfield, and Balaki (1972) state that studies on personality characteristics of the leaders failed to reveal any feature that would be common to all leaders. Certain features such as, high intelligence, superiority and dominance seem to characterize capable leaders in a wide variety of studies.

According to Sajfert (2018) while the theory of ethical behavior is accessed by observing behavior or holding leaders, another group of theories has an ethics approach from the point of view of the character of a leader. These theories are called theories based on virtues and focus on what leaders are

like human beings. According to the authors of Rajkov and Sajfert (1996) traits are qualities characterized by personal qualities or characteristics of a person, such as physical characteristics (height, weight, appearance, energy), personality characteristics (domination, extraverality, originality), skills and abilities (intelligence, knowledge, technical competence), and social factors (interpersonal skills, sociability and sociometric position).

According to the authors Mihailovic and Ristic (2011) the so-called "big people" theory prevailed during the first half of the twentieth century emphasizes that effective leadership is essential for the leader to have a specific set of personality traits. According to the authors Mihailović and Ristić (2011), only a relatively small number of people possess such personal qualities, which to some estimates it does not exceed 1%. Kouzes and Posner (2006) have done one of recent studies of the characteristics of an effective leader. It was a research with an enviable pattern captured from the leader populations from five continents. The obtained results derived from the opinion of the follower systematized the set of characteristics of the favorite leaders. The order of these qualities is as follows: Honesty, Visionism, Competence, Inspirational, Intelligence, Fair play, Width of view, Empathy, Reliability, Decisiveness, Imagination, Ambitiousness, Courage, Maturity, Loyalty, Possession, Self-Control, Independence. Haas (1999) give practical advice, to learn how to manage themselves and that this is a key feature of not only successful leaders but also successful people in general. In trying to discover the origin of features that are adorned by the successful leader Haas (1999) systematize the traits in three groups: the characteristics with which we are born; learning traits and characteristics acquired by experience and activities.

We can already point out that we come to the realization that the two critical characteristics of the leader are his personality and interpersonal relations. The three main strands of leadership, Jay (2010) are: (1) building the values of leaders, (2) maximizing the power of the leader, and (3) setting up a support team. Zenger and Folkman (2002) found the traits of leaders in practice, based on extensive research, they have a base of 25,000 leaders, estimated at 200,000 of their followers. They found that leaders possessing the ability to encourage and motivate followers to high efficiency outweigh everyone else. Of the top 10% of the top leaders, as many as 66% of them are estimated to be strong in these two characteristics. They found that the basic dimensions of leaders are: character, personal capacity, focus on results, interpersonal skills, and organizational change management.

METHODS AND GOALS OF RESEARCH

The methods used were: expert methods of scientific research (data collection survey), methods of statistical data processing,IBM SPSS Statistics was used to process all collected data. The main goal is to find the factors that make an effective leader. The research proves the influence of the leader's ethics on consumer satisfaction, the satisfaction of the follower, the desirable characteristics of the leader, the improvement of strong competences, the increase in effectiveness with the increase of strong attributes and the social line. The results of the research are expected to reveal these relationships, and the discussion of the results to prove the results obtained.

HYPOTHESIS OF THE RESEARCH

H: There are statistically significant relationships between the factors of the effective leader and the ethics of the leader.

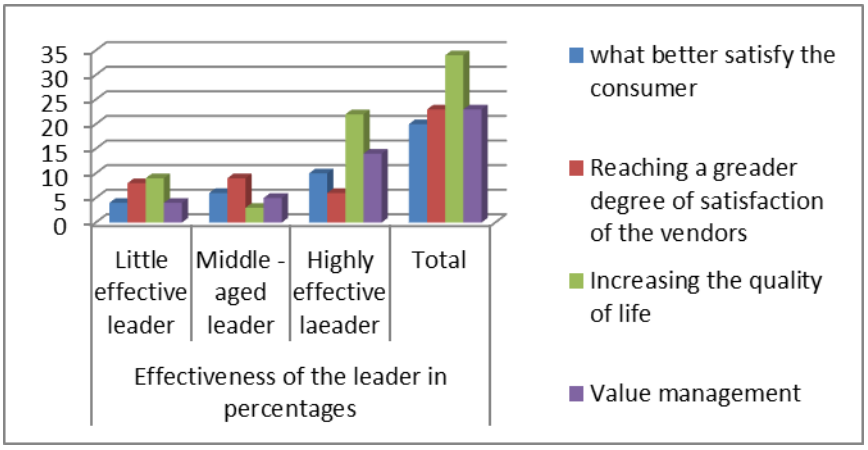
H1: There are statistically significant correlations between the ethics of the leader and the satisfaction of consumers and followers.

H2: There are statistically significant correlations between the ethics of leaders and the desirable characteristics of leaders and the improvement of strong competencies.

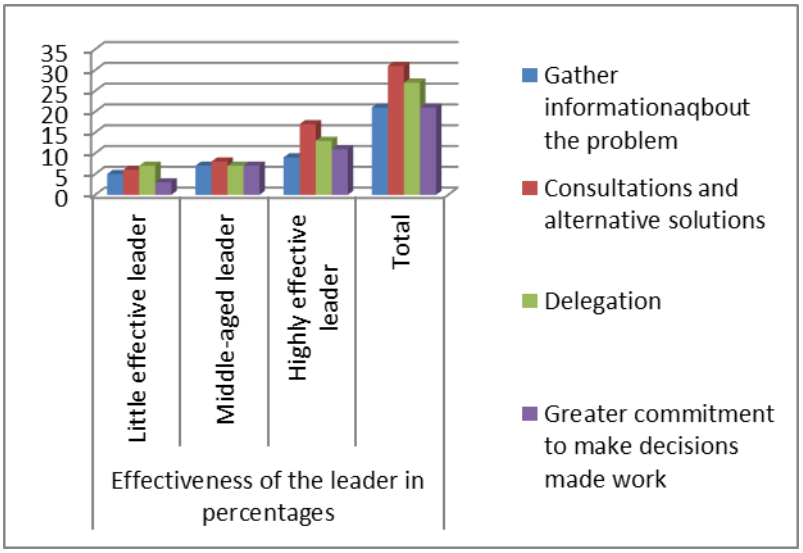
H3: There are statistically significant correlations between the ethics of the leader of the effectiveness of the leader and the social traits.

RESEACH RESULTS

The following graphic illustrations (Graph 1) shows the effectiveness of the leader and consumer satisfaction. It is important to emphasize that the results of the research show that few effective leaders attach importance to increasing the quality of life. Medium effective leaders give their attention to reaching a greater degree of satisfaction for consumers. Highly effective leaders make the difference in the quality of life. In total, the quality of life is increasing in the first place. Only great leaders make a big difference in business. Graph 2 shows the ffectiveness of leaders and employee satisfaction. The top one-third of the leader in terms of success has a big deviation in the results of research on their performance. The first result is seen in the first third of the surveyed population, in relation to consumer satisfaction and the satisfaction of followers. Such leaders create dissatisfaction. Another third of the researchers "good leaders" show that a good leader, wherever on a medium scale, is rated as having a central outcome. Only the last third of the leader is rated as excellent. And they make a sensible difference.



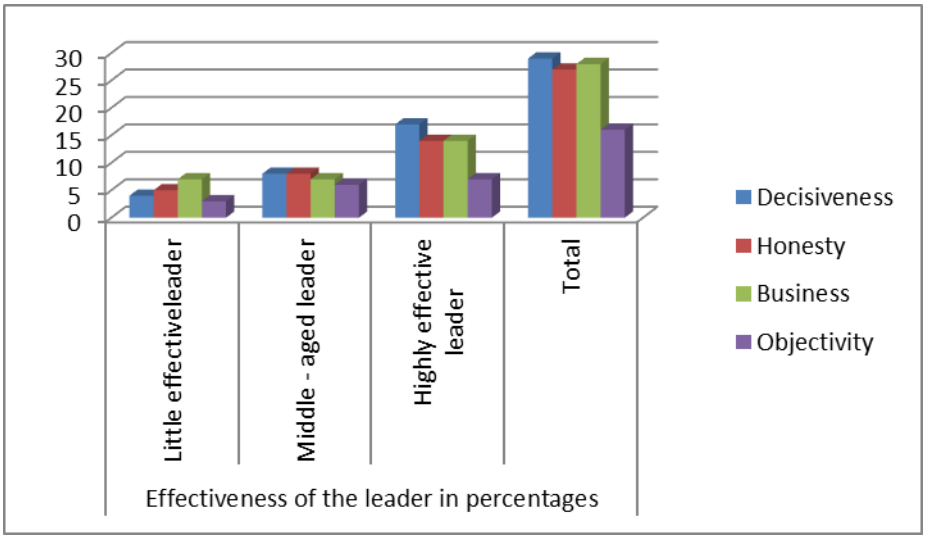
Graph 1: . Effectiveness of the leader and consumer satisfaction



Graph 2: The effectiveness of the leader and the satisfaction of followers

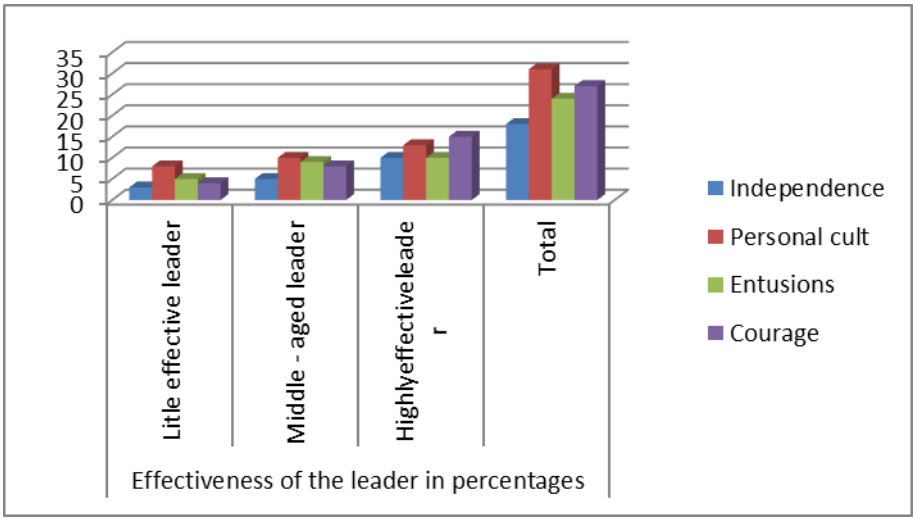
An excellent leader is created when he improves what in what he is already powerful. This is the essential difference between a good and a great leader: a good leader develops qualities in which he is weak to the average, an excellent leader develops the characteristics in which he is above average and leads them to perfection. The effectiveness philosophy is to strengthen the strengths in which you are strong.

The classic approach to work on the desirable characteristics of the leader (Graph 3) is based on the core. The essence of this approach is to improve the characteristics in which the leader is below the average.



Graph 3: Preferred characteristics of the leader

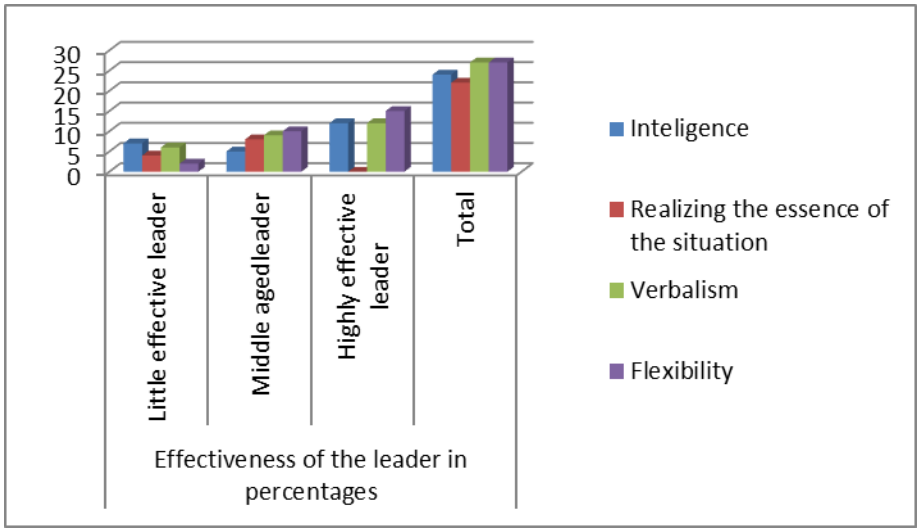
Contemporary approach (Graph 4: Contemporary approach: improving strong competencies) is based on superiority and it is essentially focused on building effective leaders.



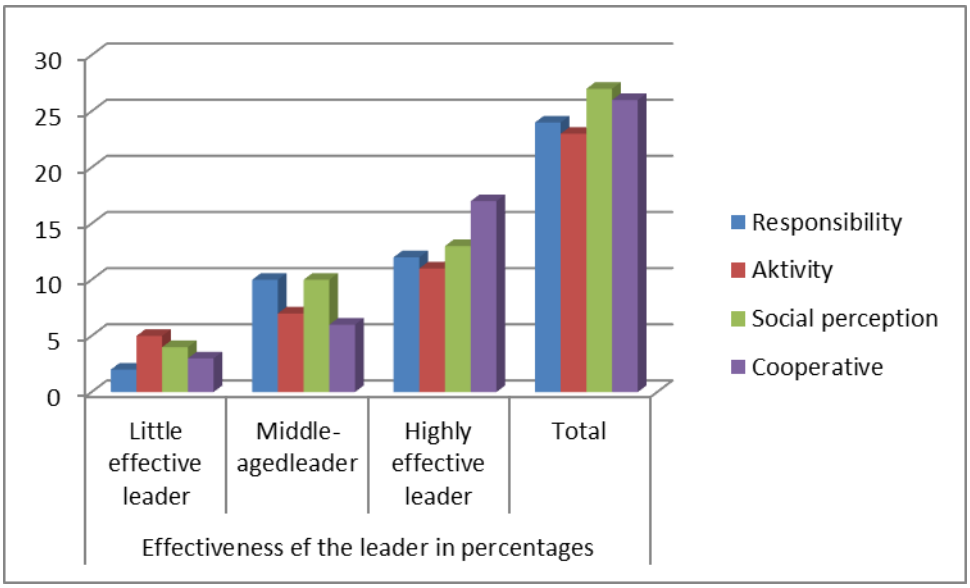
Graph 4: Contemporary approach: improving strong competencies

Another information obtained from the research gives an interesting information about the relationship between the strong qualities and the effectiveness of the leaders, based on the assessment of their associates. (Graph 5). Dramatic increase in effectiveness with the increase of strong attributes. Few effective leaders give preference to intelligence. For medium effective leaders, flexibility is the most important, and the most effective flexibility is for highly effective leaders. In the overall result, the first place is occupied by consistency and flexibility.

It should be said that the approach to enhancing superior competencies does not apply in the event that the leader has a social line (Graph 6 of the Socialization). For a few effective leaders in the first place is activity, while for medium effective leaders it is responsibility. For highly effective leaders, the second important is co-operativity, while social perception is in the first place.



Graph 5: A dramatic increase in effectiveness with the increase of strong attributes



Graph 6: Socialization

DISCUSION

Graph 1 shows relatively high average ratings for few effective leaders, even slightly surprisingly high. In the first place, the quality of life is increased, and the second is the achievement of a greater degree of satisfaction of consumers. For medium-sized leaders in the first and second place, achieving a greater degree of satisfaction of consumers and better satisfying the consumer. For highly effective leaders, the quality of life has increased in the first place, and also in the overall score. Graph 2 shows that few effective leaders put the delegation first. Medium effective leaders have the same answers, with the slightest advantage being consultations and alternative solutions. Top-rated effective leaders are in the first place consultations and alternative solutions. In the overall score in the first place are the same consultations and alternative solutions.

With few effective leaders in the first place is business, while with a medium effective leader the situation is uniform, determination, honesty, business and objectivity have received an approximate number of responses. With highly effective leaders, determination is the first place. Also, in the overall result, the decision is the first, and the second place is business. Results from Graph 4 show that for a few effective leaders in the first place is a personal cult, while in the medium effective

leaders, the result is equal, personal cult, enthusiasm, and courage. A highly effective leader is the first place to put courage. In the total results obtained, personal cult is in the first place.

Graph 5 shows that in the case of few effective leaders, the first is intelligence, and verbalism. Medium-sized leaders place flexibility first, and highly effective leaders also place flexibility first. In the overall result, verbalism and flexibility are in the first place. The results of Graph 6 of the show that few effective leaders put activity first. Medium effective leaders in the first place have put their responses into accountability and social perception. Highly effective leaders in the first place have put co-operation. In the overall score, social perceptions are in the first place, while the second place is co-operativity.

CONCLUSION

All the set hypothesis in the paper were confirmed. There are statistically significant relationships between the factors of the effective leader and the ethics of the leader. The main conclusion of the research is that the paradigm of leadership is misrepresented. We do not need a broad range of leadership programs and mass leadership leadership, but excellent leaders. We do not need development of leadership, but the formation of excellent leaders.

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IMPROVEMENT OF THE EDUCATIONAL SYSTEM OF SERBIA BY APPLYING ITL- INTERNATIONAL TEACHER LEADERSHIP RESEARCH AND DEVELOPMENT PROJECT

UDC: 37:[005.322:316.46

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ABSTRACT

The aim of the paper is to explain the concept of teacher leadership and show that leadership can bring innovations to schools and teaching, make teachers' techniques and methods less private, so that the wider community of teachers can enjoy benefits from them. The paper will also look at the ways in which teachers can become efficient leaders and motivate others to do so, which includes various other activities such as teachers' readiness to acquire new knowledge and improve the work practice in general.

Key words: leadership, education, teacher, school quality

INTRODUCTION

Leadership as a term originates from an English word *leader*, which means the person who leads a group and can be more associated with some kind of high position such as director, manager, or any person who is on a position that implies a certain authority or power. However, leadership as a term in modern and innovative education systems primarily relates to teachers and their professional work and impact on other teachers and colleagues in the school. By applying leadership techniques in teaching, a teacher who is familiar with this practice or concept can effectively transfer its knowledge not only to students, but also to other teachers and associates of the school, and encourage innovations in teaching, which constitutes the basic idea of the leadership concept. The teacher leadership as relatively underdeveloped practice and incomplete concept has plenty of opportunities and potentials, and its proper implementation can also have an impact on the school reforms, and, of course, the entire educational system.

TEACHER LEADERSHIP CONCEPT

It is well known that the teacher is not only a lecturer or person who works in school and teaches a particular subject. The global development of science and educational system and, consequently, the development of schools, are constantly increasing the duties of teachers. The old school teachers were mainly responsible for teaching one subject and maintaining the classroom discipline in all possible ways. The use of physical punishment served the purpose for which today the student motivation and encouragement are used to inspire them to learn and explore on their own. The old school teachers were not strictly obliged to work on professional development, as the university degree served as sufficient proof of the teacher's professional qualifications and practically permanent efficiency of the professional work practice.

However, during the time, the emerging development of science and technology resulted in the development of teaching methods. The development of the teaching methodology led to a gradual increase in the work duties of all teachers and some of the activities that were previously elective or only recommended, eventually, grew into the work responsibilities. Therefore, in today's schools, teachers have a duty to constantly improve and monitor the development of the profession. Instead of focusing on punishing students or forcing them to learn and regularly attend the classes, teachers in today's schools are obliged to motivate and interest students in teaching, independent research and further education by applying modern and innovative teaching methods. This promotes a proper attitude towards work and encourages students' curiosity about the particular subject, which of itself creates a pleasant atmosphere and, of course, discipline in the classroom. In this manner, the student punishment is reduced to a minimum and is applied only in cases of extreme necessity and as the time goes by, the use of punishments evidently decreases and the punishments are considerably softened. If this trend continues, the student punishment can be abolished.

Therefore, motivation has proved to be very effective even after the secondary school education, given the fact that effective motivation awakens the desire and motivation in students to continue their education at the faculties. This also has positive impact on the future business life of children, and in the future, they will be diligent workers who will conscientiously perform their work duties.

Apart from motivating and educating students, teachers are also obliged to cooperate with parents of students, other teachers and school management. They are obliged to take part in different school projects and cultural and educational school events. One of the most important duties of the teacher is monitoring of the profession or professional development. This obligation certainly deserves to be among the top responsibilities of teachers, as it brings a number of advantages that can be useful both for the teachers and students and other colleagues as well.

The logical question is - how can this be accomplished and can this type of motivation be applied to adults? A brief answer to this question can be found in the definition of the teacher leadership. Danielson (2006) defines the teacher leadership as a set of teacher's skills as an efficient lecturer, who, by means of effective motivation, positively model the working practices of other teachers. In today's schools, the cooperation with other teachers occupies a high position in the list of jobs of each teacher. The working practice of teachers has long been, and sometimes even today, a relatively private matter. This actually means that every teacher has taken care of his/her own working practice, and the rest did not have any kind of insight into his/her work, and in this way no party received benefits from the other. The teacher leadership concept aims to eliminate this barrier by encouraging teachers to share their experience and advice with other colleagues and entire community of teachers in the world through papers. "Leadership in its true (essential) sense is a turning point in the organisation that makes it able to stay competitive in a constantly changing environment. Leading an organization means directing, communicating with collaborators about common goals, motivating and inspiring. Leadership should create a leadership culture in the organisation and drive the process of learning through challenges". (Andevski, 2007:79)

The very idea for the concept that is today known as leadership is not so much new. In fact, the idea is more than 50 years old. Silva et al. (2000) explain the history of leadership in three stages:

The first stage, which is more than 50 years old, was the stage of teachers as managers. The teachers served as department heads, master teachers, supervisor teachers or representatives of unions or school associations.

The second stage in the history of teacher leadership emerged as a response to the aforementioned problems of the lack of mutual teacher collaboration and removal of teachers with authority from the classroom.

The third stage appeared in the early 1990s. Most of the elements of this stage can be found in today's modern leadership concept under the leadership of David Frost at the University of Cambridge.

Therefore, based on the above, we can conclude that the term teacher leadership relates to school teachers, and not directly to the director, pedagogue or school administration, and its original form does not imply any role of an official.

We can conclude that the teacher leader can be any teacher who meets the above conditions, and it certainly does not have to be just one teacher, but an indefinite number of them in each school. Leadership is also very grateful because it does not recognise any gender, racial, religious or any other kind of discrimination - an effective

teacher leader can be any teacher who is ready to acquire knowledge in this field and dedicate his/her work and efforts to leadership.

Another positive feature attributed to the teacher leadership is the fact that it can positively affect teachers in the long run. When we compare leadership with some higher position in the school, for example a manager or director of the school, then quality leadership definitely takes precedence, having in mind the fact that without the management support there are no conditions for the efficient functioning of leadership.

It has long been proven that a successful school director with quality management and organization can improve the overall academic level of the school, and in this way, positively influence and motivate students and teachers. However, the director's term of office is limited to four years (or eight, if re-appointed), and the leadership has no term of office.

When we take into consideration the fact that most teachers spend the longest part of their careers in the same school, which can be up to 30 years, the logical conclusion we can draw is that the leadership in this case has considerably greater advantage. The quality leadership can positively influence other teachers in the school during the entire career. It would be highly desirable to include teacher motivation to become effective leaders in the duties of the school director.

Although the school director's tasks as a manager differ from the tasks that the teacher leader should perform, these two functions can be combined to achieve an especially effective system of school progress. The director can use his/her managerial function to motivate and encourage teachers to commit to leadership in teaching, so the director can contribute to the creation of new leaders. In addition, all the characteristics of an effective teacher leader can help the teacher in gaining better marks when it comes to the annual evaluation of his/her work, and certainly in the professional development and gaining the title of mentor and advisor.

Although leadership has not yet been accepted as an official way of teachers' advancement in the school and there is no official title of a teacher leader or special purpose reward for this purpose, this should not certainly discourage teachers from taking the initiative for innovation. York-Barr et al. (2004: 255) encourage teachers to commit themselves to leadership, stating that the regular teacher collaboration at school and frequent suggestions for the introduction of novelties in teaching creates mutual trust among all workers in the school, thus speeding up the implementation of innovations in the teaching and education system in general. The leadership has generally shown positive results in the current research, and it is a matter of time when it will become a teacher's work duty, and certainly there is a possibility that leadership will once become an official form of professional development of teachers, which includes the possibility of increasing salaries and similar rewards for teachers.

Bryk & Schneider (2003) note that the trust is the basis for giving teachers any kind of authority and power. According to the opinion of these authors, the teacher becomes more efficient as he/she earns trust from other colleagues. Here, the communication skills or the ability to interact with others in a few short sentences and suggest an idea or innovation are very helpful to teachers. For more information on this topic, see Characteristics of Teacher Leadership.

> *"The previous researches have shown that there are a large number of teachers who want and can become effective leaders"* (Danielson 2006).

Goddard (2001) argues that a teacher who believes that his colleagues are able to behave in a way that will positively affect students' learning at school indicates a very high level of collective efficiency.

Thanks to the positive results of researches on the concept of leadership, many countries have begun to introduce various innovations in schools that will provide teachers with additional opportunities and motivation to become successful leaders. Here we speak about the gradual introduction of leadership on an experimental basis, or some kind of prototype. This is particularly pronounced in the United States of America, especially in Kansas, Illinois and Louisiana. Here, the concept of teacher leadership is considered the way in which one teacher transfers his/her knowledge and advice in the form of instructions to other teachers (Instructional Support for Fellow Teachers).

In Louisiana in 2004, a full system for the advancement of teachers was formed in order to enable them to gain the title of a leader. Here, the leadership concept was introduced into the way of professional advancement of teachers in elementary and secondary schools, which is regulated by the law. The teacher leadership

advancement is divided into four levels, where the teacher is enabled to reach the third and the highest level from the lowest i.e. first level. Considering the fact that leadership has not yet been introduced globally, there is a possibility that this regulation will be amended (www.selu.edu).

To introduce this program, we do not need any major reform of the educational system due to the fact that we have mentoring and counselling as a form of professional development and it would be desirable to introduce leadership as a form of additional title in the teachers' career. Therefore, it would be wise to initiate this kind of innovation in our education system, because it brings mostly positive effects. Time will tell us if something similar to this Louisiana program will be introduced in our country.

In some US states, there are suggestions that teachers, who reach the high or highest level of leadership, should be given an opportunity to assume a role similar to the school director. In this case, the teacher leader would be entitled to evaluate the work of other teachers with lower professional qualifications than a leader. By accepting this role, the teacher would have a reduced number of classes and would spend less time in the classrooms. However, this idea has not yet been implemented. Goldstein (2010) states that it is still early to implement something like this and adds that unions are still sceptical about this idea.

Goldstein is certainly right, because if we give teachers the role of a school director or assign them with some sort of managerial work, and reduce the fond of hours, then we are moving one very efficient leader away from the classroom and make them one step closer to the office. This is maybe useful for directors, especially if they are overloaded, but it is not so useful for students and other teachers. An effective teacher leader certainly needs to spend his/her working hours in the classroom, which is also the place where he/she can best apply his/her skills. As far as the motivation to maintain the professional title of the leader is concerned, it would certainly be appropriate for teachers to increase the base for the calculation of salaries as long as they successfully maintain that title. When we combine benefits such as higher salaries and the possibility of further advancement, then we can say that we have sufficient grounds for quality motivation of teachers to engage in leadership.

The United States and Great Britain are currently the most active countries in the research and implementation of the leadership system. Prof. Dr. David Frost at the University of Cambridge has launched a research project that is exclusively focused on the research and elaboration of leadership in teaching. The research involves teacher-practitioners, professors from different universities, ministry staff and other state authorities. One of the goals of developing leadership techniques is to create an effective computer program that will help teachers and facilitate the progress towards an effective leader. The project also arrived in Portugal and in some countries of Southeast Europe, and began work in New Zealand. For more information on this topic see the ITL Leadership Research Project.

> *"Sharing power and authority with teachers through decision making and shared leadership increases leadership capacity and builds a belief in the school's collective ability to affect student learning".* (Olivier and Hipp 2006:517)

Usdan et al. (2001) state that teacher leaders are needed in all schools, not only to be effective teachers for students and advisers to other colleagues, but they are also important for establishing collegial relationships among teachers, for creating a "bridge" or link between the teachers and school director. This option is even more preferable than the above, which suggests giving teachers authority of the school director, which was also discussed by Goldstein. Usdan's idea is very effective, as it does not suggest in any way the removal of teacher leaders from the classroom, but simply puts emphasis on teacher-director cooperation, which in itself opens the door for proposing and introducing innovations at the school level.

ITL- INTERNATIONAL LEADERSHIP RESEARCH PROJECT IN THE NEIGHBOURING COUNTRIES

As mentioned earlier, ITL is an international teacher leadership research project initiated by Prof. Dr. David Frost at the University of Cambridge. The ultimate goal of this research project is the implementation of leadership in educational systems around the world. The project is still in the test phase or in the test and research phase. What is of particular importance for the Balkan countries is the fact that the project has reached our regions, in particular Serbia, BiH, Croatia, and Macedonia. As for other European countries, the project has also arrived in Romania, Spain, Portugal, Turkey, Greece and Moldova. The basic idea that guides the project is the fact that the improvement of the quality of learning and teaching depends on the teacher's initiative.

In the beginning, the rule was that every country involved in this leadership project must actively participate in the research and improvement of the leadership concept in at least three schools. This number quickly increased. Initially, some school directors were sceptical, believing that the concept of leadership had the potential to jeopardize their authority and that leaders would have higher authority than the directors, and therefore, they had bad prejudices about leadership.

However, many countries interested in leadership welcomed this concept with a great deal of understanding and strong support, and it received different euphemisms with a positive connotation. For example, in Turkey we have a program called "Teachers for the 21st Century", "Club of Active Teachers" in Bulgaria, and "Teachers of the Future" in Montenegro.

The InForm XII also describes four activities that are based on the teacher leadership approach:
1. Take the initiative in order to bring innovations to the teachers' working practice,
2. Influence changes together with other colleagues,
3. Collect and use materials together with other colleagues,
4. Expand professional knowledge of teaching work.

When we talk about innovations, most will have in mind the general introduction of something new in the classroom. The innovations do not necessarily mean the introduction of something completely new. The innovations can involve upgrading or modifying something already existing. Even today, some teachers claim to see themselves as a person without a vote, or that their voice inside the school is not heard enough to directly influence innovations and educational reforms.

Bangs and Frost (2011) claim that the system environment can be blamed for this and as a result, many teachers are and remain invisible. Although many teachers certainly have innovative and creative ideas that could undoubtedly contribute to the entire education system, such teachers are missing "something"; they are missing a means or medium that would allow them to break glass with their voices and draw attention to the ideas of these teachers. If these teachers do not take advantage of their leadership skills and creative capacity in teaching, we can consider this as a great loss for education, because that teacher may have an idea that many others would support and which would later have great chances to pass the implementation at the state and global level.

David Frost calls the teachers, who due to the lack of means to spread their voice do not see or hear, the ghosts. The leadership will certainly help these teachers to hear their voices and thus contribute to the development of innovations and reforms in the education. We can compare this with African Americans who in the 1960s began to use various kinds of music, primarily rap music, as a means of expressing their ideas and attitudes, and before that, similar to some of today's teachers, they were invisible and their voice could not break through. The leadership will allow these teachers to receive the same thing the African Americans received with the music.

> *"The simplest definition of innovation for professionals in the education service is: 'doing things differently in order to do them better".* (Hargreaves, 2008)

The question is how leadership can contribute to creating innovations at schools? First of all, the obvious thing is that leadership itself is an innovation in education, and its permanent implementation will introduce an effective innovation in education. Nevertheless, here we talk about innovations that leadership brings and how the teacher leader can use this title effectively for the purpose of proposing and creating innovations. One way is certainly the use of the authority acquired to propose novelties at sessions and other meetings such as teaching staff meetings. By introducing leadership in the education system, it is likely that the leaders' sessions will be introduced and these sessions will be attended by more leaders and the proposals for school innovations and changes will be made. Furthermore, if a teacher becomes a leader, then he/she probably has some authority and trust built among the colleagues, and the others will surely listen to him/her when he gives specific proposals for innovation.

If several leaders vote for an innovation, they can, thanks to their authority and trust of other colleagues, influence other teachers who can support their proposal, so that it is easier to reach a quorum and increase the chances of accepting the proposal.

In one comprehensive study, DiRanna and Loucks-Horsley (2001) found that many teachers who have the will to take initiatives and influence the introduction of innovations and reforms in the education have several common characteristics. One of the main desires and convictions is that they can bring changes and innovations through the authority they receive with leadership.

Joint action with respect to changes involves the engagement of all teachers in as many activities focused on progress and innovation in teaching. One teacher, although willing to take the initiative and influence positive reforms in education, cannot accomplish much on his/her own. The aim is to involve as many teachers as possible in the leadership and thus jointly raise the school to a higher academic level. The same thing applies when it comes to collecting and using work materials. This involves sharing textbooks, tests, worksheets, and similar materials with other colleagues. Additionally, keeping colleagues informed about the seminars or any lengthy events for professional development is also included in the leader's list of tasks. The sharing of professional knowledge refers to the exchange of experience and advice with other teachers. This is also a primary idea of leadership that integrates the entire leadership concept.

The efficiency of the collective plays one of the key roles when it comes to effective leadership. Angelle et al. (2011) explain that leadership can only function if the school has three functional elements:

- Trust,
- Collective efficiency,
- Leadership scope.

The research was carried out by several professors at the University of Tennessee and the aim of the research was to calculate and measure the correlation or degree of correlation between leadership, efficiency of the collective and mutual trust of teachers. The Pearson's correlation (r) was used for the calculation. The correlation was calculated for each of the above three elements in comparison with the other two elements. The calculation revealed the following:

- Correlation between the efficiency of the collective and leadership: $r(166) = .59, p < .01$
- Correlation between the trust and leadership: $r(166) = .50, p < .01$
- Correlation between the trust and efficiency of the collective: $r(166) = .68, p < .01$

Based on the above results, we can conclude that there is a significant correlation and connection between these three elements and it is important to pay attention to their improvement and maintenance, in order for leadership to be even more functional.

The International Leadership Project has achieved very good results in Europe. It has left a particularly good impression and motivated our teachers and teachers in other European countries who are involved in the project. On this basis, we can highlight some of the positive comments of different teachers who participated in this project. The reports were published in the 12th edition of InForm 2011.

LEADERSHIP AND EDUCATIONAL SYSTEM

The fact that the introduction of leadership does not require a major reform of the educational system offers an additional relief. Leadership can be practically implemented in the educational system immediately after the end of the test phase, which is currently in progress, and this indicates that the leadership will soon become a practice in many educational systems around the world. As mentioned above, it can be incorporated into an existing system or can serve as a substitute for an existing system for advancement and promotion, in which case the title of mentors and advisors would be abandoned. This second option seems unjust for teachers who have put their work and effort to acquire these titles. There is also the possibility to introduce the way in which the teachers, who are already advisers, keep those titles until retirement, and that young teachers immediately start training for leaders. However, since we already have professional development programs for mentors and advisors, it is much more effective and convenient to maintain existing programs and combine them with leadership. In this way, the title of a leader will be gradually gained, which is much more natural and requires that the teacher is constantly engaged in gaining this title. After all, gradual acquisition is also the basis of the whole education system: elementary school - secondary school - faculty education - postgraduate studies

Another barrier in our area is the lack of motivation in young teachers who are employed for a definite period, and older teachers who are retiring. Namely, in our region, for several years (from 2005 until now), there is a practical impossibility of establishing an employment for an indefinite period. In America, a new term *part-time generation* was formed for today's young intellectuals who are in this situation. The work of young teachers is not evaluated at the end of the school year, although the rules on teacher evaluation and advancement do not prohibit this. Also, they do not have the opportunity to advance to the position of mentors and advisors until they have a permanent employment relationship.

Another thing we would like to mention about the implementation of leadership is defining the rules for gaining the title of the leader. To gain this title, the Louisiana Educational Leadership Certification Structure can be used as a good example. Of course, the goal is not to simply copy these rule, but to use them as a template, basis for creating our own rules. Since leadership is still in the research process, there is a possibility that the rules will be defined on two levels, both globally and nationally. The global level should cover the basic rules for gaining leadership that would be the same throughout the world. The state level would be unique for each state and would be adapted to the educational system of a particular state and related to the further development of leadership, something similar to the second and third level of leadership foreseen by the Louisiana leadership leader. The test for gaining this title, in oral or written form, should necessarily cover fields such as teaching methodology, leadership styles, school management, pedagogy, didactics, psychology and sociology. The reason for this is the nature of leadership that brings together the above-mentioned areas into one unit whose knowledge is necessary for every future teacher leader.

CONCLUSION

Before the leadership system is officially implemented in schools and introduced as an opportunity for professional advancement, it would be desirable to make some form of preparation or training for teachers on how to become an effective leader and what advantages it brings. This can be achieved in several different ways. One very efficient way of doing this would be the integration of the leadership into the curriculum of faculties at which the title of teacher or professor of a particular subject is acquired, and could also be introduced as a separate subject within the study. For example, we can introduce leadership in teaching in the third or fourth year of studies, as part of didactics or methodology. In this way, the motivation for leadership would be early awakened in the youth, and efficient teachers would be created. It is also possible to organize various lectures, workshops and seminars on this topic.

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Session C: MARKETING AND MARKETING MANAGEMENT

Papers (pp. 183-226):

IMPACT OF SUPPLY CHAIN MANAGEMENT ON BUSINESS PERFORMANCE

UDC: 658.7:005

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ABSTRACT

This paper addresses supply chain management and its impact on business performance. A theoretical analysis is conducted. A large body of literature in the domain of supply chain management was investigated. The goal is to present how much does supply chain influence affect business performance. This theoretical review approaches supply chain management in a qualitative manner, defining the performance metrics of supply chains, and their impact on companies' business. There is no statistical data, thus the results are presented in the form of propositions. The findings of this paper moderately contribute to the literature in this domain. Furthermore, the paper concisely presents the key points of supply chain management, and business performance. In addition, the importance of sustainable supply chains is described. The results indicate that sustainability is important for lower costs, and for regulating social, and environmental issues. Additionally, the results suggest that an effective supply chain management has a positive impact on productivity, customer value, and product quality.

Key words: supply chain, management, business performance, sustainability

INTRODUCTION

Supply chain management was thoroughly discussed by many authors. Early research of Christopher (1992) described supply chain management as a network through which organizations distribute resources with the goal to create, and deliver value to the consumer. Logistics, and supply chain management are extremely valuable and play a huge strategic role in business development. These two concepts evolve through time. Companies create alliances and integrate more efficient transportation routes, and methods (Meade, & Sarkis, 1998). These alliances contribute to lower supply costs, and higher productivity. Distribution channels that are well developed are crucial for efficient supply chains.

Another important concept is sustainable supply chain management. This concept includes the traditional approach to resource distribution, but also takes into consideration the social, and natural aspects of supply chains. Similarly, in the research of Seuring, and Müller, (2008) it was pointed to the importance of sustainable supply chain management regarding environmental issues. However, achieving sustainability in a supply chain is not an easy task. It is necessary to include all the members of the supply chain, and every distribution channel. Certain standards have to be met, and a strict quality control system has to be established. Without a sustainability, it is difficult to establish long-term strategies, and the cost of supplies is higher.

In this paper a concise theoretical review of supply chain management influence on business performance is conducted. As mentioned before, supply chain management has a strong influence on

business performance. This is also confirmed by Kannan, and (2005) who conducted a thorough research in the domain of just-in-time, total quality management, and supply chain management. In this paper supply chain is described through various constructs. In addition, the importance of sustainable supply chain management is addressed. Next, the impact of supply chain management on business performance is investigated.

The main goal of this paper is to provide a brief insight on supply chains. The concise nature of the review gives a clear picture of the significance that is supply chain management. The paper is split in two main sections. First, supply chain management is reviewed. Second, the impact of supply chain management on business performance is analyzed. A large number of literature is analyzed in the domain of supply chain management, strategies, and sustainability. The results of analysis are further presented through propositions.

SUPPLY CHAIN MANAGEMENT

In the research of Chen, and Paulraj (2004) supply chain management was described as planning, controlling, and distributing materials, and information between companies. These activities also include internal, and external logistics. Supply chain management is often viewed from two different aspects: purchasing, and supply management; and transportation, and logistics management (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006). In the research of Attaran, and Attaran (2007), it was noted that good supply chain performance has significant strategic value, and results in fast returns of investment, higher productivity, higher profits, better product quality, and overall good long-term relationships with suppliers. Further, supply chain management can be presented through the following dimensions (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006):

- Supply chain management activities. Includes all the activities of a company that are focused on promoting their effective supply chain management system.
- Customer relationship. This includes overall customer relationship management, and is focused on building long-term relationships with customers, increasing customer loyalty, and improving customer satisfaction.
- Information sharing. This refers to the intensity, and effectiveness of information distribution in the supply chain. This type of activity can be strategic, or tactical in nature. It is necessary to develop, and maintain an efficient information sharing system, in order to minimize risks from failed deliveries, misplaced deliveries, and low productivity of workers.
- Activity postponement. This can presented as moving an activity, process, task, or task to later part of supply chain, thus effectively postponing the activity or activities, in order to synchronize processes, evaluate process status, or improve overall productivity.

The main performance metrics of supply chain management include total supply chain cycle time, and cash flow time; customer query time, and perceived value; net profit, and productivity; investments return rate; range of products, and services; efficiency against industry norms; delivery lead time, and performance; product development time; planning time; customer service; booking procedures, delivery reliability; distribution effectiveness; cost per hour; total inventory cost; rejection rate and quality of products, services, and documentation (Bhagwat, & Sharma, 2007). In the research of Li, Ragu-Nathan, Ragu-Nathan, & Rao, (2006), there are three supply chain management degrees described. These are direct supply chain; extended supply chain; and ultimate supply chain. The direct supply chain includes the supplier, the company, and a customer. Extended supply chains also include suppliers of suppliers, and customers of customers, through an immediate relationship. Ultimate supply chains included all the companies that are distributing products, services, information, and other resources from suppliers to the customers.

Furthermore, in the modern economic era, and dynamic business environments, supply chain management faced new challenges in the domain of sustainability. Unsustainable supply chains are prone to critical failure, or lower productivity, and higher costs. New nature preservation oriented regulations created an environment, where a sustainable supply chain becomes a necessity. This issue

was analyzed by Pagell, and Shevchenko (2014), and it was discussed that even though companies, and organizations overall, are using, and utilizing sustainable supply chains, this sustainability is not real, and its goal is to survive. Therefore, supply chains often change practices, and even business models, in order to achieve adequate performance (Pagell, & Shevchenko, 2014). In accordance with the described constructs, dimensions, and notes of the previous research, the following propositions are suggested:

Proposition 1: *Supply chain management is a complex construct that includes various metrics through which the efficiency of the supply chain can be observed.*

Proposition 2: *Sustainable supply chains are becoming an imperative for creating value for companies, and customers, and in the same time preserving natural resources.*

SUPPLY CHAIN MANAGEMENT AND BUSINESS PERFORMACE

According to Li, Ragu-Nathan, Ragu-Nathan, and Rao (2006), the short-term impact of supply chain management is increased productivity, and reduced inventory, while long-term impact is manifested through increased market share, and higher profits for the participants in the supply chain. In the early research of Cooper et al. (1997) supply chain management was described as a set of beliefs that companies' performance is directly or indirectly influenced by other participants and elements of the whole supply chain. Further, the performance of the supply chain is also affected by the business decisions, and actions of the companies who are in the supply chain.

Pioneer findings of Porter (1985), noted that the main benefits of supply chain management, regarding business performance, are quick response strategy development, cost leadership, and business differentiation. Further, customer relationships impact supply chains, and supply chains impact the value that is created for the customer. Business performance is inside this circle, where suppliers, companies, and customers co-exist with the goal to improve one-another in the form of increased productivity, lower cost, and higher received value. The research of Kannan, & Tan, (2005), investigated the link between just-in-time, total quality management, and supply chain management, and their impact on business performance. The results indicated that these three concepts can be implemented together at an operational level, with the focus to create value. In the same research, it was described how supply chain management has a positive impact on creating value for customers, and product quality. In Table 1, the impact of supply chain management on business performance from various credible sources, is presented.

Table 1: Supply chain management and its impact on business performance

#	**Authors**	**Impact**
1.	Tan, Kannan, Handfield, and Ghosh (1999)	The research indicated that supply chain management alone cannot improve market share, and profitability. However, supply chain management provided a good framework for an effective marketing strategy.
2.	Reck et al. (1992)	Supply chain management is emphasized as a basic strategic process for business development, rather than just a support. This indicates that an effective supply chain positively influences business performance.
3.	Tan, (2002)	Poor supply chain performance creates a great risk from passing corporate secrets to competitors, and lower operation efficiency. However, supply chain management is important to deliver products, and services to the external and internal customers, effectively, and in a timely manner.
4.	Kannan, and Tan, (2005)	It was noted that supply chain management contributed to operational performance by increasing productivity, and resource allocation.

#	Authors	Impact
5.	Agus, and Shukri Hajinoor (2012)	In this research lean production supply chain was investigated. The findings indicated that lean supply chain management is strongly, and positively correlated to productivity, and overall business performance.
6.	Qi, Zhao, and Sheu (2011)	The research argued that the impact of different supply chain management strategies is different for every business environments. It was noted that through an effective supply chain management system, new product development is more efficient, thus creating a competitive advantage on the market.
7.	Martínez Sánchez, and Pérez Pérez (2005)	The research suggested that flexible supply chains increase business performance, and improves process flexibility.

Based on Table 1, it can be seen that effective supply chain management has a positive impact on business performance. Therefore, the following propositions are suggested:

Proposition 3: Effective supply chain management has a positive impact on business performance.

Proposition 4: Different supply chain strategies are necessary for different business environments, in order to reduce the risks of high costs, and slow deliveries.

CONCLUSION

The theoretical review, and analysis of literature gave insight to supply chain management, and its impact on business performance. It can be concluded that effective supply chain management has a positive impact on business performance. However, there is difference between various environments, thus supply chains have to be chosen accordingly. The majority of the analyzed literature suggested that in a modern business environment, a good, stable supply chain is necessary for survival on dynamic markets. In addition, supply chain management has to address the issue of sustainability. Social, and environmental issues affect supply chains, forcing them to develop more efficient strategies, distribution channels, resources, and lower overall waste in the supply chain. Sustainable supply chains are prone to new regulations on the market, therefore, it is necessary to address every internal, and external aspect of resources, and the source of raw materials.

Limitations of this paper are lack of a systematic approach to specific supply chain performance metrics, and a thorough quantitative approach to business performance metrics. However, the concise nature of the paper provides a good basis for future research in the domain of supply chain management. It is recommended for future research to obtain more data from credible sources. Further, a systematic review should be conducted. In addition, a meta-analysis of multiple statistical data from other literature in the domain of supply chain management is suggested. As a result a broader picture can be obtained, and further conclusions can be drawn.

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THE ANALISYS OF IMPLEMENTATION OF MARKETING CONCEPT IN SERBIAN COMPANIES

UDC: 339.138(497.11)

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ABSTRACT

Global markets and modern business conditions require from companies to change their business philosophy and ways of behaviour in their business practice. Relationship marketing signifies a considerable advance in marketing approach, going from thinking exclusively about competition and conflict categories towards the categories of collaboration and interdependence. Serbia companies are facing problems with achieving competitive abilities on global markets and one of significant causes of this phenomenon is inappropriate implementation of marketing concept and modern methods and techniques of marketing management.

Key words: marketing, competitiveness, global market, management, relationship marketing

INTRODUCTION

Business environment has been changing permanently. The causes of these changes can be found in intensive technological development, the changes in competitive relations in the late 90s and in the effects of the World economic crisis from 2008. According to Kotler (2009), the fact is that we are entering the new era of turbulence. Turbulence is a new normality. Stability is disappearing and the possibility of predicting events is decreased, so the society is exposed to the action of forces that caused the turbulence. Business turbulence assumes unpredictable and fast changes in internal or external environment of business organizations which affect their organizational structure.

International economic relations are globalized. The world is becoming one market. According to some authors (Acharol & Kotler, 2012), globalization is continuing feverishly with implacable tempo. The countries such as China and India, along with enhancing the consumption base, are competing with developed world countries. Nations like China and India with expanding consumption bases are racing ahead to economic prosperity. "Climate change, terrorism and globalization are the three most significant challenges to civilization as we know it" said Indian Prime Minister Narendra Modi at the World Economic Forum Annual meeting 2018 in Davos (WEF Annual meeting 2018). According to Indian Prime Minister, "everyone is talking about an interconnected world, but we will have to accept the fact that globalization is slowing losing its luster. The forces of protectionism are raising their hand against globalization. The solution to this situation is not isolation, the solution is in understanding and accepting changes".

The main consequences of market globalization are increasingly aggressive competition on the global level and the danger caused by narrow market identification. Global competitiveness is becoming more intensive. President of China Xi Jinping on World Economic Forum Annual meeting 2017 said: "There is no point blaming economic globalization for world's problem. Problems troubling the world are not caused by economic globalization ", (WEF Annual meeting 2017).

Market globalization has affected the changes in understanding and achieving competitive advantage. According to Porter (2007) three primary ways to companies to achieve a sustainable advantage are cost leadership, differentiation and focus. International business practice has proved that there is a correlation between the improvement of the management methods and techniques and establishment

NEW MARKETING MODEL

Global competitiveness is moving from the price level and technical innovations towards knowledge management and innovations in the field of management and marketing. Brooks and Little (1997) defined a new model of market performance marked as *relationship marketing* while they were studying *market* appearance of enterprises in new, global circumstances. This model is based on:

- Database Management,
- Interactive Marketing Communication and
- Network Marketing.

Marketing based on Database represents an organized set of data on individual customers, current or potential ones, including geographical, demographic, psycho-graphic data, as well as the data related to behaviour during the consumption process. Database is used for locating potential customers or clients, as well as for creating targeted marketing communication and sale efforts. Interactive marketing represents a set of interactive relations, mostly at the level of personal communication, aided by Information Technology. Network marketing represents a set of connections and relations, mostly of strategic nature both at personal level and the relationship level among enterprises. It is most often about making strategic alliances and partnerships among the enterprises belonging to a particular branch.

This model starts from a strategic focus on customers and the relations and links originated from customers' requirements in relation to an organization, and it finishes by the analysis of customers' loyalty and satisfaction as an integral part of permanent mutual relationship building up. The clue for understanding this pattern is in creating a set of relationships between an enterprise and its environment.

Relationship Marketing signifies an important paradigmatic step forward in marketing approach, going exclusively from thinking in competition and conflict categories towards thinking in the categories of interdependence and collaboration, (Đorđević at all, 2017). It recognizes the importance of different partcipants – suppliers, employees, distributors, dealers, retailers, who collaborate in order to deliver the best value to targeted customers.

Global market, burdened by fast changes, creates a strong competitive activity. Kotler (2009) speaks about the phenomenon of hyper-competitiveness, that assumes such market conditions in which technologies and offer are totally new, the standards and rules are becoming fluid and they cause competitive progress that is impossible to be stopped. Hyper-competitiveness is characterized by fast competitive progress and therefore competitors have to build new advantages in a short period of time in order to be better than their rivals. In hypercompetitive conditions the application of standard marketing methods and techniques cannot give appropriate business results. This is even more significant in big and inert international corporations burdened by unnecessary administration and bureaucracy whose productivity is not able to follow global trends.

Traditional strategic approach implies a hypothesis according to which managers can predict future market trends precisely enough to choose a clear strategic direction just by using the set of analytical tools. In order to avoid the influence of market turbulences Kotler suggests the application of a management system called Chaotic, (Kotler et al., 2009). According to Martinović (2009), the Management System Chaotic helps managers to reconsider the whole approach to management and marketing during recession and similar turbulent periods. Moreover, managers have to find a way to develop the system for early warning and identification of the first signs of changes, especially disastrous innovations and shocks. Then, it is important to make detailed, the worst, best and most expected scenarios by using the strategies for facing each of them, to cut costs strategically or to increase productivity, to secure market share in the fundamental consumer

segment, to comprise strategic planning in shorter, three-monthly cycles in order to monitor the company's pulse better and easier so as to prevent potential disastrous consequences of leaving fundamental principles.

Taking into consideration the new marketing horizon oriented by further technological development and permanent changes in the environment, marketing model born in the new millennium is consisted of three dimensions of marketing comprehension: sub phenomenon, phenomenon and super phenomenon (Acharol & Kotler, 2012). A paradigm for the third millennium is 3 dimension marketing model. Marketing seen as sub phenomenon assumes customers' experiences and observation system. Customers feel products and services through their senses and the understanding of sensual experiences is transferred to the level of neurophysiology. In order to be able to follow this trend marketing will have to develop considerably wider basis of theoretical and methodological tools. When we talk about marketing as a phenomenon we must observe that the days of vertical integration between producers and distributors have gone into the past and that nowadays distribution is performed through customers' networks, marketing networks, innovation and production networks. This means that we need rationalization and innovation outsourcing. In the future, the focus will be on micro production systems which will make products to satisfy demand near the very place of consumption. Finally, when we talk about marketing as a super phenomenon we must stress that marketing ought to establish a sustainable model of consumers' society. New business approach implies giving advantage to welfare of the society and customers in relation to welfare of marketing management. The key issues of global marketing will be the issues of sustainability and poverty reduction.

According to Kotler, marketing is moving from traditional marketing to digital marketing. (Krauss 2017). Marketing must evolve as the marketplace and consumers change. Kotler explains the marketing 4.0 is a marketing approach that combines online and offline interaction between companies and customers. Marketing 4.0 is an effort to look at marketing along a different dimension. "We are not dropping traditional marketing. We are blending traditional and digital" says Kotler. Kotler believes that technological convergence will ultimately lead to the convergence between digital marketing and traditional marketing. The role of marketers is to guide customers throughout their journey from awareness to ultimately advocacy. Kotler encourage marketers to focus both externally on the customer and the competition and internally on the enterprise.

Marketers need to adapt to this new reality and to create brands that behave like humans – approachable and likeable, but also vulnerable. Brands should become authentic and honest, admit their flows and stop trying to seem perfect.

GUIDELINES FOR IMPROVEMENT OF MARKETING IN SERBIAN COMPANIES

Transformation of domestic enterprises from relatively undeveloped organizations, from the standpoint of management theory and practice, towards the organizations with developed functions of research and development, quality management and marketing, based on system approach to organization and management, represents the only choice for improving business appearance on the international market. Therefore, a special attention must be paid to implementation of new marketing approaches, both in conceptual and organizational sense.

According to Đorđević at all (2016), Serbia companies must accept this modern marketing concept in their business on domestic market. Domestic companies are still at the level of vertical marketing concept. Marketing ought to be clearly positioned within internal environment of business functions in the enterprise as a function of strategic significance, together with research and development function and quality management function. The stress is on wider acceptance of a new marketing model, characterized by technological development and represented in marketing communication component through the model of integrated marketing communication. New approaches to marketing research and its application in theory and practice represent the reality of modern business and they are the part of the world economy globalization process. Innovations, flexibility and productivity are guidelines for the future development in the field of competitiveness and organizational management. The very essence of the struggle for competitiveness lies in

accepting changes. The future belongs to those business organizations that were the most resourceful, innovative and flexible.

Domestic companies have to get rid of their old way of thinking limited by domestic market, comprehension of business and business experiences (according to the motto "if something is functioning, it shouldn't be changed"). The common approach that the international market is seen as absolutely homogeneous has to be left and furthermore, the international market should be viewed in the light of the most significant international tendencies, structural and technological changes, knowledge innovations with all specific features and local characteristics.

According to the results of the research which analyzed the implementation of modern management techniques in domestic enterprises (Bešić at all, 2013), the following management methods and techniques should be implemented in domestic business organizations so as to improve business efficiency and competitiveness:

- Database Management 18.4%,
- Quality Management System – 17.6%,
- Corporate Social Responsibility – 17.6%,
- Relationship Marketing – 16.8% and
- Benchmarking – 12.6%.

Management methods and techniques identified by domestic enterprises managers as significant for business performance of their enterprises are all based on knowledge. New management paradigm at global level is based on the process of knowledge productivity improvement. Database Management is in fact creating and storing information for the needs of managerial decisions and a piece of information represents knowledge in motion. Quality Management System in its essence involves the need for permanent knowledge productivity improvement, primarily through education for quality. The concept of Corporate Social Responsibility assumes learning about needs and requirements of other interest groups from business environment. Relationship Marketing finally means knowledge management. Marketing is a key instrument for making knowledge more productive. Benchmarking implies a technique of learning on other people experiences, primarily the best ones. It gives the best answers about temporary market position of the organization. The result of this process ought to be the creation of strategic variants for market positioning. Quality Management System, on the other hand, represents the need for permanent knowledge productivity improvement, predominantly through education for quality. Faster and more comprehensive foster from international standards and integrated management systems should be certainly added as well as investing in domestic brands development.

The following general recommendations for improving marketing activities of domestic enterprises are distinguished:

- Necessity for permanent knowledge innovation of all employees, predominantly marketing experts, who should be taught the most advanced world experiences and modern methods and techniques of marketing management,
- Necessity of planning approach to marketing activities,
- Necessity of permanent quality improvement, organization functioning and management innovativeness are imperatives of business performance in modern society.

There are three ways of increasing enterprise's creativity:

- Employment of naturally creative people who would be given freedom in their work,
- Creativity stimulation by means of using a great number of well tested methods,
- Engagement of external experts who would enable the appearance of new, interesting ideas (Kotler, 2004).

The issue of marketing function improvement in Serbian companies is reduced to the issue of knowledge improvement and knowledge productivity. According to Masaaki Imai (2008), one of the greatest practitioners from the field of quality and productivity improvement, every delay in applying

the newest technologies can be as expensive as delay in applying the newest management techniques. Domestic managers have to become efficient and then to make other employees efficient, too.

CONCLUSION

Relationship marketing represents a significant paradigmatic step ahead in the field of marketing theory and practice. It recognizes the significance of different participants – suppliers, employees, distributors, dealers, retailers, who are collaborating in order to distribute the best value to their targeted customers.

The application of modern management techniques is an essential precondition for the success of business in general. Wrong understanding of marketing is typical for transitional countries and developing countries without free markets. To achieve commercial success of the company it needs to have a competitive advantage in the form of lower costs and/or product differentiation, with a long-term strategy of providing products and services of high quality and continuous innovation. Serbia companies have to use global experiences, standards and globally acknowledged business practice in the process of their business internalization. It is therefore, necessary to implement these management techniques that potentiate long-term commitment towards competitiveness, such as marketing, quality management, benchmarking, etc. Domestic companies need experts with thorough knowledge on management and marketing methods and techniques.

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EXPORT COMPETITIVENESS OF RASPBERRY OF THE REPUBLIC OF SERBIA

UDC: 339.564:339.137.2]:634.711

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ABSTRACT

In terms of economic importance, the production of raspberries is the second most important in the group of berry fruit production, after the strawberry production. However, in Serbia, the raspberry production is the most important in the group of berry fruit considering both quantity and value of production. Raspberry is an export oriented product and more than half of the exports are frozen raspberries. High yields in raspberry production and long-term exports to the world market significantly influenced development and intensification of production of this fruit in Serbia. Performances of production and foreign trade of raspberry are analyzed in this paper, with a special emphasis on competitiveness of this production on the world market, as well as on main trade market segments. As the liberalization process has significantly changed market situation in the last decade, in this paper special attention will be paid on influence of free trade agreements which Serbia made on competitiveness of raspberry production.

Key words: Serbia, raspberry, comparative advantages

INTRODUCTION

In Serbia, the production of raspberries, by volume and value of production, is the most important in the group of berry fruit (SORS, 2018). Also, raspberries are one of the most important export product of Serbia. Namely, high raspberry yield, as well as long-term export to the foreign market, significantly influenced the development and intensification of raspberry production in Serbia. The realization of the economic interests of raspberry producers was crucial reason in deciding to invest in production of raspberries and to enter economically profitable business. In order to achieve the criteria for the production of raspberries imposed by the world market, it is necessary to achieve the level of quality and quantity of production. (Veljković et al., 2006).

In the production of raspberries, a high degree of vaporization of comparative natural conditions is achieved. In the foreign market, in particular the countries of the European Union (EU), the demand for frozen raspberries produced in our geographical conditions is increasing. Serbia is a significant raspberry producer in the world, and besides Serbia, large world producers are Russia, USA, Germany, Poland and Chile (Stevanović, Stefanović, Dimitrijević, 2003).

The growth of raspberry production in Serbia is slower than global growth for about 10% (Figure 1). The slowdown in production growth is not really a bad trend if it reflects on the stability of the sector in which the changes are taking place - there was a specialization of manufacturers that gradually

increase production, have contracts and long-term relationships with cold storages, apply good agricultural practice, which is increasingly documented by Global GAP certification. On the other hand, a certain part of the producers who realized that raspberries are not the ideal solution for their income is abandoned or transferred to other production (SEDDEV, 2017).

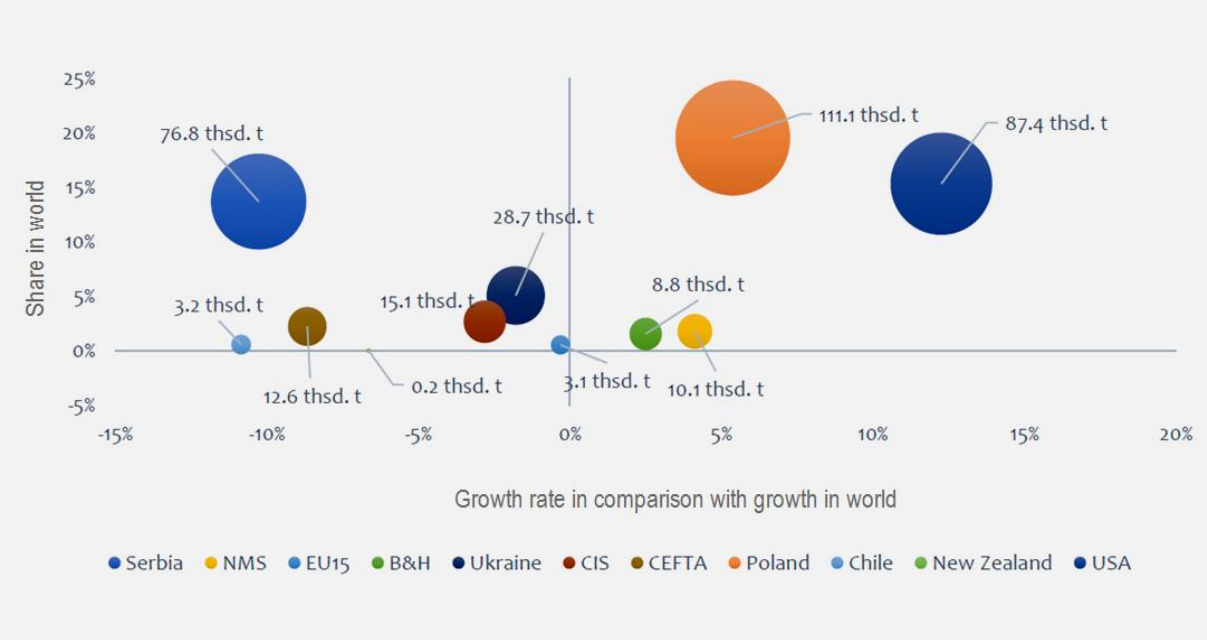

Figure 1: Raspberry production growth in comparison with growth in world in period 2009-2014
Source: FAO, SEEDEV, 2017

Serbia has signed numerous agreements regarding free trade with the aim of integration on the international market and preparations for the EU membership: the Stabilization and Association Agreement with EU countries, the CEFTA Agreement (Bosnia and Herzegovina, Macedonia, Montenegro, Albania, Moldavia, UNMIK in the name of Kosovo), agreements for free trade with the EFTA countries, Russia, Belorussia, Turkey, the USA. An impact of the signed agreements on the range of foreign trade with agri-food products is inevitable, and according to Matkovski, Lovre and Zekić (2017), liberalization of trade has had positive effects on intensification of foreign trade, as well as on the growth of comparative advantage of the agri-food sector on the international market.

The main objective of this paper is to find the level of competitiveness of Serbian raspberry production on international market, as well as on markets of EU and CEFTA countries. In order to reach objective, paper has been organized as follows. After introduction, material and methods are presented. The third section shows the results of analysis of production and export performances of raspberries, as well as levels of comparative advantages. At the end of paper, conclusion is presented.

MATERIAL AND METHODS

The level of competitiveness of raspberries production of Serbia on global market, as well as on the market on EU and CEFTA countries, is determined by indicators based on comparative advantages. These indicators are usually used in economic literature to measure competitiveness of some market segments on international market. Comparative advantage is measured by Lafay Index (LFI) which is set by Lafay (1992):

$$LFI_j^i = 100\left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N}(x_j^i - m_j^i)}{\sum_{j=1}^{N}(x_j^i + m_j^i)}\right)\frac{x_j^i + m_j^i}{\sum_{j=1}^{N}(x_j^i + m_j^i)}$$

where x represents an export, m is an import, i is a country, j is a commodity and N is the number of analyzed items. When this index is greater than 0, it indicates an existence of comparative advantages. The higher index value indicate the higher level of specialization of the given country in trade in given commodity. Similarly, the negative value of the LFI index signals that the specialization and hence comparative advantages are lacking (Bielik et al., 2013).

LFI index is often used for measuring comparative advantages of sector or commodity. In literature, there are a number of papers which determine level of comparative advantages of some sector or commodity in Serbian foreign trade exchange by using LFI index, for example: Ignjatijević and Milojević, 2012; Zekić et al., 2015; Matkovski et al., 2017). According to Zekić et al. (2015) LFI index can provides a more complete analysis of the specific positions of individual products within the foreign trade structure of the country.

For a necessary empirical data for the research, a database of Statistical Office of the Republic of Serbia (SORS) is used. Analysis include foreign trade exchange of raspberries in period 2004-2017, and verifies the change in competitiveness of these products on the international market, as well as on the market of EU and CEFTA countries. Raspberries mean analysis of two products: fresh and frozen raspberries.

RESULTS AND DISCUSSION

In analyzed period the average growth rate of the raspberry production in Serbia was 2.07% (Figure 2). The highest production were in 2016 (113,172 t), while in the last analyzed year it was produced 109,742 tons of raspberries on 21,861 ha. Production area of raspberries also had grown in analyzed period, by growth rate of 5.18%, annually. Production of raspberries is concentrated in region Serbia-South (about 95%), and dominant production area are Arilje and Ivanjica.

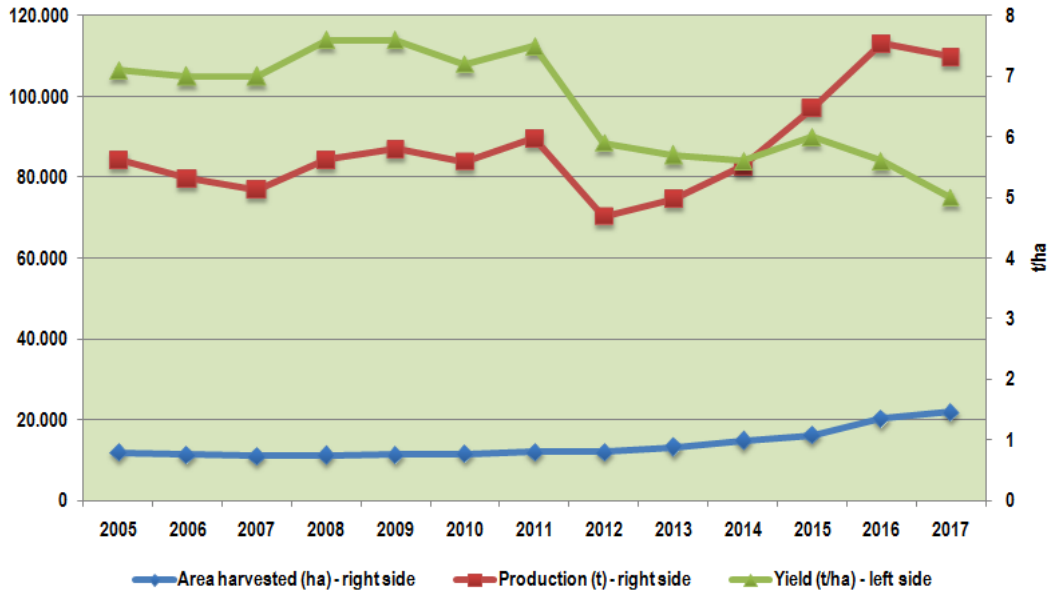

Figure 2: Dynamic of production, yield and harvested area of raspberries in Serbia
Source: The authors´ calculations based on SORS, 2018

In analyzed period 2004-2017, the share of raspberries in the total export of fruit amounted 46%, averagely, so raspberry is one of the most important export products of Serbia (Figure 3). The export had a tendency of growth of 7.76% annually, and the largest value of export was realized in 2015. The majority of export of these products (about 96%) is frozen raspberries.

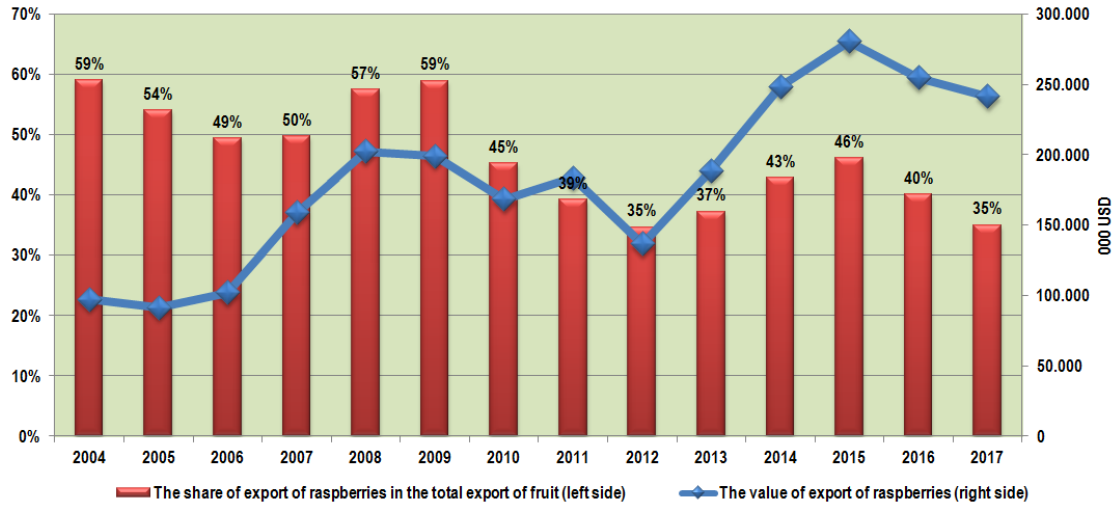

Figure 3: Trends in the export of raspberries of Serbia
Source: The authors´ calculations based on SORS, 2018

The most significant market for the export of raspberries is EU market to which about 92% of the total export of these products has been exported in the analyzed period (Figure 4). Analyzing the regional structure of export of raspberries in EU, it is noticed that largest percentage of these products was exported in Germany, France and Belgium. A significant growth in the export of raspberries has been noticeable on the other countries, primarily on Russian market, as a consequence of the duty-free import for large number of Serbian agri-food products since 2011. Export to the CEFTA countries is on the extremely low level, as these countries are self-sufficient in production of raspberries.

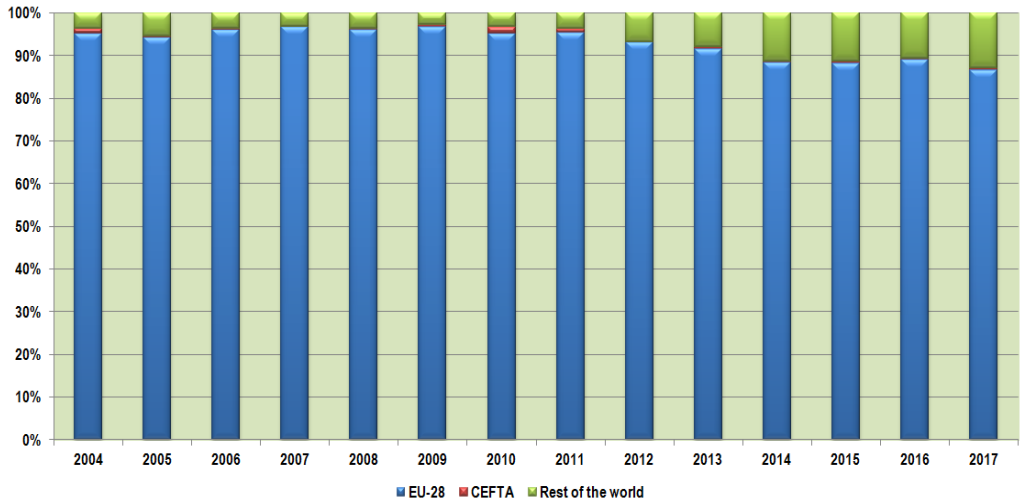

Figure 4: Regional structure of the export of raspberries of Serbia
Source: The authors´ calculations based on SORS, 2018

A positive foreign trade exchange balance of raspberries was realized in the all analyzed years (Figure 5), except for CEFTA countries. As the main export market is EU, the biggest positive balance of raspberries was realized for EU countries.

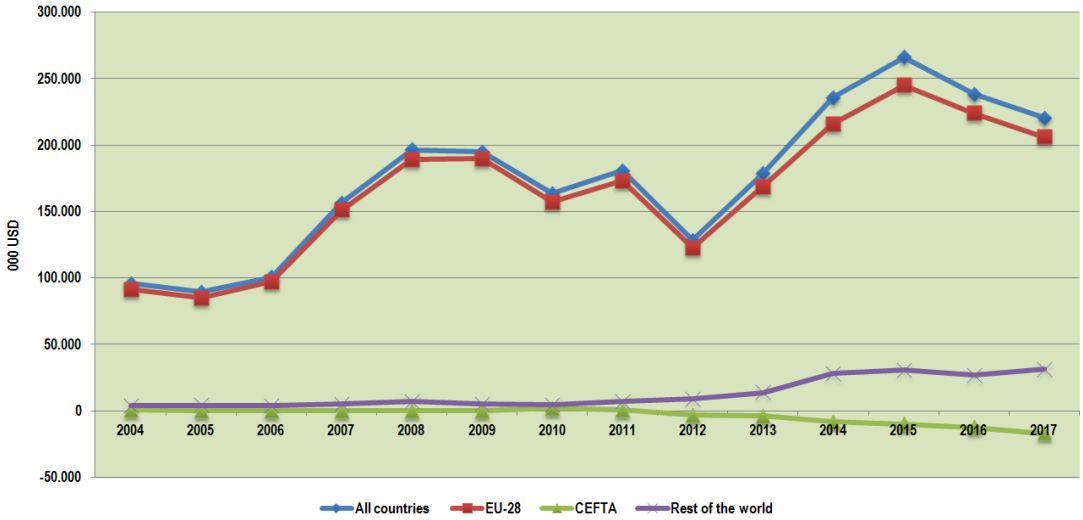

Figure 5: Trends of the net-export of raspberries of Serbia
Source: The authors´ calculations based on SORS, 2018

In order to determine the comparative advantage of raspberries of Serbia on world market, as well as the markets of the EU and the CEFTA countries, the index of comparative advantages was analyzed with LFI (Figure 6). The Serbian LFI on the international market for raspberries is positive and the similar situation is on EU market, so comparative advantages of this product were present. On the other hand, on market of the CEFTA countries, comparative disadvantages were present.

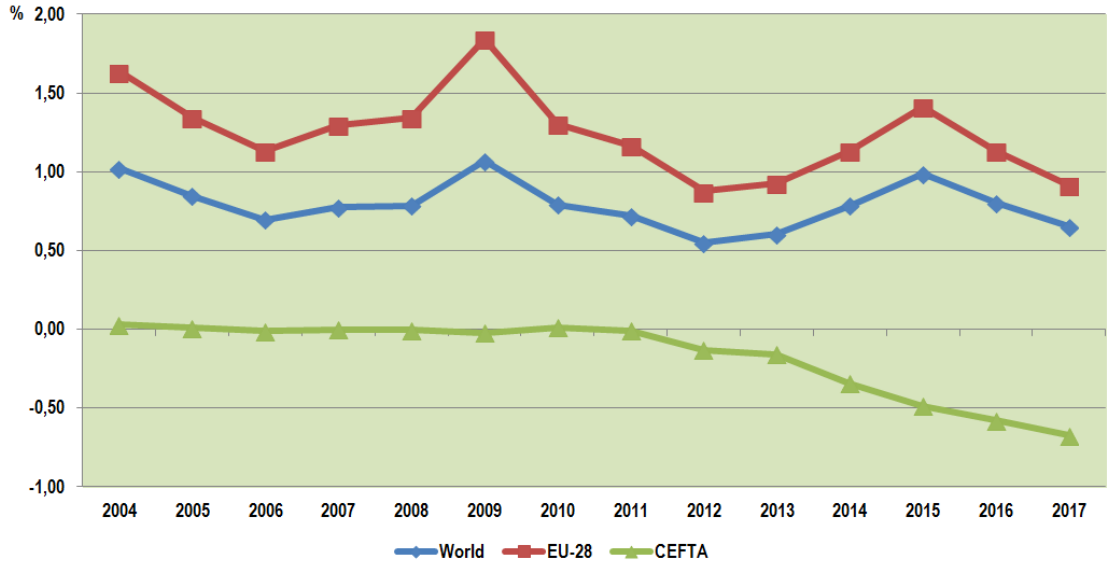

Figure 6: LFI of raspberries of Serbia
Source: The authors´ calculations based on SORS, 2018

Serbia is the third most competitive country in raspberries, in front of the most of the EU and all CEFTA countries. The innovations have influenced Serbia to be one of the main producers of raspberries. In Serbia, there is an increase of trade in fresh raspberries (30% faster than the world average), and intensive raising of plantations with dual variety. In frozen raspberries, despite the decline in export in 2016 compared to the previous year, Serbia is the world leader, in front of the Poland and Chile. The raspberry cultivation technology has been improved, so a number of hectares of raspberries are grown under greenhouses for the fresh market, and in Vojvodina there are already centers for cultivating two varieties. In this case, in parallel with the competition, the cooperation motivated producers to establish the production associations (SEEDEV, 2017).

CONCLUSION

Within the berry fruit, raspberry represents the most important fruit in Serbia in terms of volume and value of production, and Serbia is one of the world's largest producers of this fruit. Raspberries also have great economic significance, considering the number of producers involved in this production line, but also considering that raspberries are one of Serbia's most important export product. Raspberries are mainly exported to the EU market, over 90% of total raspberry exports of Serbia, and the most important export destinations are Germany, France and Belgium. Preferential trade agreements, concluded within the general international economic integration of Serbia, are of great importance when it comes to the export of all products, including raspberries, and they enable duty-free exports. In recent years, growth in exports to the Russian market has been noticed, as a result of Russia's sanctions on imports of EU products. Despite the increase in production and the growth of exports that has been present in the last decade, certain problems are present in the production, which to some extent limit the achievement of better positions and competitiveness in the international market. The problems are primarily in the relationship between farmers and cold storages and the price offered to farmers for raw raspberries. Therefore, the state policy, through certain measures, should stimulate in certain ways the improvement of partner relations between farmers and cold storages.

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SERVICE LOGISTICS IN THE CONTEXT OF THE INTEGRATED APPROACH

UDC: 658.5

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ABSTRACT

Integrated logistics has a significant role in the process of value creation, ensuring the delivery of the right product at the right time to the right place. In this way, through transportation, warehouse and manipulative activities, it is directly involved in satisfying customers' needs and wants. In addition to main logistics activities, integrated logistics also includes activities related to services. Moreover, all main logistics activities can be seen as equipment-based services. Activities related to service logistics include lead time, capacity and delivery channel. The paper analyzes the above mentioned activities, as well as strategies related to matching between capacity and demand. Bearing in mind the importance of logistics service and its impact on customer satisfaction, attention is also paid to its quality. Accordingly, various dimensions of the quality of logistics service, as well as its measuring methods, were considered.

Key words: logistics, service, quality, satisfaction.

INTRODUCTION

Under the influence of many factors and changes on supply side, as well as on the demand side, the satisfying of customers' needs has become one of the main goals of market oriented companies. Hereby, they are trying to find and implement different ways of creating and delivering the right value, adapted to customers' demands. The important place in this process belongs to integrated logistics, which can also represent one of the main sources of cost decrease.

In addition to activities related to product flow, integrated logistics includes service logistics, that is based on three elements, capacity, lead time and delivery. In order to provide an adequate level of logistics service, companies can use different strategies associated to matching between capacity and demand. Besides these strategies, the paper analyses the quality of logistics service, from the aspect of its identifying and measuring. The examination of its level may be of a special importance, especially bearing in mind positive relations between logistics service quality and customer satisfaction and loyalty, which later may have effect on certain business performance.

INTEGRATED LOGISTICS

In any society, the point of production is connected with the point of consumption through physical movement of products. According to Lambert et al. (1998, p. 504) “the alignment of firms that bring products or services to market has been called the supply chain”. On the other hand, the same authors describe the term “supply chain management” as “the integration of business processes from end user

through original suppliers that provides products, services and information that add value for customers" (1998, p. 504). Significant role in realizing this task belongs to integrated logistics, which represent one of the main supply chain activities.

For Bloomberg et al. (2006) integrated logistics represents the process of forecasting customers' and clients' needs and wants; providing capital, people, technology and data that are necessary for satisfying these needs and wants; optimizing goods and/or services and creating a network for fulfilling clients' demands; and using this network for fulfilling new client's demands in a reasonable time period. It also "involves getting, in the right way, the right product, in the right quantity and right quality, in the right place at the right time, for the right customer at the right cost" (Mangan et al. 2008).

As other sectors such as production, finance, accounting, human resources and marketing, integrated logistics can aslo be considered as special functional area within a company. It consists of two groups of activities: main logistics activities and activities related to service logistics.

Transportation, warehousing, inventory management, material handling (packaging) and communications represent main logistic activities. Through them, the product flow from supplier to a company (inbound logistics), within a company (internal operations) and from a company to buyer (outbound logistics) is operationalized. In addition to these activities, integrated logistics includes service logistics as well. It refers to three operations: capacity management, lead time and delivery.

SERVICE LOGISTICS

Besides moving and storing the products from the point of delivery to the point of consumption, integrated logistics is related to services as well. Moreover, all main logistics activities (transportation, warehousing, inventory management and material handling) are services (Grant, 2011).

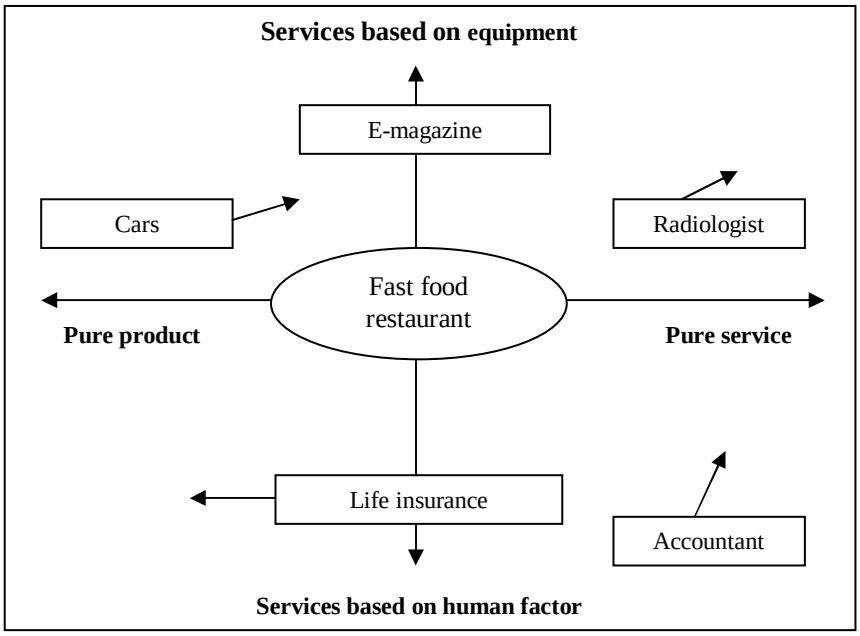

Figure 1: Service classification (Bloomberg et al. 2006)

As all services, they can also be determined by using a number of criteria (Veljkovic, 2009). In accordance with the participation of tangible goods/services in the total companie's offer, they can be ranged from a pure product to a pure service. On the other hand, the types of services vary depending on whether the human factor or modern equipment and technology are dominant in their delivery. Hereby, while services based on a human factor achieve a larger form of adjustment, in the case of a

greater role of technical components, a higher level of standardization is present. Figure 1 presents the classification of services based on the given criteria.

The realization of all main logistics activities is largely conditioned by the technical components of the company (equipment and technology). In this regard, they can be classified in the upper right quadrant, representing pure services based on equipment.

In addition to standard logistics activities, Bloomberg et al. (2006) devote special attention to the logistics of service companies, considering it as the basic dimension of integrated logistics. Its role is reflected in the coordination of non-material operations, with the aim of making the realization of service more efficient and effective. According to these authors, the service logistics consists of three key activities:

- managing the capacity of the service - planning, organizing and scheduling the resources of a company (people and equipment) in order to adjust the level of service to customers' needs;
- management of lead time - activities related to the shortening of the customers' waiting time;
- service delivery - selecting and managing the service distribution channel (through which distribution channel, at what time and at which location the service will be performed).

Veljkovic (2009) analyzes the presented activities of logistics services in the context of managing the service organization's offer. In addition, he cites specific strategies for matching the capacities and demand, as well as the strategies of shortening the lead time, while from the aspect of the distribution channel he distinguishes direct, indirect and electronic delivery of services.

Table 1: Matching capacities and demand in service sector (Veljkovic, 2009)

Adapting demand to capacity	
When demand is too high	*When demand is too low*
– Inform consumers about days when it is crowded or hours when it happens during the day; – Motivating consumers to use services during the „low-demand“ period; – Special treatment for Loyal and VIP consumers; – Communicating through promotional activities regarding the time of the use of services and benefits of using the services during the „low-demand“ period; – No discounts - full price charged.	– Organizing promotional and sales efforts to increase demand on a given market segment; – Adjusting the offer in order to "attack" the new market segment; – Discounts and other benefits for consumers; – Adjusting working time to the needs of consumers; – If possible, "take the service" to the consumer or bring it closer to him.
Adapting capacity to demand	
When demand is too high	*When demand is too low*
– Extending the working time, engaging new people, new space and new equipment; – Training of employees to perform multiple roles; – Recruitment of part-time workers; – Overtime; – Rental of space and equipment; – Collaborate with other service companies or transfer certain activities to an intermediary.	– Repair and renovation of space and equipment; – Workers' annual breaks; – Training of employees; – The release of workers, renting machines and space.

As presented in Table 1, there are two approaches depending on whether demand is adapted to capacities or capacities are adjusted to demand. Also, within both groups, there are activities that can be performed when demand is too high or when demand is too small.

LOGISTICS SERVICE QUALITY

Within service logistics, special attention is dedicated to the analysis of its quality. Bearing in mind, its positive effect on customer satisfaction and loyalty, and through them on certain business performance (Stank et al. 2003), the quality of logistics service occurs as the subject of many marketing studies (Kilibarda et al. 2012).

Table 2: Logistics Service Quality Sub-Scales (Mentzer et al. 1999, p.17)

Sub-scale	**Item**
Information Quality	
–	Catalog information is available.
–	Catalog information is adequate.
Ordering Procedures	
–	Requisitioning procedures are effective.
–	Requisitioning procedures are easy to use.
Ordering Release Quantities	
–	Requisition quantities are not challenged.
–	Difficulties never occur due to maximum release quantities.
–	Difficulties never occur due to minimum release quantities.
Timeliness	
–	Time between placing a requisition and receiving delivery is short.
–	Deliveries arrive on the date promised.
–	The amount of time a requisition is on backorder is short.
Order Accuracy	
–	Shipments rarely contain the wrong items.
–	Shipments rarely contain an incorrect quantity.
–	Shipments rarely contain substituted items.
Order Quality	
–	Substituted items sent by DLA work fine.
–	Products ordered from DLA meet technical requirements.
–	Equipment and/or parts are rarely non-conforming.
Order Condition	
–	Material received from DLA depots is undamaged.
–	Material received direct from vendors is undamaged.
–	Damage rarely occurs as a result of the transport mode or carrier.
Order Discrepancy Handling	
–	Correction of delivered quality discrepancies (Report of Discrepancy) is satisfactory.
–	The Report of Discrepancy process is adequate.
–	Response to Quality Discrepancy Reports is satisfactory.
Personnel Contact Quality	
–	The designated DLA contact person makes an effort to understand my situation.
–	Problems are resolved by the designated DLA contact person.
–	The product knowledge/experience of DLA personnel is adequate.

One of the most frequently used approach for measuring its level is related to the implementation of *SERVQUAL* model, conceptualized by Parasuraman et al. (1988). It presents service quality as a 5-dimensional construct, which consists of assurance, reliability, responsiveness, tangibles and empathy. However, besides its wide application, Babakus and Boller (1992, p. 264) suggested that "the dimensionality of the construct may be a function of the type of services under investigation".

On the basis of this methodology, Stank et al. (2003) have identified three key dimensions of logistics service: operational (related to reliability), relational (which encompasses assurance, responsiveness and empathy) and cost dimension. In their conceptual model, logistics relational performance was presented as the antecedent of other two dimensions (operational and cost). In addition, the model included customer satisfaction, customer loyalty and market share. Their research, related to logistical

services provided by 3PL providers, identified "service performance as a key antecedent of market share through its relationship with customer satisfaction and loyalty" (Stank et al. 2003, p. 44). All three dimensions had positive effect on customer satisfaction, whereby statistical significance was recorded only in the case of relational performance. Moreover, customer satisfaction had significant positive effect on customer loyalty, which positively influenced market share.

SERVQUAL model was used in researches conducted by Neo et al. (2004) and Chen et al. (2009). In the former, a case study was performed on a 3PL company. Its results pointed to the importance of reliability such as picking and documentation accuracy, and on-time delivery, as well as to the importance of ease of communication and productivity. On the other hand, Chen et al. (2009) applied the SERVQUAL in the shipping industry of Taiwan. In addition, they examined two service quality gaps (between types of customers and between employee statuses). However, their results indicated to certain problems in the application of the SERVQUAL instrument and highlighted the necessity of developing more appropriate service quality measuring scale.

For measuring logistics service quality, Mentzer et al. (1999) developed the LSQ instrument (Table 2) and tested it among the DLA (Defense Logistics Agency) customers. The final LSQ scale consisted of nine sub-scales (information quality, ordering procedures, ordering release quantities, timeliness, order accuracy, order quality, order condition, order discrepancy handling and personnel contact quality). Later, this instrument was validated and tested in the context of the 3PL industry in the UK by Rafiq and Jaafar (2007). Moreover, they have conceptualized the ordering procedures and the information quality differently from Mentzer et al. (1999). Although the results of their study have suggested that the LSQ scale was generally applicable across the sample, some weaknesses of this approach (such as the second order formulation of the LSQ) have been presented as well.

One of the most detailed reviews concerning the measuring of logistic service quality (which included some of the previously mentioned studies) was presented by Kilibarda et al. (2012). In addition, they proposed the methodology for measuring logistic service quality, based on the multi-attribute decision-making technique. With its application, logistic service quality can be measured during the phase of making the logistic offering. The proposed model was tested in a case study which included a logistics provider from Belgrade.

In order to explore logistic service quality from the perspective of both service providers and customers, Thai (2013) suggested the model of five factors (customer focus quality, order fulfillment quality, timeliness, information quality and corporate image) and 20 items. It was obtained as a result of a survey in which more than two thousands logistics service providers and customers from Singapore participated. Hereby, among all factors, the quality of customer focus was "deemed the most critical to enhance the perceived logistics service quality" (Thai, 2013).

CONCLUSIONS

Integrated logistics, as a special functional area in the company, includes main logistics activities (transport, warehousing, inventory management, materials handling and communications) related to product flow, and service logistics activities. Hereby, starting from the basic differences between products and services, main logistics activities can also be considered as services.

Depending on the share of the tangible goods/services in the total companie's offer, services can be analyzed on the interval from pure products to pure services. They can also be distinguished according to the participation of the human or technological factor. Based on the above criteria, logistics services can be viewed in a combination of pure, equipment-based services.

The service logistics, whose role is reflected in the coordination of non-material operations related to efficient and effective service performance, includes three activities: management of service capacity, lead time management and service delivery. In order to satisfy customers' needs in an adequate

manner, companies can apply different strategies for matching capacity and demand, as well as strategies for shortening lead time.

Customer satisfaction can also be increased due to the higher level of service quality. In this regard, many researches focused on the quality of logistics service. For measuring its level, the most commonly used approaches were based on the SERVQUAL model. Starting from its positive impact on customer satisfaction and loyalty, in some studies the level of logistics service has been examined as an important determinant of the market share of the company. Bearing in mind the above mentioned relations, considerable attention should be paid to the increase of the quality of logistics service and the analysis of its basic dimensions, all with the aim of improving the competitive position of the company.

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CORPORATE SOCIAL RESPONSIBILITY CONCEPT DEVELOPMENT AS A PREREQUISITE FOR QUALITY IMPROVEMENT

UDC: 005.35:005.6

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ABSTRACT

In this work the importance of using corporate social responsibility (CSR) is analyzed, as well as the influence of CSR on upgrading quality of business. Companies are a part of a society in which they function, therefore aside from accomplishing economic goals, they must pay attention to their influence on society and the natural environment, i.e. they must organize their business in a socially acceptable way. Corporate social responsibility represents activities by which companies fulfill ethic responsibilities toward all interest groups. A narrow connection can be spotted between total quality management and corporate social responsibility. This before all reflects in their shared interest to satisfy all interest groups as well as society as a whole.

Key words: corporate social responsibility, TQM concept, quality upgrading, CSR standards.

INTRODUCTION

The time we live in can be called a period of historical changes. Basic marks of the second millennium are: globalization and dynamic changes. Market globalization has influenced the increase and intensification of competition. The main factor for achieving competitiveness is quality upgrading (Sajfert, 2008).

Business organizations of today have realized that the way they do business affects society, therefore they must do business in conjunction with socially responsible principles. Corporate social responsibility refers to company devotion to ethic behavior and contribution to economic development, all the while demonstrating respect towards people, communities, societies and the environment (Đorđević & Ćoćkalo, 2007). By investing in society, companies create a healthy environment which will help them in their growth and development. The size of a company is mirrored in its responsibility towards the society in which it does business and makes profit, widens its business reputation, increases productivity and secures higher employee loyalty and motivation. Worldly companies are well aware that social responsibility investments has value, because in this manner they become more intimate with their clients and build themselves a positive image (Kotler & Lee, 2007).

It should be emphasized that quality upgrading is well under the influence of the social responsibility concept and that it depends on its development, this is because elements of the corporate social responsibility concept are contained within the integrated management systems concept and the total quality management concept.

CORPORATE SOCIAL RESPONSIBILITY CONCEPT

In recent years the definition of business success is slowly, but steadily changing, i.e. it is expanding from "how much money a company is making " to "how the company is earning that money". Companies are being met with an increasingly wider specter of interests and demands of their interest groups. As general and social awareness grows, so does business awareness, and as a consequence to that we have an ever growing desire of interest groups to as directly as possible influence company business. (Erić, 2000). Exactly in this context, the term corporate social responsibility rises in importance.

The term social responsibility emerges in different shapes and names in theory and practice. Business ethics, sustainable development, corporate reliability are some of the terms that contain the idea of social responsibility of a company – that it advocates and measures the influence of its decisions on economic, social and natural environment in which it does business (Đurić & Filipović, 2007). Corporate ethics represents a way of moral evaluation of certain business decisions and activities on the basis of generally accepted principles of behavior (Đorđević & Ćoćkalo, 2007). Company social responsibility represents a concept in which companies consciously and voluntarily dedicate to activities which go beyond their primary interest of profit increase and positively influences on their working, social and natural environment. The practice of socially reliable business refers to the operation of a company as a whole: what it produces, how it buys and sells, does it respect the law, how it treats its employees, does it invest in the local community and in which way it contributes to preservation of the environment

Six social initiatives that take part in corporate social responsibility can be noticed (Korler & Lee, 2007):

- promotion of social causes,
- social cause marketing,
- corporate social marketing,
- corporate philanthropy,
- volunteer community work, and
- socially responsible business practice.

Promoting of social causes implies that the organization provides financial funds or other resources so as to develop an awareness toward some social cause or in order to get certain resources to benefit that social cause. Marketing connection with social causes implies that an organization is committed to invest a certain percent of its profit toward a certain social cause. Corporate social marketing implies that an organization bolsters the development realization of a campaign for changing behavior and increasing health, security, natural environment and general welfare of the community (Urosević & Kokeza, 2012). Corporate philanthropy has different shapes, like donating cash assets, material donations (products, space, use of other company resources), offering favors of company expertise, employee volunteer work. Non-cash contributions in wares and favors are a prevailing trend in international corporate giving nowadays (Ćeha, 2011). Volunteering is defined as a non-profit activity in which individuals or groups contribute to the wellbeing of their community or society as a whole. Socially responsible business practice implies that an organization adopts and applies business practice, which implies some social cause, which should improve life in the community and protect the environment.

Key benefits of investing in socially responsible business are (Kotler & Lee, 2007):

- sale and share increases on the market,
- improving brand position,
- improving corporate image and influence,
- improving of possibilities for attraction, motivation and retention of employees,
- decreasing of business expenses and increasing investor and financial analytics attraction.

Serbian company managers show a non-satisfactory level of awareness for the need of socially responsible business. The opinion of many Serbian company managers is that the country should take care of social problems, which is why they do not involve themselves in socially acceptable business in any big way. Even the managers that consider socially responsible business important for their company usually connect it with different shapes of one-time financial help because the opinions of most company managers are that sponsorships and donations are the most vivid way of socially responsible business from which the company can benefit.

SOCIAL RESPONSIBILITY STANDARDIZATION

The international organization for standardization started up a procedure of preparation a series of standards ISO 26000 about social responsibility during 2005. ISO 26000 provides guidance on how businesses and organizations can operate in a socially responsible way. This means acting in an ethical and transparent way that contributes to the health and welfare of society. ISO 26000:2010 provides guidance rather than requirements, so it cannot be certified to unlike some other well-known ISO standards. Instead, it helps clarify what social responsibility is, helps businesses and organizations translate principles into effective actions and shares best practices relating to social responsibility, globally. It is aimed at all types of organizations regardless of their activity, size or location. (https://www.iso.org/iso-26000-social-responsibility.html)

There are seven core subjects in ISO 26000 (http://www.premysisconsulting.com/services/corporate-social-responsibility/csr-strategy/):

- organizational governance,
- human rights,
- labour practices,
- the environment,
- fair operating practices,
- consumer issues and
- community involvement and development.

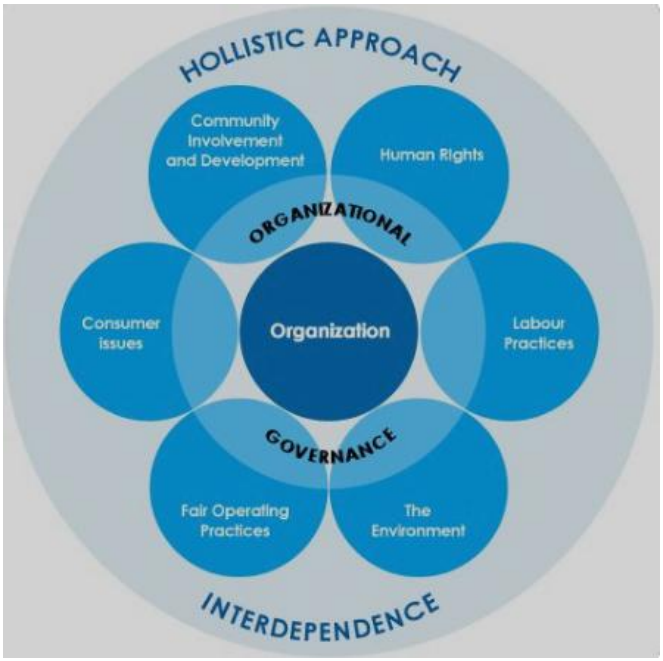

Figure 1: Seven core subject in ISO 26000

The SA 8000 Standard is leading social cetification standard for factories and oranizations across the globe. It was established by Social Accountability International in 1997 as a multi-stakeholder initiative. Over the years, the Standard has evolved into an overall framework that helps certified organizations demonstrate their dedication to the fair treatment of workers across industries and in any country (http://www.sa-intl.org/index.cfm?fuseaction=Page.ViewPage&PageID=1689).

Integration of management standards is the newest trend in quality management development, as well as the process of organization management. One of the practical ways of corporate ethics use and corporate social responsibility is implementation of integrated management systems. International management standards published by ISO which contain elements referring social responsibility are (Đorđević & Ćoćkalo, 2007):

- ISO 9000 – quality management system,
- ISO 14000 – environment management system,
- OHSAS 18000 – employee health and safety management system.

QUALITY IMPROVEMENT BY USE OF THE CSR CONCEPT

Today the concept of corporate social reliability has a tight connection with the concept of integrated management system, and especially with the concept of total quality management. Modern management concepts insist on the individual and responsibility. The TQM concept implies (Majstorović, 1994):

- satisfaction of user needs,
- quality system improvement,
- employee safety and environmental protection,
- employee education and creation of corporate culture.

TQM is a multidimensional and dynamic model of quality management which takes into consideration parameters of business management, accenting responsibility of every individual in business, especially for increasing productivity as an imperative of the modern market. The goal of the TQM concept is quality of life improvement. The end goal of the organization is achieving business exceptionality, achieving world class products and services which in global business conditions creates preconditions for long term growth and development of the organization on the basis of satisfying all social segments. When viewed in this manner, the entire system lies on the individual who must become “a responsible individual”, who contributes to productivity increase with his work and procedures and therefore the general wellbeing (Besić & Đordjević, 2009).

Competitive ability improvement of companies is under direct influence of the use of corporate social responsibility and quality management concepts. Therefore, one should have I mind the necessity of build firm relations between knowledge management , quality management and productivity increase, as basic assumptions for establishing a competitive position on the market.

Understanding the importance of improvement in the field of quality is important because of the fact that the concepts of integrated management system and total quality management contain important elements of corporate social responsibility. When we talk about integrated management systems, every management standard explicitly contains the element of corporate social responsibility, while there are special standards which deal only in the matter of corporate social responsibility, like SA 8000 and ISO 26000. So through education for quality and the use of the concept of quality the concept of corporate social responsibility is directly developed (Ćeha, 2011).

Implementing the concept of corporate social responsibility in an organization’s structure, building up the standard of business behavior and transferring it into the business codex, as well as continual education of all employees in the domain of ethic behavior represent one of the most important

preconditions for achieving business exceptionality of an organization (Sajfert, Đordjević & Besić, 2006).

CONCLUSION

Corporate social responsibility of business subjects is of great importance even today, but it is certain that in the future it will become even more relevant. For companies it is not enough to just develop and implement socially responsible initiatives, but to effectively and efficiently promote them as well. By investing in improvement of the social community, company business becomes more stable and predictable because it creates the economic and social conditions of business, in the same time it builds a good reputation in the community so that corporate social responsibility secures a sustainable competitive advantage. Business organizations that wish to create a successful competitive position on the global market must use modern methods and techniques of management such as integrated management systems and corporate social responsibility. The practice of the most successful world corporations shows that the most successful corporations are socially responsible organizations. Therefore, countries in development like Serbia and companies that come from this part of the world will have to strongly accept all the conditions of the global market, one of which is corporate social responsibility, if they wish to successfully do business. In the end all of this brings us to the conclusion that with development and use of the concept of corporate social responsibility organizational quality of business will be improved.

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APPLICATION OF THE SOCIAL NETWORK ANALYSIS IN E-LEARNING: A RESEARCH PROPOSAL

UDC: 37.018.43:004.738.5

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ABSTRACT

Social Network Analysis (SNA) provides extracting useful information from social networks. SNA is fast growing research area with great interest world in using social media not only from academic, but also from the business organizations. SNA provides a powerful mathematical approach to study the process of computer supported collaborative learning from a theoretical point of view. In last few years, increasing attention has been devoted to virtual learning. The trend to online technologies continues in the higher education sector. This paper presents the research proposal and analyzes the means by which digital technologies can be employed in order to facilitate and support virtual spaces for bringing learners together. In addition, this paper demonstrates how SNA method can be applied in e-learning. The research proposal is going to be conducted at the Faculty of Technical Sciences, University of Novi Sad. This study is going to measure the relationships among performance of students and the use of learning resources from the e-learning platform.

Key words: social network analysis, e-learning, e-business;

INTRODUCTION

E-learning system is an effective learning environment (Marjanovic, Delić, & Lalic 2016) and is adopted in many higher education systems via platforms provided by Learning Management Systems (LMS) (Kigundu 2014). Theoretical and practical insights into e-learning environments must be grounded in experimentation and careful analysis of emerging critical issues for teachers and students (Segrave & Holt 2003). Social Network Analysis (SNA) provides method which leads to a clearer understanding of interaction patterns in LMS (Rienties et al. 2009). SNA can be considered as a wide-ranging strategy to explore social structures to uncover the existence of social positions of individuals within the network such as position of students and teacher (Rienties et al. 2009).

In this paper authors will present research proposal for application of SNA method in LMS (i.e. Moodle) at the University of Novi Sad. Research will be conducted on the class of Electronic business at the study program Engineering of Information Systems. This paper will emphasis importance of social structure in the development of learning activities in the dependence of interactions of students in the group, which constructing a culture of shared understanding and share of information.

LITERATURE REVIEW

Cho et al. (2007) found that a social network is central element in a Compute Supported Collaborative Learning (CSCL). In CSCL studies peer interaction is determining learning outcomes (Chen &

Watanabe 2007). The Social Interdependence Theory of Cooperative Learning served as the basis for the first application of SNA into learning environment (Chen & Watanabe 2007). During the period between 1999 and 2013, numerous papers applied SNA on e-learning and published results in in refereed journals and proceedings, underlining research that applied, confirmed, questioned, and critiqued it (Cela, Sicilia, & Sánchez 2015). Figure 1 depicts number of publication per year that applies SNA to e-learning.

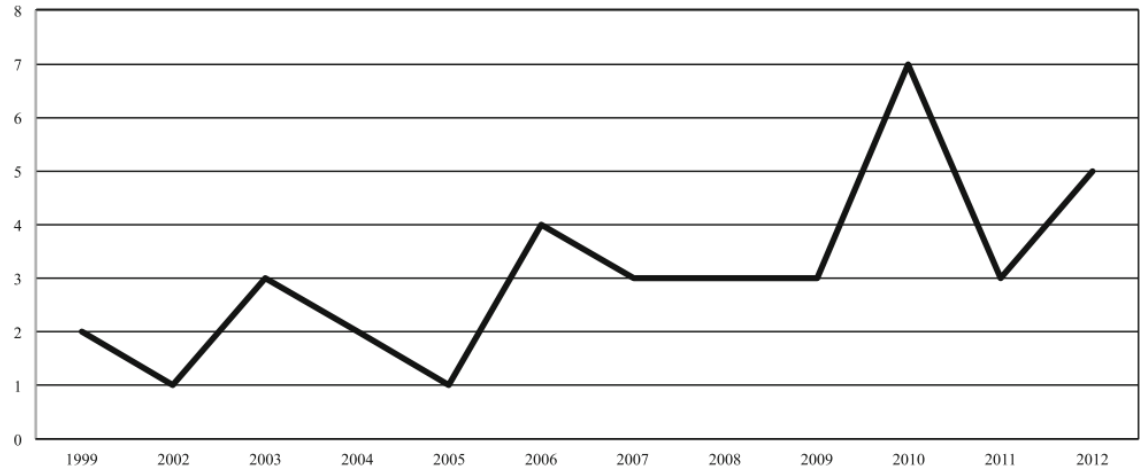

Figure 1: Number of publications per year that apply SNA to e-learning (Cela, Sicilia, and Sánchez 2015)

In SNA theory, social relationships are represented in terms of nodes and ties (Daniel, McCalla, & Schwier 2008). For the research proposal presented in this paper, nodes are students and ties are the frequency of resources usage by students. The major challenge is whether the performance of students (their marks) depends on the frequency of resources usage in the LMS.

Application of SNA in e-learning have received much attention among researchers (Cho et al. 2007; Dawson 2010; Dradilova 2008; Hamulic & Bijedic 2009; Lin, Huang, & Chuang 2015; Mansur, Yusof, & Othman 2011). For instance, Dradilova (2008) conducted a research by using data from the Moodle LMS at Silesian University. Weighted graphs were constructed using system data, which represented the structure and relationship among e-learning students (Dradilova 2008). Mansur et al. (2011) discovered the hidden behavior which is happening during the interaction inside of e-learning in wikis. They found that learners who use wikis as a collaborative tool in e-learning environments can collaborate to greater or lesser degrees depending on how much time they devote to the wikis (Mansur, Yusof, & Othman 2011). Lin et al. (2015) investigated how variables, such as network centrality and self-regulation, impact student learning in an SNA-related e-learning environment. Analytical results indicate that the student group with high-level centrality and low-level self-regulation more significantly progresses in learning achievement than the other groups (Lin, Huang, & Chuang 2015). For that reason, the following research questions are proposed:

1. What is the relationship between the success of students and the use of resources at the Moodle LMS?
2. How much centrality in a network affects the success of students?

PLANNED USE OF RESEARCH METHODS

SNA is used widely in the social and behavioral sciences (Wasserman & Faust 1994). In social network analysis the observed attributes of social actors are understood in terms of patterns or structures of ties among the units (Wasserman & Faust 1994). Main points in the social network analysis are: nodes, types of ties, importance of structure, centrality and other (Borgatti et al. 2009).

Given a set of actors or nodes, there are several strategies for collecting data on the relations among them (Hanneman & Riddle 2005). These strategies are: full network methods, snowball methods, ego-centric networks (with alter connections) and ego-centric networks (ego only) (Hanneman and Riddle 2005). Full network methods approach yields the maximum of information (Hanneman and Riddle 2005). This method requires collecting information about each actor's ties with all other actors (Hanneman & Riddle 2005). Hence, this method of data collection has been selected in this research proposal. This method is also chosen due to the number of students on the course. The number of students is 20. In this research proposal they will be marked from S1 to S20. Resources will be marked from R11, R12, R13, R14, R21, and R22 to R84. To understand the interdependent relationships among the success of students and use of resources at the Moodle LMS, direct observation for the collection of data is proposed. Direct observation is a relevant method for data collection in LMS (Marjanovic, Delić, & Lalic 2016). A sociogram is used to view the collected data in the SNA method (Butts 2008). Table 1 shows sociogram in research proposal.

Table 1: Sociogram in the research

	R11	R12	R13	R14	…	R84
S1	1	1	1	1	1	1
S2	0	0	0	0	1	0
S3	1	1	0	1	0	0
…	0	1	0	1	0	1
S20	0	0	1	0	1	0

When connection between the actors in sociogram exists, the value is set to 1, and when there is no connection, the value is set to 0. Each area specifies its starting number (e.g. R1, R2, R3 to R8). And resources within the area are marked with R11, R12, R13, R14, R21, R22, R23, and R24 to R84. Class Electronic business in the LMS consists of 8 areas and 4 resources in every area. Therefore, in this research proposal 32 resources are presented. For example R11 represents resource from first area and first resource, R81 represents resource from 8 area and first resource. Students are interconnected if they use the same resources. In this case, they are in the same structure. In the model, students are nodes and the use of resources is a tie between them. After data collection process, data need to be inserted into software for SNA analysis (i.e. UCINET) (Borgatti et al. 2009). Data can be imported into UCINET from many different file formats (e.g. NetDraw (VNA format), Pajek, Krackplot, & Negopy). It also supports importing raw ASCII text files, and files saved as MS Excel spreadsheets (Hanneman & Riddle 2005). When UCINET process the data, a graph showing the structure of the network with the relations of nodes between them is obtained (Hanneman & Riddle 2005). Example of the graph is shown in Figure 2.

After obtaining a graph from the UCINET program, the next step is to discuss the results in relation to research questions or hypotheses to see if the results obtained are in line with expectations.

PRELIMINARY DISCUSSION AND IMPLICATIONS

Expected results will be compared with the theoretical framework that underpins the research, since early studies in application of SNA in Moodle system show that students with similar activities are in clusters (Dráždilová et al. 2008). They can be represented as the behavior models of study activities in the Moodle system (Dráždilová et al. 2008). Hence, in this research proposal, it is expected that students who achieve the same or similar results use similar resources. For the second research question, it was seen that centrality was influenced like a correlations between centrality and student sense of community, noting that that degree and centrality were noted as positive predictors of student sense of community (Dawson 2010). Therefore, it is expected that students which is in center of network have better results than students on margin.

Implications for lecturers, moderators and course evaluators are in the centrality of the network. They could approach students who are on the margin and connect them with the students in the center of the

network. This assessment will enable moderators to quickly come up with feedback on the performance of the students and underutilization of the resource in the e-learning settings. Potential changes could contribute to the ability to innovate an online course design. All results should be discussed in accordance with the graphs and parameters that the SNA method applies in analyzing them.

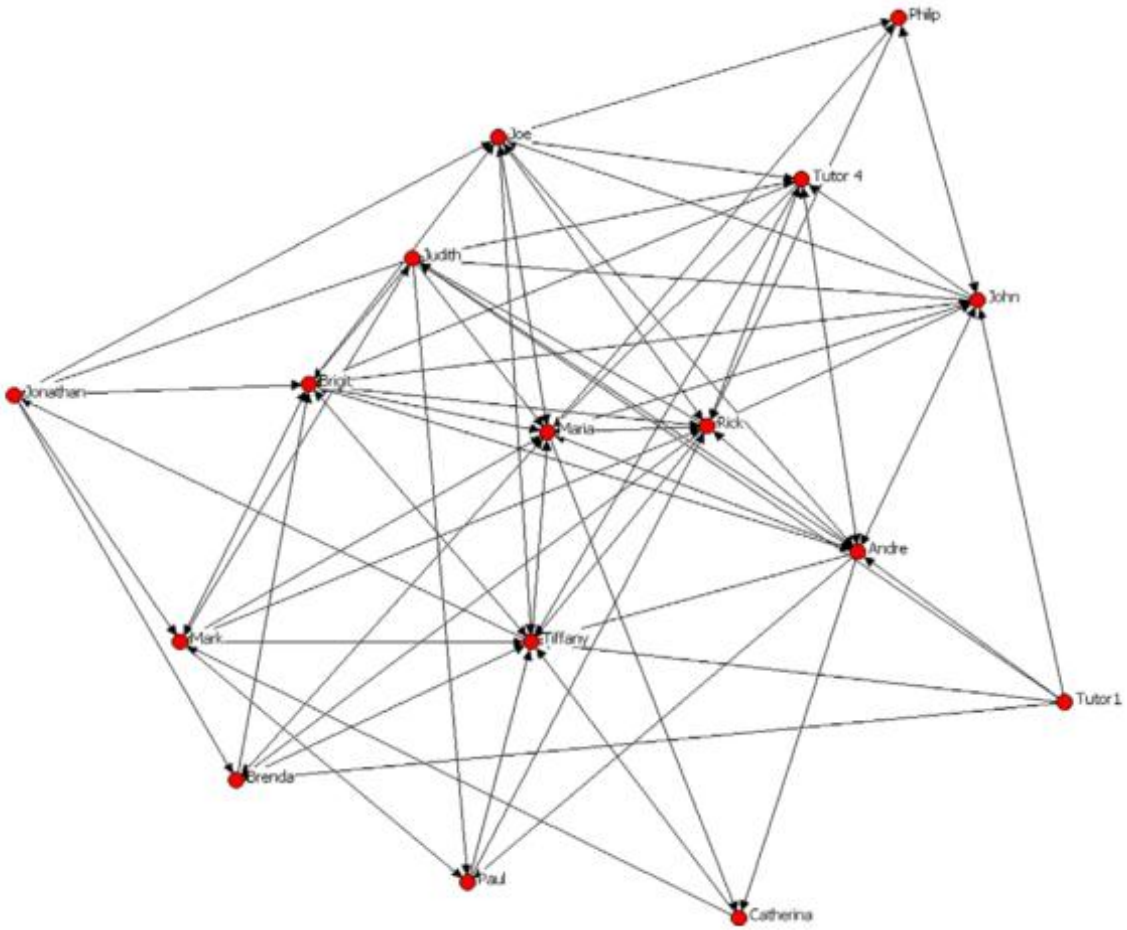

Figure 2: Graph illustrating social network of higher cognitive discourse (Rienties et al. 2009)

CONCLUSION

This paper proposed a research on the application of SNA in e-learning. Main contribution is literature review, proposed research questions, research methods, and expected results. Expected results should be in line with previous research – interconnected students that use the same resources should achieve the same performance. Hence, students which are in the center of network and use all resources will achieve the best results, and students closer to those in the center will have better grades than those who are farther away from center. In case the results of research are contradictor, the challenge could be explained by the sociogram. Based on the sociogram, it is possible to see which resources are not so important in creating student's assessment. In this way, you can better shape the course and give focus on things that add value in creating students grades and knowledge.

The next step is to conduct a core research. It is expected that the core research, evaluation and final write-up of the report will occur in the time frame of six months.

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MODERN COMMUNICATIONS - CHANGES AND THE IMPACT OF SOCIAL MEDIA

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ABSTRACT

With the emergence and growth of global telecommunications and information technologies, the role of the media only become more important. The media are creators of public opinion. The use of various mass media extends the power and reach of human communication. Mass media is part of the reality of the human world, it determines not only its movement and interpretation, but also its conception. The growth and popularity of social media has also changed communication with various public. The paper will describe the change from traditional to new media with a special emphasis on social media that is used in a very large percentage.

Key words: media, tranditional vs modern, social media, Serbia.

INTRODUCTION

According to (Davis, 2007), the media provide a framework for social reality, informing and establishing values. According to the same author, people based on messages from the media form their opinions and define their own opinions about whether something is socially acceptable or not. Technology has changed the world and facilitated the construction of media relations and interaction with the wider audience than ever before. The digital world has led to changes in communication between organizations and their various public. Social media has changed the way the organization communicates with its public (Wright & Hinson, 2009). Cutlip, Center, and Broom (2006) discuss how inclusion of new media is part of the process of social change. The World Wide Web is now becoming an important communication tool for media releases that can be effectively realized. Individuals use vertical, traditional and horizontal media based on their interests (Shaw & Mc Combs, 2008).

As global markets are expanding and digital technology is transforming the way organizations communicate with their clients, the importance of communication integration is impossible to ignore. The development of digital technology, the increase of the role of stakeholders in an organization, the growth of competition in the global marketplace, as well as globalization itself, has created a new communication environment not only within organizations but in the society as a whole (Einwillera & Boenigk, 2012).

According to (Cutlip et al., 2006; Shan et al., 2014), the media are divided into traditional media and new media. Both traditional and new media are very important for businesses. Traditional mass media such as newspapers, television, etc. they dominated the 20th century. Traditional mass media usually included one-to-one communication with an anonymous recipient number through communication channels with a clear difference between the sender and the recipient of the message (Croteau & Hoynes, 2014). The media developed and is used differently in different countries in Europe. (Kelly, Mazzoleni, & McQuail, 2004)

At traditional media, the sender of the message is oriented to the marketing and advertising communication protocol. In this type of message transmission, the message design is the key to successful communication, because if the recipient of the message does not understand the meaning of the message, it is considered that communication did not occur (Stidsen, 1975). In this process, which is commonly referred to as a one-way communication model, which involves only the action of speakers, it is believed that the most widespread opinion on communication (Griffin, 2003). This type of communication is most common in Western culture (Heide 2009).

MODERN COMMUNICATIONS IN THE WORLD AND IN SERBIA

Internet as a new media is still expanding around the world. New media is a challenge, which has certainly changed what the media used to be. New generations live in an extremely new communication environment that is designed to facilitate data collection and access to knowledge is faster. The Internet has this ability to reach the mass market and to every individual who uses it. It is global and offers great opportunities to connect sellers and customers. With the advent of mobile technology, such as laptops, tablets and smartphones that are widely distributed throughout the nation, online advertising enables potential customers and consumers to respond directly to announcements.

With the emergence of new technologies, new media and new forms for reaching stakeholders, traditional media relations are challenged to adapt to new concepts (Bentele & Nothhaft, 2008) and their one way power is slowly becoming a phenomenon of the past (Gillmor, 2004; Shirky, 2008). With the rise and rapid expansion of digital and online marketing, Internet marketing is the only faster-growing category of advertising on television, radio, or other traditional media formats (Gardner & Lehnert, 2016). Table 1 shows the world regions and Internet users while table 2 (next page) show how many households have Internet connection in Serbia.

Table 1: *Worldwide Internet usage and population statistics*

World Regions	Population (2018 Est.)	Population % of World	Internet Users 31 Dec 2017	Growth 2000-2018
Afrika	1,287,914,329	16.9 %	453,329,534	9,941%
Asia	4,207,588,157	55.1 %	2,023,630,194	1,670%
Europe	827,650,849	10.8 %	704,833,752	570%
Latin America / Caribbean	652,047,996	8.5 %	437,001,277	2,318%
Middle East	254,438,981	3.3 %	164,037,259	4,893%
North America	363,844,662	4.8 %	345,660,847	219%
Oceania / Australia	41,273,454	0.6 %	28,439,277	273%
WORLD TOTAL	7,634,758,428	100.0 %	4,156,932,140	1,052%

Source: https://www.internetworldstats.com/stats.htm (accessed 05.05.2018)

Respondents answered for which purpose did they use internet in the last three months: (Kovačević, Pavlović, & Šutić, 2017)

- 22.8% of respondents use Internet for Internet banking.
- 25.1% of respondents use the Internet to sell goods or services over the Internet (through auctions).
- 34.9% of respondents use the Internet for services related to travel and accommodation.

- 44.6% of respondents use the Internet to set up websites and share private content over the Internet with other people.
- 55.7% of respondents use the Internet to send / receive e-mails.
- 65.1% of respondents use the Internet for telephoning via the Internet / video chat (via webcam) over the Internet.
- 67.8% of respondents use the Internet to participate in social networks (Facebook, Twitter, blogs).
- 75.5% of respondents use the Internet to search for information about goods and services.
- 75.6% of respondents use the Internet for reading online newspapers or magazines.

Table 2: Households in Serbia that have access to the Internet

Year	The percentages that have internet access
2007	26.3%
2008	33.2%
2009	36.7%
2010	39.0%
2011	41.2%
2012	47.5%
2013	55.8%
2014	62.8%
2015	63.8%
2016	64,7%
2017	68,0%

(*Source*: Kovačević, Pavlović, & Šutić, 2017)

THE IMPACT OF SOCIAL MEDIA

Social media can be defined as "online means of communication, transfer, collaboration and relationships between related and dependent groups of people, communities and organizations enhanced by technological capabilities and mobility" (Tuten, & Solomon, 2015, p. 4). Social media is excellent for two-way communication, as interaction between the seller and the buyer is created. This way of communication makes it easy for potential users to ask questions or to express the need for products / services, and in addition allows sellers to discover additional sales opportunities (Andzulis et al., 2012).

Social media has more than ever lowered the barrier to information exchange. Networking features allow users to get information from various sources. People are increasingly using social media to learn more about various news and events (Kwak, Lee, Park, & Moon, 2010). Also through social media, customers / users can get recommendations on products and services (Kim, 2014).

Social media is changing our world. Through the emergence of smartphones and social media, the availability of information is greater than it has ever been before. Since 1999, the media world has changed significantly, enabling individuals to set up, share and re-publish content on the Internet through a simple click. This back-to-back web 2.0 (O'Reilly, 2004) facilitated and increased the degree of connectivity, collaboration and conversation between decentralized web sites.

According to Avlonitis and Panagopoulos (2010), the inclusion of the use of social media in interaction with clients is a logical advancement for companies to expand communication with their customers. Active use of social media can help companies in their communication with clients (Agnihotri et al., 2012). Customers are often asked to "like" something related to the company on Facebook, to "follow" companies on Twitter, or to "connect" through LinkedIn. As a result, users /

customers are becoming better connected with companies, have more knowledge about the company, its products and services.

Although Facebook has started by allowing friends and family to communicate with each other through the "wall", messages, photos, personal messages, live conversations and status updates, it evolved into a large social media marketing platform (Holzner, 2009). Companies can create a Facebook Profile that is similar to a personal profile in order to present and promote their products or services. They present in this way, through advertising and quality content, market their products, services and acquire Facebook friends and "likes". The main goal of Facebook marketing is to influence the "friends" of those who are already "fans" of the company on the Facebook page, reaching more potential consumers (Holzner, 2009). The use of Twitter for professional reasons in the field of public relations is no exception to other social media, as Grau and Ponte (2009) found, 36% of Twitter users say they use it for strictly professional purposes. Blogging has described the director of Alcatel, who started this activity at the internal level, as a great way to get a direct dialogue with employees (Dutta, 2010). He believes that this kind of communication positively affects the motivation of employees and support it in this. Blogging also helps in the design and execution of a company's strategic plan. He asked nine thousand employees to express their opinion on the strategic plan of the company, thus improving the plan and the employees were familiar with the overall plan (Dutta, 2010). According to the survey (Accenture, 2014), in the next five years, digital media budgets are expected to account more than 75% of the marketing budget, while social media spending will make up over 21% of the marketing budgets (Tadena, 2014).

As top leaders of their organizations, directors influence organizational direction, relationship with stakeholders, corporate image and organization efficiency (Men, 2014). With social media, which are interactive and personal, CEOs are able to reduce the power distance between them and their public. In this way, CEOs can get in touch with their stakeholders in a personal way. This two-way communication through social media allows for an additional increase in the transparency of the communication of a company and CEO, which in this way presents its accessibility and sociality (Men & Stacks, 2014).

The social presence and activities of CEOs through social media are believed to show innovation and enhance the image and reputation of his / her company (Weber, 2012). According to the same authors, it is believed that social CEOs who can enter into personal interviews with their stakeholders represent a new wave of corporate leaders (Weber, 2012). In research by the same author (Weber, 2012), the advantages of engaging the following channels - the intranet company, the company's website and social media - are evident. Researchers pointed out that each channel has its own distinctive purpose and merit, and by properly integrating it, they can accelerate and deepen the impact of the communication strategy.

The research (Nguyen & Western, 2006) shows the specific complementary effect of online news and the use of information from traditional sources, believing that internet news and information was obtained through traditional ones in a positive correlation. Research has shown that those who inform most on the Internet are still using traditional sources. These results indicate that, even if there is a decline in the use of traditional media, traditional media will continue to exist as a supplement to the Internet in the service of news and information (Nguyen, Western, 2006).

CONCLUSION

The speed of the change of traditional mass media is conditioned by the speed and intensity of technological changes and the degree of development of the technical and technological infrastructure. In this paper, through the literature review and the analysis of the results of numerous researches, as well as the results of research on the use of new media in Serbia, especially the social networks, it has been found that internet and social networks are being used to a large extent both for business and individual purposes.

The results of this study indicate that the characteristics and the role of traditional media in the new digital environment are being modified, which leads to the redefinition of the concept of media. Traditional media in their online versions acquire new features, that are interactivity and multimedia In Serbia there was the growth of online advertising, the number of news portals keeps increasing, the online research media are initiating and also there are increasing visits to news sites and on their pages on social networks. It can be concluded that the Internet and traditional media are complementary. In other words, there is a significant relationship between traditional and new media.

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THE IMPORTANCE OF MARKETING COMMUNICATIONS IN SMALL COMPANIES IN SLOVENIA

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ABSTRACT

A modern company that wants to communicate efficiently with its environment prepares a detailed plan of marketing communication that is part of the marketing and strategic plan of the company. However, only big companies with good knowledge on marketing and adequate funding to invest in marketing plan this way. Meanwhile, marketing in small and middle-sized companies has special characteristics. Research has shown that small enterprises equate marketing with sales, promotion and advertising. Most of them have short-term plans and their awareness about the importance of communication is low. Research also shows differences between small and big companies in forming the tools of marketing communication mix. Small companies are not simply small versions of big companies. They have their own qualities and characteristics. The aim of this paper is to learn about specific characteristics of marketing communication in small companies. With researching marketing communication in small companies, we find out, how they understand this field and how they implement and plan it and what are special characteristics of marketing communication mix in small companies.

Key words: marketing, marketing communications, small companies, marketing communications in small companies, marketing communications mix

INTRODUCTION

The article shows the results of the research which the Project of Voronezh City Socio-Economic Modern marketing calls for more than developing a good product, pricing it attractively, and making it accessible. Companies must also communicate with their present and potential stakeholders and the public. For most marketers, therefore, the question is not whether to communicate but rather what to say, how and when to say it, to whom, and how often. Consumers can turn to hundreds of cable and satellite TV channels, thousands of magazines and newspapers, and millions of Internet pages. They are taking a more active role in deciding what communications they want to receive as well as how they want to communicate to others about the products and services they use. To effectively reach and influence target markets, holistic marketers are creatively employing multiple forms of communications (Kotler&Keller 2012).

However, large companies, strong brand companies operating in major markets and having some marketing knowledge and resources that they are ready to invest in to plan marketing communications. In large companies, marketing communication is structured, strategically planned and carried out in line with the notions of classical marketing theory, while marketing and marketing communications in small businesses are characterized by special characteristics, style and organization (Hogart-Scott, Watson and Wilson (1996) and Hultman (1999) found that in most of the small companies that were studying, marketing activities are planned informally. Stokes (2000) found that entrepreneurs in small businesses are oriented towards innovation, driven by new ideas and intuition instead of customers' wishes.

MARKETING COMMUNICATIONS MIX IN SMALL COMPANIES

The marketing communications mix in small companies contains all the classic marketing communication tools, and some authors equally add to their marketing from mouth to mouth and interactive marketing. The combination of the use of these tools in small companies depends on the goals of communication, the target group, the budget intended for communication and the type of product or services. A small company needs to find the most appropriate and cost-effective combination of tools that will communicate the product in the most innovative and attractive way (Konečnik Ruzzier, Ruzzier, & Hisrich, 2013).

Advertising in small companies

Communication tools in small companies do not usually include advertising, especially television, as this is far too expensive. Advertising in a small compabies must be carefully planned and adapted to the target groups. Small companies therefore use media advertising, which is more accessible and cost-effective. Instead of expensive ads on national television, they use ads on local or cable channels, on local radio stations and in local newspapers. Likewise, for small companies operating on the local market, it is very appropriate to use outdoor advertising, especially if it is innovative (Jerman &Završnik 2007).

For small businesses that do not only operate locally, local media are not enough to complement them with advertisements on the Internet, which is surely one of the better media for advertising companies (Knight Ruzzier, Ruzzier, & Hisrich, 2013). Also in Slovenia, the use of the Internet is growing rapidly. Over the past ten years, its use has more than doubled, so now 65% of the population regularly use the Internet. After reaching, it is third, immediately for television and radio, and on average, it is spent for users two and a half hours a day. According to Mediane, a market research and media research institute, almost 18% of people online always notice advertisements, and 22% of people advertise on the Internet to help make good purchasing decisions. All this information is very interesting for small companies and points to the potential effectiveness of online advertising (Henigman, 2015). In the last five years, the value of online advertising in Europe has doubled; even last year, online advertising was the largest generator of growth in the entire advertising market in Europe, as advertising in all other media decreased altogether. In Slovenia, 50 to 75% of online advertising funds are invested in online media like Google, Facebook, YouTube, as they allow targeted advertising.

Public Relations in companies

Public relations is a communication tool that is usually combined with advertising. For this reason, the importance of public relations in small companies has been increasing in recent years, as consumers are more likely to believe opinion leaders and journalists than advertisers and companies. Nevertheless, relations with the public should not only be an extension of advertising, but an independent communication tool. In order to maximize the effectiveness of the campaign, small business communications should first start with public relations and later combine them with the rest of the tools. In addition to high credibility of messages and low costs for small companies, the use of public relations has even more advantages - less targeted audience saturation with messages, impact of opinion leaders and innovators, and cheaper and easier sending of messages to target groups. One of the main weaknesses is the lack of coordination with other areas, and in addition, a small company does not have control over how the media will publish the message and if it will be at all. Very little has been explored regarding the actual implementation of public relations in small enterprises. One of the reasons most likely is that small companies have few specialists in different fields (Carson, Stabnley, McGowan, & Hill, 1995). In small businesses, marketing is already being carried out in a very simple way, so it is difficult to determine how public relations is conducted in these companies (Moss, Ashford, & Shani, 2003). Using public relations tools will definitely increase in the future. In particular, companies with a low budget for communication will deliberately plan and introduce innovative approaches to future public relations activities.

Sales promotion in small companies

A small company uses sales promotion tools to offer added value to the product. Sales promotion tools are most useful and effective in the maturity phase and the decline in the product's life (Chaston & Mangels, 2002). The use of sales promotion tools has also been increasing in small companies in recent years due to:

- Decrease in the importance and effectiveness of advertising
- A focus on short-term goals that sales promotion can help to achieve
- An increasing number of brands that do not differ much from each other
- The growing power of sellers and increasing competition
- Changes in consumers' behavior - Increasingly belonging to brands and higher price sensitivity.

For small companies, appropriate sales promotion tools are targeted at:

- Consumers - tools can be priced with which a small company wants to influence the price perception of consumers, which can have a significant impact on their purchases (coupons, reductions, quantity discounts, etc.), and non-priced (samples, gifts, prize games, loyalty programs, guarantees).
- Trade intermediaries - small businesses use them more often, because it is still a particular challenge for them to get into the shelves. This includes, for example, price reductions, gifts, special invitations to events and receptions, specialized fairs, etc.
- Sales agents and other companies (sales fairs, invitations to special events, cash prizes, invitations to travel, etc.).

Considering that excessive use of these activities can reduce consumer long-term brand loyalty, it is important that small companies use various sales promotion activities. In particular, those activities that only encourage quick purchases and do not build brands are to be combined with other tools, especially with advertising. Some tools that promote consumer returns, such as loyalty programs can actually contribute to long-term sales growth.

Direct marketing communication in small businesses

Marketing is developing in the direction of increasing immediacy, high targeting and interactivity. This is why direct marketing communication becomes a key element of the entire marketing web. It converges the distance between consumers and products that they need urgently and builds relationships with them. It is suitable for both small and large companies, since they can all benefit from it. It is even more appropriate for small companies because they have to use their own, usually a lower communication budget, thoroughly (Thomas, 2007).

In its beginnings, direct marketing communication in a small company was understood in terms of customer database, with which it contacted, usually by post or telephone. Today's small businesses who know what and how they can get the most out of it use it not only as a communication tool, but also as part of their business model. The importance of direct marketing communication and its upgrading can be so remarkable that with the effective use of this kind of business model from a small local company, it can grow into a serious player in the global marketplace.

Personal selling in in small companies

The essence of personal selling is in direct relationship between the seller and the consumer, which has the precise aim - to achieve a purchase that will satisfy the consumer's wishes and needs. In the past, the belief was that small businesses should focus primarily on personal selling, as they are essentially closer to their customers and can gain a large competitive advantage over larger companies. In some cases, this is still true, but it depends very much on the way a small business operates, a type of market, the nature of marketing, and the competition of the company. Many small companies want to integrate more personal selling into their communication network, but this is an expensive method of communicating with individual consumers. The cost-effective becomes only when the average purchase value of one consumer is very high. Personal selling is a basic communication tool for a small companies that operates in a highly concentrated, low-cost market, each of which represents a large share of the company's revenue.

In small companies, especially from the beginning of business, Director is actually the most important sales staff. In many cases, the personal relationship that it develops with its consumers remains for a longer period and becomes stronger and deeper over time.

In small companies, personal selling are often taken over by the owners / directors, mainly because they develop a deep understanding of the needs of key users of the company over time (Chaston & Mangels, 2002).

In the future, creative sales will increase, while new forms of impersonal sales, supported by advanced information and communication technology, will replace the first two levels.

It is important that small companies look at personal selling from a long-term perspective and use a new sales model, which is also called consumer-oriented sales. The core part of the sales process is building confidence between sellers and consumers, followed by the determination of consumer needs and desires. This requires a good way of obtaining information, listening to consumers and analyzing responses. Then the presentation of the advantages and attributes of the product, which represents the satisfaction of the customer's wishes and needs, is followed. The least emphasis in the sales process is obtaining information and completing the purchase. This way of personal selling is the foundation for creating a long-term relationship with consumers.

EMPIRICAL FINDINGS

The survey included micro and small companies with the number of employees from 1 to 49. The survey questionnaire was sent by e-mail to more than 8000 companies, 227 were completely returned.

The questionnaire contained three parts of questions. The first, introductory part contained demographic data on small companies - the number of employees, the age of the company, the type of company's activities, the product market, the geographic market, the region in which the company is registered and the amount of sales revenue in the past year.

The second part had two open questions, with which we gained insight into the understanding of marketing and marketing communication in small companies.

The third set of questions was the most comprehensive and related to the implementation of marketing communication in a small companies.

a) Sociodemographic characteristics of the sample

The questionnaire was completely fulfilled by 227 small companies. Of this, the vast majority of companies (77.4%) had up to 10 employees, followed by companies with 11 to 25 employees (15.9%), the least number of companies with 26 to 49 employees (6, 6%)

Almost two-thirds of participating companies (62.1%) works in services, almost a quarter (23.3%) in trade and in production sector only 15% of the companies.

b) Understanding marketing communications

The answers showed that a quarter (25.3%) of small businesses understand marketing communication as a call to sales, while the second quarter (23.5%) is making contact with customers, the environment, various public and communicate with them. 20.7% of respondents represent marketing communication promotion, presentation of the product, informing customers, and 14.3% of respondents equate marketing communications with advertising. Integrated in the broader context of establishing and building relationships and dialogue with environmental marketing communication understood only a tenth of small businesses.

c) Planning of marketing communication and communication mix in small companies

In most cases, more than two-thirds (69.2%) of small companies are mainly engaged in marketing communications by the director or the owner of the company. In approximately 8% of companies, these activities are carried out by a person in sales or by general and common services.

d) Marketing communication Mix in small companies

In the continuation of the research we wanted to explore the marketing communication mix in small companies. Small companies first assessed the frequency of using individual communication tools with a scale of responses ranging from 1 (never) to 5 (very often).

Data show that small companies on average most often they often use personal sales (M = 3.5), while other tools use on average only occasionally (2.5 <M <3.4). Small companies use very little public relations (M = 2.5)

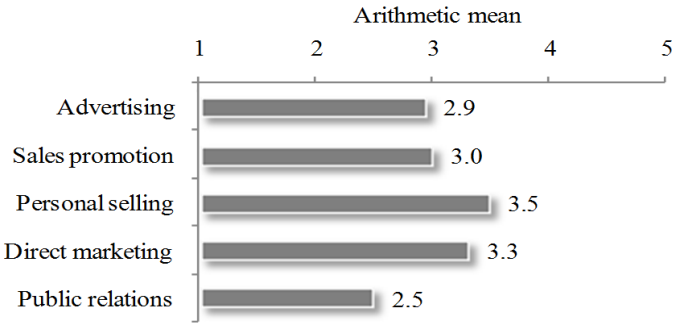

Figure 1: Using marketing communication Mix in small businesses

e) Designing marketing communication in small companies

When analyzing the steps of planning successful marketing communications, the questions were formed in the form of statements with the Likert scale. The claims were formed after eight steps in the marketing communication planning process.

Data show that for small companies, on average, it is true that they implement the first six steps of marketing planning (3.5 <M <4.4). The exception is the last two steps, on which companies are undecided on average or, neither agree nor disagree - they connect communication tools in their entirety in order to achieve the greatest possible communication effect and, after the completion of the marketing communication campaign, measure its effects on awareness, sales and customer satisfaction.

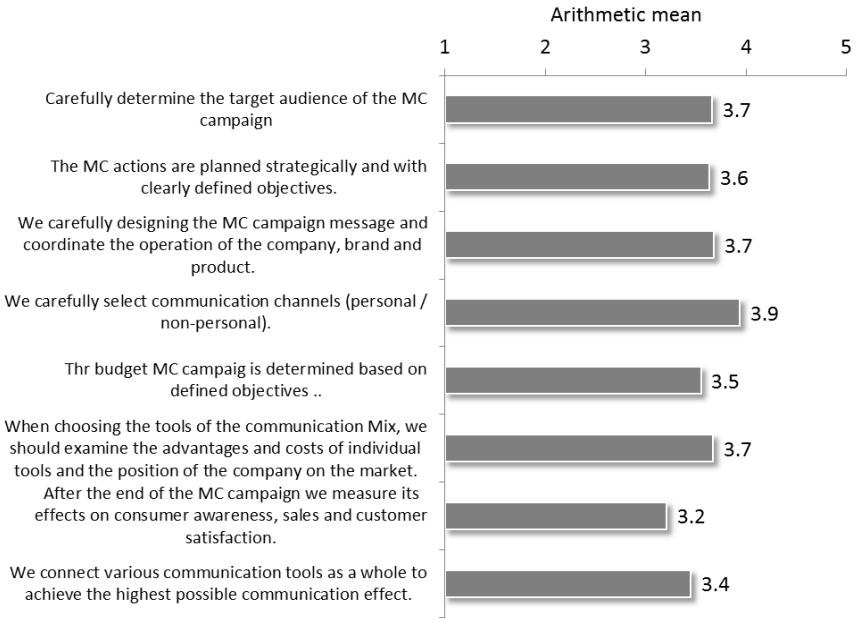

Figure 2: The process of formal planning of marketing communication in small companies
Notes: 1 = not at all agree ..., 5 = completely agree

CONCLUSION

The research of marketing communication in small companies has shown that the understanding of marketing and marketing communication is still insufficient and too narrow. Small companies mostly understand marketing in terms of communication (or promotion and advertising) or in terms of sales. Only one fifth of small companies are those who understand the marketing concept wider, holistic, at least as a process of trade, building a brand, establishing a dialogue or building long-term relationships with consumers. It is similar to the understanding of marketing communication, since it is the small companies that mostly addresses the sales and contacts with the environment. In over two thirds of small companies, the marketing director is engaged in marketing communications. The owner of the company, that is, the implementation of marketing communications in small enterprises depends largely on his knowledge, skills and competences. The survey also showed that people who take care of marketing communications in a small company acquire the most relevant knowledge independently, through books and manuals, and informal education, which sixth do not have adequate knowledge. In fact, it is not surprising that the understanding of marketing and marketing communication is inadequate to such an extent. Therefore, it would be good if the owners or Directors of small companies devoted a little more attention to acquiring knowledge in this field, at least in terms of quality non-formal education, visiting forums and conferences.

For better, in\tegrated, strategically oriented and effective communication, small companies can hire outside co-workers and advertising agencies. There are also those on the market that specialize in working with small companies, have both marketing, design skills, and are cost-effective for small companies.

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Session D: ECONOMY AND FINANCIAL MANAGEMENT

Papers (pp. 229-256):

MONITORING OF BANK'S RISKS AS A FUNCTION OF RISK MANAGEMENT

UDC: 005.334.336.71

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ABSTRACT

The banking business is one of the most profitable and important types of economic activity, and it is important to remember that this business, first of all, built on trust. Due to this kind of banking features it could be argued that banking activities face numerous risks. It is specially noted that banks' stability is one of the most important indicators of economic condition. Increasing of socio-economic threats which are closely linked with risks of banking activities, highlights the need for the creation of the efficient risk management system in banks. Nowadays, in the current situation of the transforming russian banking system, the creation of that system is one of the priority tasks for the banks and the mega-regulator of the economy. Monitoring of bank's risks is one of the key functions of risk management in banks. The article outlines the main methods which used in Russian practice to monitor banking risks and indicators used in the monitoring process to identify bank's risks. They are compared in order to identify strengths and weaknesses of each of the methods.

Key words: Risk Management, Bank's Risks, Risk Monitoring

INTRODUCTION

In terms of commercial bank management it is essential to remember that banking activities have their own special aspects and that the stability of the economy highly depends on the stability of the banking system. Therefore, banks have to make sure they develop in a constant manner. Modern science doesn't have any universal definition of financial stability. But if we take into account all of the existing definitions, we can conclude that financial stability of commercial banks is the ability to operate without losses under volatile economic conditions and in accordance with the requirements of the regulator and those of the creditors. Therefore, it is especially important to conduct effective analysis and evaluation of the existing bank risks in order to ensure their proper management. Even though bank risks vary in nature, they still have something in common – every possible risk can directly influence the financial stability of a particular banking institution and the economy.

BANK'S RISK MANAGEMENT AS A FINANCIAL STABILITY INSTRUMENT USED IN THE BANKING SECTOR

In terms of the current stage of risk management development, bank risk management is considered to be a combination of methods and techniques used by bank staff in order to ensure positive financial result even in case of uncertain operational conditions, to predict risk events and to take measures aimed at the elimination or de-escalation their negative effects (Lavrushin O., Valenteva N., 2013).

Due to the banking business specifics and the importance of the banking sector both for the economy and the social sphere, risk management is conducted directly by the bank and the regulator, i.e. the Central Bank in case of Russia (the Bank of Russia).

Typically the risk management system includes risk management entities, risk identification, risk assessment and risk monitoring. Risk monitoring is a process which involves regular analysis of risk indices and adoption of decisions with the purpose of risk minimization and profitability maintenance.

Risk monitoring can be divided into two categories depending on whether it is conducted by the bank itself or by the regulator (Travkina E., 2013):

- monitoring of the bank's financial standing, including internal control and evaluation of the bank's general activities and those of its subdivisions and business areas;
- monitoring of a commercial bank's stability conducted by the regulator. In this case the activities of the bank are compared with the existing requirements. If they satisfy those requirements, then the bank's condition can be called financially stable.

Bank risk monitoring is the key element of the banking regulation, which is the main duty of the regulator. It is conducted in accordance with the goals of the Bank of Russia, which are established by the legislation and include the following: development and strengthening of the Russian banking system, stability of the financial market and the national payment system.

Regulatory compliance control as an instrument used for bank risk monitoring

Among the main indicators that describe bank's activities are the mandatory norms. Those indices are calculated using a special formula and must be followed by all the banks that operate in Russia. The required values are established by the Instructions from the Bank of Russia. In particular, the following norms are considered mandatory:

- capital adequacy;
- liquidity;
- single-client concentration or related-party exposure limits;
- risk limits for large credits;
- limits for credit volume, bank bonds and guarantees issued by the bank for the stockholders;
- cumulative insider risk;
- employment of the bank's own funds with the purpose of the acquisition of stocks (equities) of other entities;
- risk limits regarding any related party (parties).

This regulatory system is based on CAMEL, the American bank performance analysis method, and considers all the main risks associated with banking, including the following: the market risk, i.e. the risk of capital loss as the result of adverse effects on market prices in case of investments in commodity, stock or exchange markets; the repayment risk which states that a loan agreement participant might be incapable or unwilling to pay interest or the principal loan.

The regulator uses an expanded rating system that describes the financial conditions of a bank and its risk exposure in order to find out whether the bank meets all of the requirements for participating in the deposit insurance system used for the general public. It includes analysis and evaluation of the capital, the assets, the profitability, the liquidity as well as the quality of bank management.

Stress testing as an instrument used for the estimation of possible losses in case of any risk event

Stress testing is one of the most common instruments used in bank risk monitoring. It allows you to evaluate the possible losses of financial institutions caused by different stressful events. According to the Bank of Russia, stress testing is the evaluation of a potential impact on the financial condition of a banking institution made by several given changes in risk factors that correspond with exceptional yet possible events. During the development of the main monetary policy directions for a three-year plan the regulator usually creates two scenarios, the basic one and the alternative one. Both of them are based on oil prices. In this particular case the stress test is used to evaluate the macroeconomic conditions and the impact of possible risks on the economy.

As for the micro level, the banks are advised to conduct the stress testing on their own. This analysis can help evaluate the bank's prospects and determine potential simultaneous impact that several risk factors can cause on the activities of the banking institution in case of an extreme yet possible event. When a bank conducts a stress test, it should always recognize its asset portfolio as a whole. If it identifies only the risks that are associated with some separate elements, the risks for the asset portfolio as a whole might be evaluated incorrectly. The banks are advised to develop the what-if scenarios that recognize the worst possible risk and potential losses.

The most common types of stress tests that are used for the evaluation of possible risks and their consequences for commercial banks are represented at Figure 1.

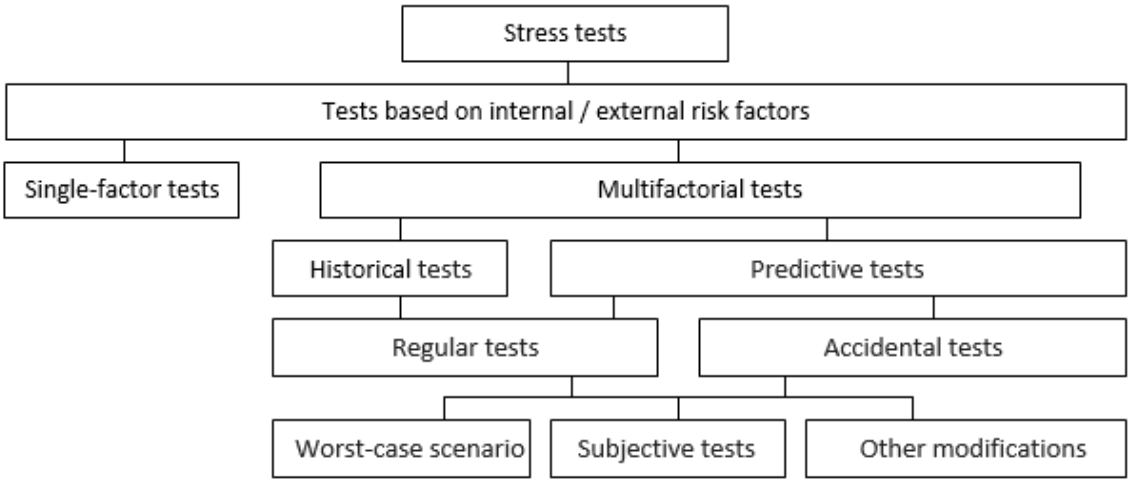

Figure 1: Classification of stress tests (*Andrievskaya I., 2007)*

External monitoring of bank's risks, conducted by the regulator, has a direct impact on maintaining the stability of banks and the banking sector of the national economy. In conjunction with internal monitoring which is conducted by the bank independently, there is an opportunity to identify risks, forecast risk events and take measures to prevent or minimize the damage caused by them.

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AVAILABLE SOURCES OF SME FINANCING IN SERBIA

UDC: 334.71:336(497.11)

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ABSTRACT

The financing practice of the Serbian economy shows that the financial system of Serbia is predominantly based on banking institutions as the bearers of the financial activity. A small part of the financial flows fall to other specific forms of financing business entities. When it comes to small and medium-sized enterprises, the most common sources of financing are own capital and bank loans. However, in addition to these two forms of financing, business entities operating on the territory of Serbia also have available financings through: leasing, factoring, venture capital and private equity. Potential funding sources for SMEs are also non-refundable funds granted by state or international funds. The aim of this paper is to analyze the state of SME funding sources in Serbia in the period directly after the economic crisis from 2008 to the present.

Key words: loans to SME, factoring, leasing, venture capital and private equity, funds.

INTRODUCTION AND METHODOLOGY

When it comes to financing small and medium-sized enterprises, a number of specifics influence the structure of their financing sources. Entrepreneurs start the venture by financing it mainly with their own capital at the inception phase (Gompers & Lerner, 2001; Metrick & Yasuda, 2010). Thus, the first source of financing for starting a small business is the founders' own capital. One of the problems for these companies is how to provide resources for further growth and development. As looking for additional sources of financing, companies have two options: additional borrowing through debt or the raising additional capital (Berger & Schaeck, 2011). Depending on the company's own capital, the length of the company's business and financial performance indicators, financial institutions can provide funds in the form of a debt that the company returns according to a predetermined depreciation plan. On the other hand, if the company is financed through capital, the ownership structure in the company is expanding and moral hazard appearing (Bettignies & Brander, 2007; Inci & Barlo, 2010). Since SMEs are mostly non-listed companies, additional capital cannot be obtained through the issue of shares. In this case, additional capital could be provided by private equity and venture capital funds, and so encourage the quality and innovation of the SME by external supervision, and through that encourage the economic growth of a country (Maula, Murray, & Jääskeläinen, 2007; Samila & Sorenson, 2009).

The paper presents an overview of available funding sources in Serbia. Therefore, the aim of the work is to analyze the financial institutions' placements so far by identifying the tendency of the financing sources use by SMEs. In order to obtain data on the scope of the available sources of financing we used the consolidated balance sheet of the banking sector of Serbia, as well as the individual financial reports of selected banks, available data of the Business Registers Agency and the data obtained by the analysis of state owned institutions and international fund for support SMEs.

BANK LOANS AS THE MOST COMMON FORM OF FINANCING THE ECONOMY

At the beginning of the 21st century, the financial system of Serbia suffered major transformations. By adopting a series of legal and regulatory regulations related to banks' operations, and primarily by opening a domicile banking market for the entry of foreign banks, the structure and number of banks in the market has changed. System reforms and the entry of foreign banks resulted in the acquisition of domestic banks by foreign banks and mergers within the existing domicile banks, and the number of banks in the banking market has almost halved. Strengthening the banking sector and introducing a deposit insurance system gradually restored confidence in the banking system of Serbia, and it also contributed to the largest share of banking sector in the overall structure of financing of the Serbian economy.

After the recovery of the Serbian banking system, the absolute amounts of loans granted to the economy as well as the population grew. Observing loans granted to the economy, there is a significant decline after the crisis, that is, from 2010, both, in absolute and in the relative amount. The real growth of loans granted to the economy and households is shown in the following graphic representation.

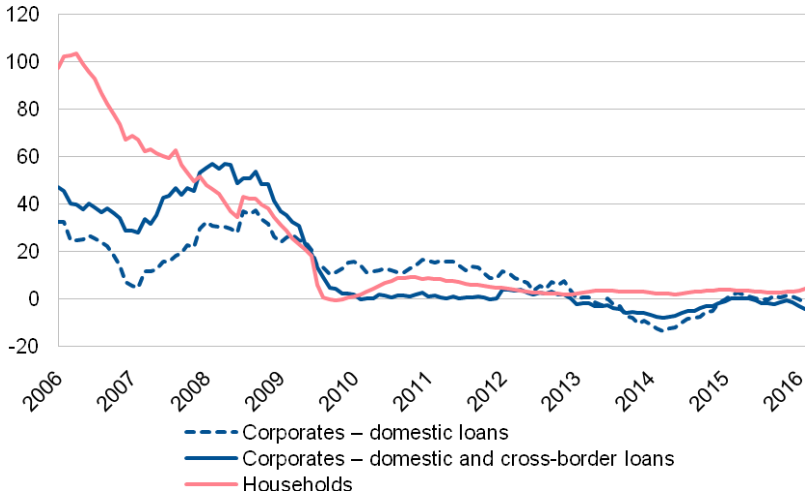

*Figure 1: Real growth of loans to corporate and household sectors**

* (y-o-y growth rates, %) Excluding the exchange rate effect. Source: NBS.

Based on the Figure, it can be seen that the loans granted to the population reacted more to the economic crisis by drastic fall in the real rate, which was reflected in the higher amounts of problematic loans and write-offs. Observing loans granted to the corporate, there is a sharp decline in the real growth rate after 2009, which can be attributed to the effects of the global economic crisis on the credit market in Serbia. The relatively lower growth rates of loans granted to the corporate in the years following the crisis are the result of a reduction in the debt and a smaller volume of borrowings compared to the pre-crisis period. According to the NBS data, domestic loans to industry in the year 2006 registered a decline of 3.8%. Such a fall is the result of banks' activities in solving NPL through a write-off on the one hand, and on the other hand, premature repayment of loans with simultaneous direct borrowing abroad. In addition, the decline was also influenced by the repayment of subsidized loans approved under the 2014 program. If only newly approved loans to the corporate are observed, they increased by 16.6%.

In summary, the analysis of credit placements in Serbia in the period from 2000 to 2017 points to the conclusion that the amount of loans granted to the business sector, after a large decrease in 2002, was observed in absolute terms grew by 2012. When considering percentage participation in GDP, it can be noted that in the period from 2003 to 2012, the share of loans granted to the economy grew by an

average of 0.07% of share in GDP. The reform of the banking system has affected the initial decrease in credit placements, due to tightening of the borrowing criteria. After 2002, there was an increase in the amount of "healthy" loans granted to the business sector, which is reflected in the participation of NPL in that period according to NBS data.

FINANCING THROUGH FINANCIAL LEASING AND FACTORING

In addition to bank loans, one of the alternative forms of financing the business process in companies is financial leasing and factoring. Financial leasing issues are defined by the Law on Financial Leasing "Official Gazette of the Republic of Serbia" No. 55 of 27 May 2003 and 61/05 of 18 July 2005 and 31/11 of 9 May 2011 and 85/2011 and 87/2012, 4/2015, 33/2015 and other laws referring to financial leasing. It is under the responsibility of the National Bank of Serbia to supervise the operation of financial leasing providers and, in its jurisdiction, it is the issuance and revocation of a license for financial institutions dealing with financial leasing operations.

In the period from 2008 to 2017, the number of leasing companies on the territory of Serbia remained relatively unchanged. According to the data of the National Bank of Serbia, 17 leasing companies operated by mid-2012, and from the middle of 2012 until now 16 leasing companies operate. The share of leasing companies' assets in the total financial sector of Serbia in the period from 2008 to 2015 is given by the following table:

Table 1: Assets of the leasing and the banking sector in the overall financial sector of Serbia in the period 2008-2015.

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Leasing sector	6,2%	4,7 %	3,6 %	2,8 %	2,3 %	2,2 %	2%	1,81%
Banking sector	89,3%	90,8%	91,8%	92,4%	92,6%	92,4%	92%	91,6%

Source: Authors based on data from the NBS report

Based on the presented ratio of the assets of leasing companies and banks to the entire asset of the financial system of Serbia, it can be noticed that leasing companies have a small share in the total assets of the Serbian financial sector. If leasing is viewed through a time series, it can be noticed that leasing sector participation in the overall financial sector is declining.

The analysis of the financial reports generated by NBS in order to control the financial leasing sector in Serbia shows that the structure of the placements of leasing companies has not significantly changed over the past ten years. In order to provide a clearer picture of financial leasing as a source of financing for business entities, the structure of placements will be analyzed according to the subject of finance through leasing and the recipient of leasing.

According to the latest NBS data, the total balance sheet assets of the leasing sector increased in the third quarter of 2017 on the ratio to the last quarter of 2016 by 8.6%. The structure of leasing sector placements, according to the recipient of leasing in 2017 (without data for the last quarter), were the following: 83.8% of placements were directed to companies, followed by farmers and entrepreneurs whose share does not reach either 5% of placements. Regarding the structure of placements in 2017, the structure did not change significantly compared to the previous years. The average values for 2017 (without data for the IV quarter) show that 36.87% of placements were used for commercial vehicles, buses, minibuses; 31.13% of placements were used to finance passenger vehicles, and other placements made about or less 10%.

This data suggests that leasing as a means of financing is not used enough, especially not in the area of production, where there is the possibility of financing the purchase of equipment or fixed assets through leasing. On the other hand, leasing is used to a large extent with enterprises engaged in transport services and is mainly used for the purchase of passenger cars.

Factoring is regulated by the Law on Factoring "Official Gazette of RS" no. 62/2013, which was adopted on July 16, 2013 and came into force on July 25, 2013. Coming into force of this law, the factoring was for the first time institutionalized, although it existed in economic and financial practice but it was regulated by the contract between the agent and the factors. With the institutionalization of factoring it was to expect that it will be used more in the economy as an alternative source of financing business entities and affect a higher liquidity of the economy. SMEs should have special benefits from factoring, especially those which are not creditworthy and do not have adequate means of security.

On the territory of Serbia, the license for performing factoring business, dated on December 2017, has AOFI (Agency for Insurance and Financing of Exports), fourteen factoring companies and thirteen banks of thirty operating on the territory of Serbia. Factoring activity in Serbia is at a very low level. Among the small number of factoring banks, Societe Generale, Bank Intesa and Raiffeisen Bank have the largest amount of activity in the last two years. The following table shows the participation of factoring in the total assets of banks.

Table 2: Factoring in Bank Assets[1]

	2011	**2012**	**2013**	**2014**	**2015**	**2016**
Intesa	1,07%	0,77%	0,39%	0,03%	0,68%	0,3%
Euro efg	0,07%	0,08%	0,01%	0	0	0
Erste	0,27%	0	0,02%	0	0	0
Kombank	0,13%	0,03%	0,04%	0,02%	0,05%	0,08%
Otp	0	0	0,05%	0,01%	0,03%	0,02%
Raiffeisen	0,64%	0,41%	0,14%	0,43%	0,2%	0,21%
Societe Generale	1,71%	1,78%	1,63%	1,20%	3,17%	3,61%
Unicredit	0,18%	0,06%	0,16%	0,15%	0,29%	0,15%

Source: Authors based on audited financial statements of banks

Table 2 complements the analysis of the factoring of banks' placements and shows that the rate of factoring to the total assets of banks is at a very low level. Societe Generale Bank has maintained the largest share of factoring in total assets. In this bank, in 2014, the share of faktoring in total assets fell in comparison with the previous years, and in the last two years the share has more than doubled, but still remained at a low level. In the previous years, Bank Intesa had a higher percentage in factoring placements. Raiffeisen Bank increased the percentage of factoring in total assets in 2014, and then decreased. Unicredit Bank shows a certain amount of activities in the last two years.

Considering the factoring companies and AOFI, it should be noted that the NBS is recording a consolidated balance sheet from 2012 for these institutions. The amount of placements of these companies and AOFI is far higher than the placements of banks in factoring jobs. A review of the placements of all entities engaged in factoring in the past five years is given in the Figure 2.

Figure 2 shows that factoring placements are in a slight increase in Serbia in the past years. If we observe placements of factoring companies, we can notice relatively constant amounts. The overall structure of placements shows that the factoring companies have far greater amounts placed comparing to banks in the overall structure of factoring placements in Serbia. However, the relative share of banks in total placements is on the rise; in 2012 it was 15.5%, in 2013 it was 16.9%, in 2014 it was 17.2%, in 2015 it was 34.7% and in 2016 it was 34.5%. Although the percentage share of banks in factoring placements increased, the amounts are still small considered as the percentage of the total assets of the banks' balance sheets.

[1] Shows only the banks with the ratio of the factoring activity in total assets of 0.01% and above.

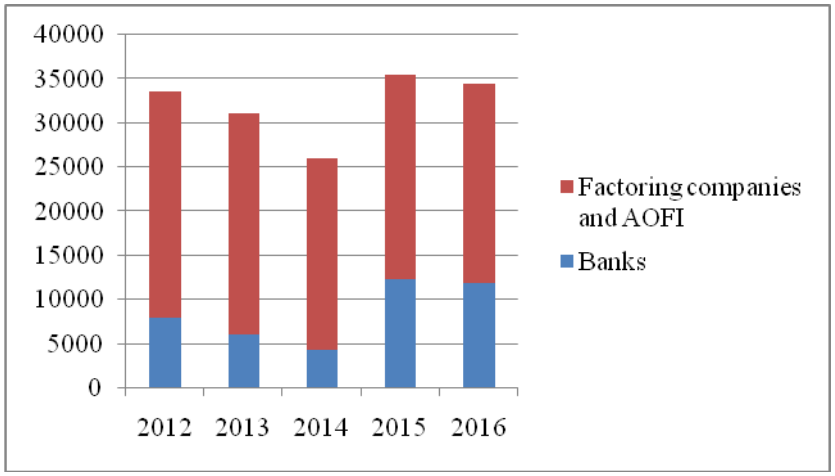

Figure 2: The amount of factoring placement according to entities that approve them in millions of dinars

Source: Authors based on NBS data and financial statements of banks

STATE OWNED FUNDS AVAILABLE SMEs

In Serbia there are several state owned funds established in order to support SME activities, to provide financial sources at better conditions, or to give grants for SMEs. In the following there is a list of most active funds:

- The Development Fund of the Republic of Serbia (1992-founder R. Serbia). This fund deals with the granting of loans for more favorable conditions for reconstruction of buildings, construction of new equipment modernization and employment.
- Provincial Fund for Agricultural Development (2001-founder Province of Vojvodina). The fund aims to encourage agriculture in Vojvodina by encouraging the establishment and organization of enterprises in the field of agriculture, encouraging co-operatives and improving the export of agricultural products.
- Vojvodina Development Fund (2002-founder Province of Vojvodina). Fund beneficiaries are small and medium enterprises, entrepreneurs, agricultural cooperatives, holders of individual agricultural holdings, with headquarters or residence in the territory of AP Vojvodina.
- The guarantee fund of the A.P. of Vojvodina (2003 founder AP Vojvodina). The fund was set up with the task of facilitating access to the financial market and providing more favorable terms of lending than those offered by banks.
- Development Agency of Serbia (2016-founder R. Serbia). The main activity of agency is to support SMEs and entrepreneurs in order to strengthen the economy of Serbia, support to direct investments and promotion of exports, raising the reputation of Serbia and regional development.
- Innovation Fund (2011-founder R. Serbia). The aim of the fund is to encourage innovation and provide funding for innovation activities, primarily through cooperation with international financial institutions, organizations, donors and the private sector. The focus of the fund focuses on encouraging and financing innovation in priority areas of science and technology, providing support for new technologies to emerge from the academic framework to the economy, and also helps small and medium-sized enterprises developing innovative technologies.

In addition to these state owned fund (institutions) which provide support to SMEs in the form of financing facilities, the state provides assistance to SMEs in applying for European funds. The current European funds available to SMEs and entrepreneurs, among others are: Horizon 2020, WBEDIF, APEX, EASI and COSME.

FINAL CONSIDERATIONS

Having in mind the overview of the financial sector in Serbia, it can be noticed that financing of the SMEs relies little on alternative sources of financing. Leasing is mainly used in transportation not in the production sector and the main purpose of its use is the purchase of vehicles not equipment. On the other hand factoring is used mainly to overcome illiquidity, and it is most used by larger companies since it is an expansive source of funds for SMEs. The main sources of financing for small and medium-sized enterprises are credit resources. There are a few VCPE funds present in Serbia and a small part of small and medium-sized enterprises uses capital as a source of financing. The most active funds in Serbia are SEAF South Balkan Fund, StartLabs (American Fund), Enterprise Innovation Fund ENIF, Enterprise Expansion Fund ENEF.

The number of institutions and funds at the state and provincial levels that support the SME activity proofs that the state actively supports the development of this sector either through direct investments or through a variety of benefits. The state also plays an important role through indirect regulatory measures. According to the World Bank report, Serbia has taken a number of measures in the last five years regarding the reform of the private sector. Some of them are the reducing the minimum amount of founding capital, the state facilitated the procedure for starting a private business, and simplified the procedure for issuing a building permit. Measures that hamper business processes relate to the increase in corporate income tax in 2013 from 10% to 15% and the abolition of the possibility of registering assets under urgent procedure in 2015.

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DOES A RISE IN MORTGAGE INTEREST RATE NECESSARILY INCREASE THE BURDEN OF BUYING A HOUSE?

UDC: 347.27
336.781

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ABSTRACT

In this paper, we demonstrate that although the housing price and house price-to-income ratio can undergo a very large rise, the burden of repaying a mortgage might decrease due to a reduction in the interest rate. In order to check if burden on house buyers increases or decreases, we suggest calculating and depicting "equal repayment curves". These curves represent a borrower's equal periodical repayment given that house prices and mortgage interest rates vary. The curves enable us to compare the burden of buying a house during a certain time period compared to a bench mark point intime. Using Israeli data, we calculated a house price indexed to income and showed that although nominal house prices during the period 2003:1 – 2011:4 increased by more than 66%, the burden on house buyers did not increase. These results contradict the idea held by many that reducing the interest rate necessarily makes buyers worse off due to increased house price-to-income ratio.

Key words: mortgage, interest rate, housing price

INTRODUCTION

Most people who consider buying an apartment use a mortgage in order to finance a large part of the purchase. The size of the mortgage is limited by the buyer's repayment capability which is directly connected to income and the mortgage interest rate. It is not surprising that some authors only consider disposable income and interest rates as the real price drivers of housing prices (Hunt and Badia, 2005, Hofman, 2005), while others add more explanatory determinants such as housing stock supply (McCarthy and Peach, 2004), population growth (Terrones and Otrok, 2004) and stock market and real credit (Fitzpatrick and McQuinn, 2004, Sutton, 2002). The measure of income elasticity on housing expenditure is often of considerable interest to applied researchers and policy makers in real estate economics. Arcelus and Meltzer (1973), Mayo (1981), Goodman and Kawai (1984), Hansen et al. (1996), and Gallin (2003) show that the income elasticity for home owners is high and can range anywhere between 0.5 and 2.8. This variation should not be viewed as an anomaly since income elasticity can vary across regions, socioeconomic factors, and estimation techniques. The strong relation between interest rates and housing prices has been mentioned by many researchers. For example, Anna J. Schwartz (2009) states that it has become a cliché to refer to the asset boom as a mania. The cliché, however, obscures why ordinary people become avid buyers of whatever has become the target of their desire. An asset boom is propagated by an expansive monetary policy that lowers interest rates and induces borrowing beyond prudent bounds to acquire the asset. John Taylor (2009) argues that the Federal Reserve held the federal fund rate too low for too long during the critical years of 2002 through 2005, a period of time that coincides roughly with the most rapid inflation in housing prices. Shiller (2009) recognizes that the period of very low federal fund rates coincided with the most rapid rise in housing price. Barth (2009) suggests the mechanism through which the drastic cut in the federal funds rate can be linked to the housing price bubble. The amount lent by

a mortgage institution to an individual is critically dependent on current disposable income and interest rates. This amount largely depends on the fraction of income that goes to mortgage repayments and the duration of the mortgage using a standard annuity formula. Ultimately, this value should be an important determinant of housing demand. The question we raise in this paper is whether increasing the interest rate necessarily makes the buyers worse off and whether reducing the interest rate makes them better off. Two factors should be taken in consideration regarding the effect of interest rates on housing buyers: the first is that an increased interest rate has a negative effect on housing prices and the second is that increased an interest rate increases the repayment of a mortgage. These two effects have contradictory effects on the burden of repaying the mortgage. In order to clarify the above ideas, let assume that two similar houses are offered for sale and that purchasing both of them can be fully financed by taking a mortgage. Let us also assume that one of the houses is immediately sold while the other is sold later on, only after the interest rate increased. Assuming that the effect of the interest increase on the housing price was fully absorbed, the house price is reduced. The buyer of this house would take a lower mortgage, but would pay a higher interest rate. The question is whether the mortgage repayment for the second house is higher or lower than that of the buyer of the first house. A common way to examine if the burden of buying a house increases or decreases is to check the ratio of an average house price to an average monthly income, an index that gives the number of months of income (totally dedicated to buying a house) needed to finance the purchase (see Friggit (2009, 2011) for example). Himmelberg et al. (2005) claim that in the US, the ratios used to investigate house price overvaluation are the price/rent ratios which increased, between 1995 and 2004, to a level above its long-term average. Tsai et al. (2012) claim that "theoretically, household income and house price should be integrated in the long run, since effective demand for housing depends on household income. Although speculative demand can also influence the fluctuation of housing markets, the effect should not be permanent. Hence, any variations in housing affordability will be temporary. In other words, house price-to-income ratio (PIR) is a stationary variable". This attitude might be misleading since it ignores the changes in mortgage interest rates. In order to demonstrate this, in table 1 we present the average house price, average wage and the number of months worked needed to finance buying a house in Israel in the first quarter of1995 and the 4th quarter of 2011.

Table 1: Number of months of work needed to finance buying a house in Israel

	Average Wage	Average House Price	Number of Months of Work Needed to Finance Purchasing a House
1995-1	4,123.3	408,696	99.1
2011-4	8,535.3	1,097,800	128.6

As we can see, the burden of buying a house increased dramatically from 99.1 months in 1995:1 to 128.6 months in 2011:4. As mentioned before, the results presented in Table 1 can be very misleading since they ignore the drastic changes in interest rate during this period of time. In order to take in consideration the changes in interest rate, we used the data of housing prices and interest rates in Israel for the period 1995:1-2011:4 and calculated the monthly mortgage paid by an agent who purchased a house in each of these quarters, assuming that the agent fully financed the buying by a mortgage and took a Spicer loan for 20 years. For each year, dividing the monthly mortgage payment by the monthly average wage we get the share dedicated to mortgage repayment in figure 1.

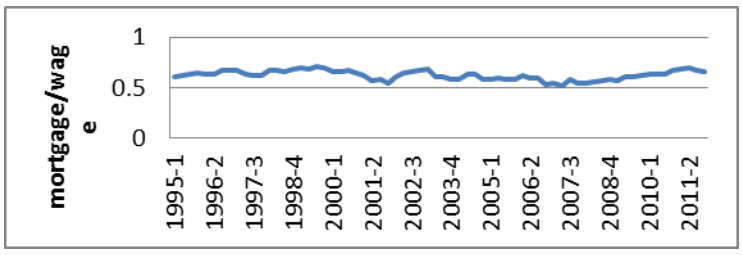

Figure 1:Share dedicated to mortgage repayment

As we can see, the ratio fluctuates around a mean, but does not show a large deviation from the mean.

THE MODEL DEMAND FOR HOUSING AND EQUAL REPAYMENT CURVES

Let us define:

PV-mortgage size, T – duration of repayment, i – periodic mortgage interest rate;
PMT – mortgage repayment.

Mortgage standard annuity formula calculates the repayment according to the Spicer formula:
Let us consider two consumers: the first can dedicate 1,000 dollars each month to mortgage repayment while the second can dedicate 2,000 dollars.

Let us extract, for a Spicer loan taken for 240 months, the pairs of loan size and interest that are accompanied by a constant monthly repayment of 1,000 dollars and in the same manner the pairs of loan size and interest that are accompanied by a constant monthly repayment of 2,000 dollars.

Table 2 presents, for a given fix amount of periodic repayment (PMT), pairs of interest rate (i) and loan size (PV), assuming that the duration of repayment is fixed and equal to 240 months.

Table 2: Interest rate and loan size, given periodic repayment

interest	repayment=2000	repayment=1000
1.0%	434,883	217,441
2.0%	395,348	197,674
3.0%	360,622	180,311
4.0%	330,044	165,022
5.0%	303,051	151,525

As we can see, the loan size (PV) is reduced as the interest rate is higher. Figure 2 presents equal repayment curves for monthly repayment of 1,000 and 2,000 dollars.

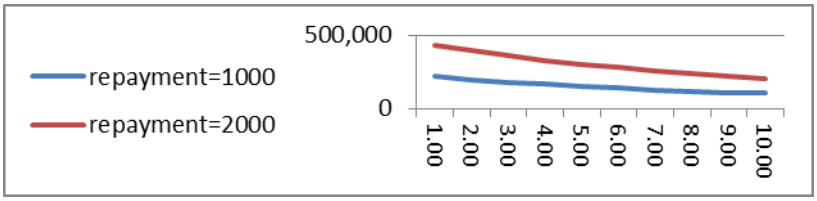

Figure 2: Equal repayment curves

Notice that for a given exogenously determined interest rate, and a given repayment capability of the borrower, the curve defines the higher amount the household can offer to pay for the house. Each equal repayment curve can represent the demand curve for housing of households with a certain level of income that determines the available amount allocated for mortgage repayment.

IS A RISE IN HOUSE PRICES A BURDER ON BUYERS?

According to empirical evidence, the price of a house is negatively connected to the interest rate. Figures 3 and 4 present the connection between interest rates and average house prices in Israel for the period 1995:1-2011:4. We can see a clear negative connection.

The question we should ask ourselves is whether a rise in housing prices increases the nominal burden on house buyers. In order to answer the question, we should combine figure 2 with figure 3. If we compare the buyer's situation in 2003.1, a period with the highest interest rate during the sample period, to his/her situation in other periods, there are 2 possible states: 1. S/He became worse off, 2. S/He became better off. Figure 5 presents a situation where the buyer becomes worse off since the equal repayment curve is below most of the dots representing actual house prices. This means that a buyer financing a house by a mortgage in Israel would have had a higher repayment in periods other than 2003-1.

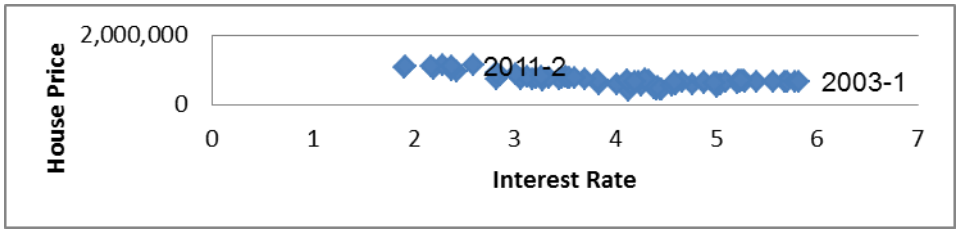

Figure 3: The connection between interest rates and average house prices in Israel

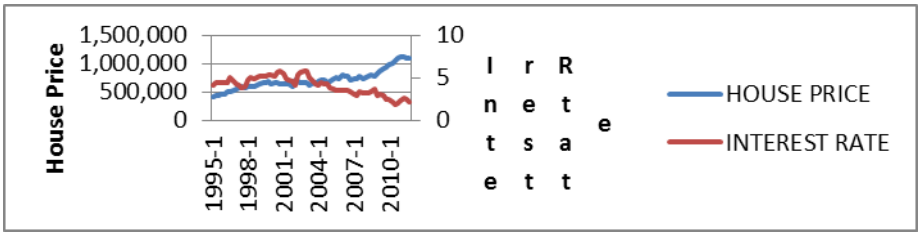

Figure 4: The connection between interest rates and average house prices in Israel

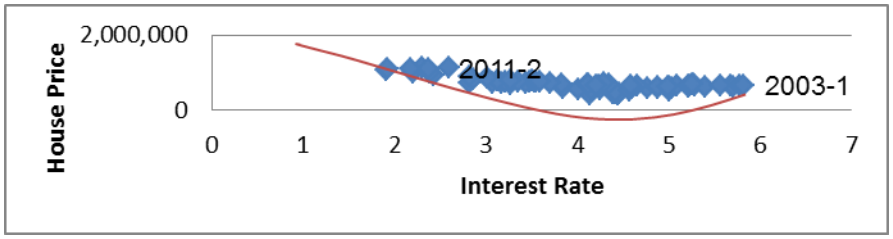

Figure 5: The buyer becomes worse off

Figure 6 presents a situation where the buyer becomes better off since the equal repayment curve is above all the dots representing actual house prices. This means that a buyer financing the house by a mortgage in Israel would have had a lower repayment in periods other than 2003-1.

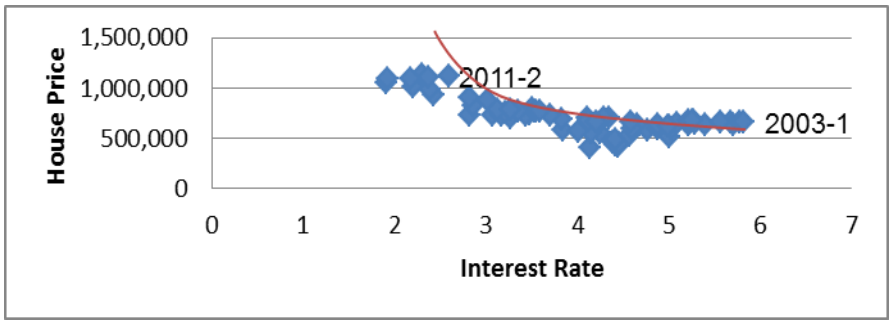

Figure 6: The buyer becomes better off

ACTUAL SITUATION IN ISRAEL

First, we examine the burden of buying a house in nominal terms, namely if a buyer should pay a larger nominal repayment for a mortgage when buying a house. (For simplicity, we assume that the house is totally financed by a mortgage.) Referring to 2003.1 as a benchmark, we can see that the average house price in 2003.1 was 660,400 Israeli Shekels while the yearly interest rate was 5.813317%. Assuming that a buyer takes a mortgage for 240 months, the monthly repayment is 4,660.46 shekels. We calculate the equal repayment curve for a house bought at this period of time and depicted it with the data presented in figure 3. Figure 7 presents housing prices and interest rates in Israel (the curve in figure 3) and the equal repayment curve for a house bought in 2003.1 with a repayment of 4,660.46.

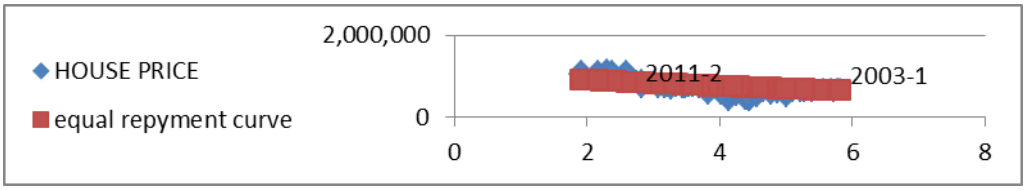

Figure 7: Housing prices, interest rates and the equal repayment curve in Israel

As we can see, although the house price in 2009.1 was higher than in 2003.1, the nominal mortgage repayment was lower. Only after 2009-1 did the nominal mortgage burden increase relative to 2003.1.

MORTAGAGE BURDEN AS A RELATIVE SHARE OF CURRENT INCOME

Since the real burden on house buyers should be measured in terms of their current income and not in terms of nominal repayment, we made some adjustments in the model. Instead of referring to the nominal house prices during the sample period, we indexed the house prices according to the changes in the average wage. First, we built an index of average wages, defining the wage in 1995.1 as equal to 1 and then we divided nominal house prices by the income index. Figure 8 presents the indexed houses price during the period 1995.1 – 2011.4.

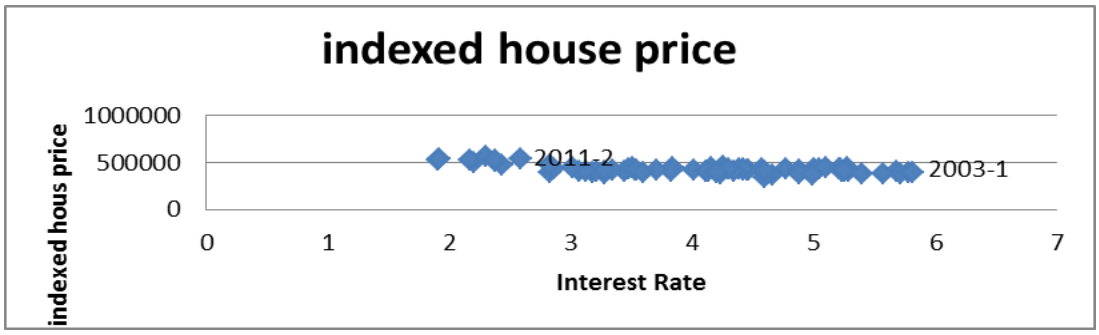

Figure 8: Indexed houses price during the period 1995.1 – 2011.4.

Referring to 2003.1 as a benchmark, we can see that indexed (to income) house price in 2003.1 was 392,591 Israeli Shekels while the yearly interest rate was 5.8133%. Assuming that a buyer takes a mortgage for 240 months, the monthly repayment is 2,770.53 shekels. We calculate the equal repayment curve for a house bought at this point of time and depict it with the data presented in figure 8. Figure 9 presents the indexed average housing price and interest rate in Israel and the equal repayment curve for a house bought in 2003.1 with a repayment of 2,770.53.

Figure 9: Indexed housing price, interest rate and the equal repayment curve in Israel

The picture is much clearer now, although there has been a large increase in housing prices in Israel since 2003-1. House buyers are better off in all periods following 2003-1 except in 2011-1 and 2011-2.

SUMMARY

Many agencies try to define indexes of the burden of buying a house. One of the most acceptable indexes is the number of months of work needed in order to buy one. According to this index, we find a very large increase in the burden of buying a house which increased from 99.1 months in 1995:1 into 128.6 months in

2011:4. We suggest to use a new and simple technique to examine the burden of buying a house on purchasers. We present a curve that represents a given fixed level of periodic mortgage repayment for changing pairs of loan interest rates and loan sizes. Since income level determines the maximum repayment capability, each equal repayment curve can be regarded as agents' demand curve for houses as a function of interest rate, given fixed income levels. Assuming that the interest rate is determined by central bank policy, we can assume that given the interest rate level, equal mortgage curves determine the maximum house price capable of being paid by the buyers. We used quarterly Israeli data of mortgage interest rates, average house prices and income for the period 1995:1 until 2011 :4 and showed that although there was an extreme rise in average house prices in Israel during the sample time period, it was not accompanied by an increased burden on the buyers due the very large decrease in interest rates. Referring to 2003.1 as a benchmark, we see that until 2009-1, although the average house price was rising, the nominal mortgage repayment was lower. Only after 2009-1 did the nominal mortgage burden increase relative to 2003.1. In order to examine not only the effect of reduced interest rates, but also the rise in income on the mortgage burden, we built an index of house prices and used it to define house prices in terms of periodic current income. Building equal repayment curves for indexed house prices, we show that although there has been a very large increase in housing prices in Israel since 2003-1, house buyers are better off in all periods following 2003-1 except 2011-1 and 2011-2.

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DEVELOPMENT OF THE INSURANCE MARKET OF SERBIA AND SURROUNDING COUNTRIES

UDC: 368(497.11)

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ABSTRACT

Insurance companies, as legal and economic institutions, and as one of the most important institutional investors in the financial market, significantly affect the economic development of each country. By performing their basic function of economic protection of persons and property, insurance companies have large amounts of money, whose placement in the financial market contributes to the growth and development of the entire economic environment of a country. Mobilizing cash in the financial market, insurance companies besides protection of persons and property, influence the efficient merger of the surplus and deficit business entities and by placement of their funds provide assistance in realization of large investment projects. The insurance market in Serbia is still underdeveloped in comparison with the surrounding countries, as well as the developed European countries. The aim of this paper is to point out the most important characteristics of the development of the insurance market in Serbia. The first part of the paper points to the current state of the insurance market in Serbia, analyzing the key factors of the development of the insurance market. The second part, analyzes the development factors of the surrounding countries, showing a comparative analysis of the development of the insurance market in Serbia and the surrounding countries.

Key words: insurance, insurance companies, the market.

INTRODUCTION

The most important role of insurance companies is to provide protection to insurance beneficiaries. In today's time, the whole society is exposed to a wide variety of risks that can inflict enormous damage to property and endanger human lives. Insurance is a highly developed economic service activity, providing economic protection for insured persons, natural and legal persons from harmful activities (Miloradić, 2004).

In addition to providing protection to individuals and legal entities of various risks, insurance companies also abolish other functions, among which the most important function of mobilization of financial assets, ie mediation functions, which significantly influence the economic growth and development of the country (Ostojić, Lutovac and Matić, 2016). The development of the insurance sector significantly influences the increase in employment, the stimulation of production, the development of innovation, trade, entrepreneurship, and the strengthening of competitiveness. The most important is the improvement of the efficiency of capital allocation (Marović and Njegomir, 2016). Insurance companies providing insurance coverage do not need to have large amounts of reserve funds, but they can invest more effectively on the financial market, thus contributing to the development of national financial markets.

The significance of these institutions is also reflected in the fact that insurance companies in the capital market mostly appear in the role of investors and very rarely in the role of users of financial resources. Thanks to this, insurance companies manually transform funds collected from small insurers into large funds to fund significant investment projects. Insurance assets are placed on the financial market so that their value can not be reduced and the liquidity of the insurance companies must be maintained (Sain and Selimović, 2009).

Insurance companies must first cover all risks assumed for insurance, but also insurance companies are exposed to numerous risks in their operations, such as: market risk, the risk of determining the necessary premium to cover all the risks arising, the risk of investment, foreign exchange risk as well as the interest rate risk (Lazarević, 2013).

THE MARKET INSURANCE IN THE REPUBLIC OF SERBIA

The insurance market in Serbia was decimated a decade ago and was either unregulated and undeveloped. The lack of relevance was primarily reflected in the existence of numerous irregularities in the work of insurance companies, the inadequately established risk management system and the control of the business of insurance companies, and the failure to ensure the security of investing funds of insurance companies in the financial market. However, the establishment of high quality institutional and legal solutions, adequate application of regulations, rigorous and rigorous control over the entire insurance industry in Serbia was influenced by the sun and significant growth and development of the overall insurance market (Jovanović, 2016).

The global economic crisis of 2008 resulted in a sharp decline in economic activity in most countries of the world, especially in less developed countries such as Serbia (Vojinović, 2010). The solid start of the business of insurance companies in Serbia, thanks to the implementation of the new legislation, endanger the aforementioned crisis. Generally speaking, insurance companies in relation to other non-institutional investments and financial institutions, have relatively well submitted the effects of the 2008 global economic crisis.

Based on the official data of the National Bank of Serbia in 2016, 23 insurance companies operated in Serbia, that is, a smaller insurance company compared to the previous year. Only insurance companies deal with 19 companies, and only reinsurance activities of four companies. Of the insurance companies, only five insurance companies deal with life insurance, with only eight non-life insurance, and six life insurance and non-life insurance. When considering the ownership structure of capital, out of 23 insurance companies in 2016, 17 of them are in majority foreign ownership.

Table 1: The participation of insurance companies in the financial sector

	Banks		**Leasing**		**Insurance**		**Pension funds**	
	2015	2016	2015	2016	2015	2016	2015	2016
Balance sum	91.6	91.2	1.8	1.9	5.8	6.1	0.9	0.9
Capital	92.2	91.4	1.2	1.2	6.7	7.3		
Number of employees	68.0	67.5	1.2	1.1	30.5	31.0	0.3	0.3

Source: https://www.nbs.rs/internet/latinica/60/60_6/izvestaji/izv_IV_2016.pdf#page=12&zoom=auto,-107,681

Analyzing the overall financial sector in Serbia, observing banks, insurance companies, leasing companies and pension funds, the insurance sector on the balance sheet, capital and number of employees occupies the second place. In the total balance sheet total of the total financial sector, which amounted to 3.556 billion dinars in 2016, the insurance companies account for 6.1% and the banks as much as 91.2%.

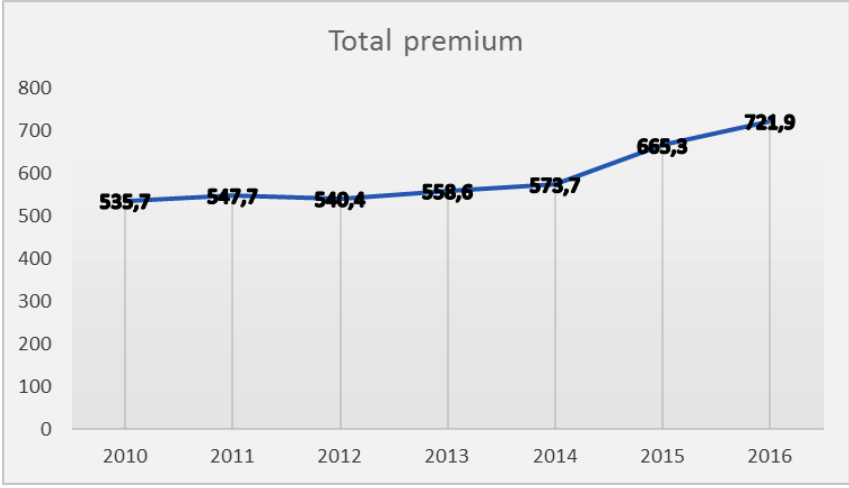

Figure 1:Total premium in Serbia (euro) total insurance premium in Serbia in euros

The total insurance premium collected in the Republic of Serbia, expressed in euros, has recorded positive growth rates over the past 10 years, except in 2009, 2010 and 2012. In the period from 2005 until 2015, the total real growth in Euros was over 50%, ie the premium increased from EUR 418 million in 2005 to EUR 665 million in 2015.

Table 2: Total insurance premium in serbia (life and non-life) in evro

Years	Premium life	Premium non-life	Total premium	% life	% non-life
2010	88.652.82	447.099.81	535.752.63	16.55	83.45
2011	95.495.25	452.225.60	547.720.85	17.44	82.56
2012	104.252.35	436.238.53	540.490.88	19.29	80.71
2013	122.690.18	435.931.05	558.621.23	21.96	78.04
2014	132.318.93	441.473.90	573.792.84	23.06	76.94
2015	159.211.67	506.153.62	665.365.29	23.93	76.07
2016	187.310.91	534.616.10	721.927.02	25.95	74.05

Source: http://www.nbs.rs/internet/cirilica/60/60_2/index.html

Based on the presented bee, it can be concluded that the participation of life insurance premiums in the observed period creates constant growth. In 2010, this share amounted to 16.55% in 2016, which would amount to 25.95% in 2016. As a consequence of the increase in the share of life insurance premium in the observed period, simultaneously in the observed period, the share of non-life insurance premiums fell in the total insurance premium. The share of the non-life insurance premium in the total premium in 2010 was 83.45% for this participation in 2016 to 74.05%.

In 2016, the premium in the estimated GDP in Serbia had a share of 2.1%, while the premium per capita was $ 108 or 102 euros. The development of the insurance market in Serbia, measured by the real growth of the premium, shows the retention of a positive trend. The insurance sector in Serbia is still underdeveloped and, according to the level of development, it is well below the average of the member states of the European Union. In support of this, indicators of the development of the insurance market - the ratio of the total premium and gross domestic product to the total premium per capita - are shown. According to the share of the premium in the estimated gross domestic product in 2010 of 2.0%, Serbia is 61st in the world, this indicator for EU Member States amounts to as much as 7.6%. However, compared with a group of developing countries with an average of 2.9% and countries of central and eastern Europe, whose average is 1.9%, and given that countries such as Romania and Turkey are behind Serbia, it can it is concluded that Serbia is in a satisfactory position.One of the basic indicators of the development of the insurance market is the ratio of the total insurance premiums collected in relation to the gross domestic product achieved, and it, in percentage terms, exceeded 2% in 2015 (2.05%), considering the total premium for life and non-life insurance . It should be noted that the achieved result was recorded after a long period of stagnation of this

indicator, which had the previous highest value, recorded in 2005 from 1.98%. On the other hand, its lowest value was recorded in 2013, when it was 1.65%.

Table 3: Share of total premium in GDP(%)

Years	Serbia	European Union	Position in the World
2008	1.9	8.3	65
2009	1.9	8.4	66
2010	2	8.4	64
2011	1.8	7.8	68
2012	1.8	7.8	65
2013	1.7	7.5	66
2014	1.8	7.6	64
2015	2	7.6	61

Source: http://www.kzk.gov.rs/kzk/wp-content/uploads/2016/12/sektorska-analiza-osiguranja-preciscena-verzija.pdf

Based on the presented table, it is noticeable that the insurance sector in Serbia is far from the average of the insurance sector in the European Union. The share of insurance premium in Serbia amounts to only 2%, and in the observed period this percentage is almost unchanged. Less oscillations were recorded in the period from 2011 to 2014, when the share of total premium was about 1.8%. Observing Serbia's position in the Council, in 2015, this position is best when Serbia snap 61 positions. In the observed period, with certain deviations, Serbia is making progress in the participation of the total premium on the world list.

Table 4: The amount of premium per capita in dollars

Years	Serbia	European Union	Position in the World
2008	113	3061	62
2009	110	2772	66
2010	98	2716	66
2011	98	2739	67
2012	99	2558	70
2013	108	2660	68
2014	98	2515	67
2015	102	2412	67

Source: http://www.kzk.gov.rs/kzk/wp-content/uploads/2016/12/sektorska-analiza-osiguranja-preciscena-verzija.pdf

One of the most important developers of insurance sector development is the amount of premium per capita. The largest premium per capita in Serbia was in 2008 and amounted to $ 113, but in the next three years it is falling, which is a consequence of the global economic crisis. As of 2012, 2013, there will be an increase in per capita income from $ 99 to $ 108, in 2014, this amount will be reduced to $ 98, and in 2015 it will rise to $ 102. Observing the amount of premium per capita in the European Union, it can be concluded that Serbia is far from the average. The premium per capita in the European Union was the highest in 2008 when it was 3061 dollars to make this figure fall due in the wake of the global economic crisis in the next two years. In 2011, there is a small premium for the year that the premium will fall again in 2012. In 2013, there is a mild increase in per capita income in the European Union of $ 2660, with the fall of the premium to $ 2,412 per capita in the next two years.

Among the important indicators of insurance development is the insurance density. The insurance density in Serbia is calculated from the ratio of life insurance premium to the number of inhabitants of Serbia for the observed period. The insurance density in Serbia had an upward tendency in the observed period. Namely, from year to year it was getting higher, that in the last year it was 3.14 times higher than in the initial year of analysis.

Table 5: The insurance density in Serbia

Years	Density of life insurance
2007	8.45
2008	9.75
2009	11.23
2010	12.16
2011	13.20
2012	14.48
2013	17.12
2014	18.55
2015	22.38
2016	26.60

Source: https://www.nbs.rs/internet/cirilica/60/60_6/index.html

One of the most important insurance policy developers is the distribution of premiums by type of insurance. The most dominant type of insurance in the insurance market of the Republic of Serbia is compulsory insurance from auto-liability with a total of 35.9% of the total in the total insurance premium, followed by life insurance with 23.91% and property insurance with a share of 18.2% in 2015 . A very important indicator of the development of the insurance market is the steady increase in life insurance premiums.

SECURITY MARKET FOR SELECTED EUROPEAN COUNTRIES

Data on the ratio of the total premium collected in relation to the gross domestic product achieved and data on the average per capita premium per capita for the countries in the region and the developed European countries show that the insurance market of the Republic of Serbia is at the very beginning in Europe.

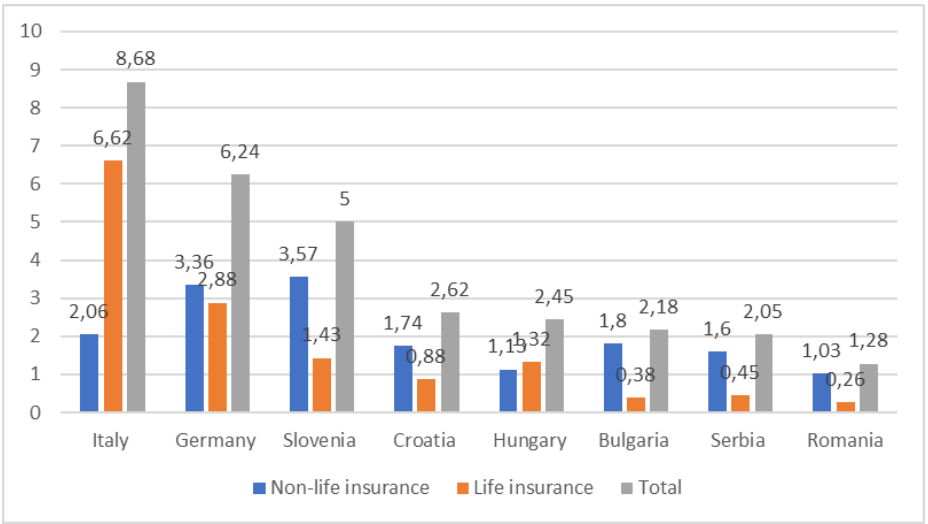

Figure 2: total insurance premium in GDP in 2015. (%)

Based on the presented graphic, it is noticeable that Serbia records better results only from Romania. However, these results are slightly higher, with the total share of premiums in GDP in Serbia amounting to 2.05% and in Romania 1.28%. Similarly, the share of non-life insurance premium, which is 1.6% in Serbia, and 1.03% in Romania. The share of life insurance premiums in GDP in Serbia is 0.45% and in Romania 0.26%. Observing all the other countries, Serbia has achieved poorer results.

Table 6: The average premium per capita in 2015 in dollars

Country	Non-life insurance	Life insurance	Total
Italy	612	1.968	2.580
Germany	1.381	1.181	2.562
Slovenia	755	303	1.058
Hungary	140	163	303
Croatia	199	100	299
Bulgaria	123	26	149
Romania	86	21	107
Serbia	82	23	105

Source: http://www.kzk.gov.rs/kzk/wp-content/uploads/2016/12/sektorska-analiza-osiguranja-preciscena-verzija.pdf

The table shows the data for Croatia and Slovenia, the countries of the former Yugoslavia and countries in the immediate environment: Romania, Bulgaria and Hungary. In order to present a comprehensive analysis, data are also given for two developed European countries such as Italy and Germany. Based on the Swiss Re Sigma report, which presents data for 32 European countries, Serbia is at 27th and 30th, observing these two indicators respectively.

CONCLUSION

Compared with developing countries whose participation is slightly better for the countries of central and eastern Europe, Serbia is in a satisfactory position. Given that Serbia still seeks accession to the European Union, as well as its involvement in its common financial market, it should develop its insurance sector primarily through the development of life insurance and attracting new, healthy competition. In order to achieve this, it is necessary to ensure adequate economic growth, better business conditions and new investments. While it is necessary for the population to provide a better standard of living, which is reflected in the reduction of unemployment and the increase in average earnings that would affect not only the allocation for the amount of the policy, but also the only decision on the purchase of the policy. On the other hand, a large number of residents do not have the resources for basic needs, so they do not think about insurance possibilities.

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VORONEZH CITY LABOUR MARKET STRATEGICAL ANALYSIS

UDC: 331.5(470+571)

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ABSTRACT

A modern company that wants to communicate efficiently with its environment prepares a detailed plan of marketing communication that is part of the marketing and strategic plan of the company. However, only big companies with good knowledge on marketing and adequate funding to invest in marketing plan this way. Meanwhile, marketing in small and middle-sized companies has special characteristics. Research has shown that small enterprises equate marketing with sales, promotion and advertising. Most of them have short-term plans and their awareness about the importance of communication is low. Research also shows differences between small and big companies in forming the tools of marketing communication mix. Small companies are not simply small versions of big companies. They have their own qualities and characteristics. The aim of this paper is to learn about specific characteristics of marketing communication in small companies. With researching marketing communication in small companies, we find out, how they understand this field and how they implement and plan it and what are special characteristics of marketing communication mix in small companies.

Key words: labour market, urban district, human resources.

INTRODUCTION

The article shows the results of the research which the Project of Voronezh City Socio-Economic Development Strategy (later on – Strategy Project) for the period up to 2035 is based on. Authors (Arzamastseva et al., 2011; Kolesnikova, 2013) have already described some Voronezh labour market researches. Voronezh labour market shows significant imbalances. In 2016 the labour force was on the mark of 680 ths. people; economically active population (EAP) – 442.4 ths. people (45.7% of Voronezh population size); 95-96% of EAP are occupied so the rest can be classified as unemployed. The majority are employed at distributive trades and services (including auto services). In 2016 there were 275.7 ths. people occupied in large-scale and mid-sizes business (Official statistics).

Labour force quality is described by high educational level and diversified professional development provided by Voronezh educational facilities. 45% of EAP have higher education and 35% of EAP have advanced education.

The professional structure of the Voronezh labour resources recently transformed. One could see the increasing amount of legal, finance, accounting, management, economics and other nonproduction professionals which were in demand at early 2000th. Nowadays there is a leak of workers and engineers.

THE VORONEZH CITY LABOUR FORCE AND LABOUR MARKET CONDITIONS

The intermunicipal mobility is prevailing at Voronezh labour resources. The commuting migrants from nearby municipal settlements (such as Novaya Usman, Semiluki, Ramon) increase the amount of Voronezh labour force and change its structure. There are positive changes in Voronezh labour market due to heightened labour mobility and quantum leap of information and transport interconnections. At the same time the commuting migration regulates the city population by reducing its overgrowth.

By the expert opinion the increasing labour market strains is one of the threats to Voronezh socio-economics development. It goes right after "The social strain due to decline in pensioners' and public sector workers' incomes" and "The leak of science and education financing" (Risin et al., 2016; Tabachnikova, 2017). Besides these threats the experts note the sharpening of the trans-regional competition with most qualified and mobile labour resources as its subject. Domestic migration has centripetal nature and, which is more, no official statistics are available. Nevertheless, one could fix attention on different qualification labour force traffic from regional centres (Voronezh for example) to Moscow.

Significant challenges of Russian labour market also connected to the lack of corporate social responsibility system.
The Strategy Project has the following priority goals of Voronezh City labour market development:

- employment enhancement; creating the conditions that meet the criteria of "decent work";
- provision of the needs of the developing economy with labour resources of the required volume and quality on the basis of the effective use of own labour potential;
- formation of favourable conditions for attracting labour migrants with high professional characteristics;
- ensuring the flexibility of the labour market through the use of non-standard forms of employment;
- ensuring high spatial mobility of labour resources.

The labour force of Voronezh City is on the mark of 680 ths. people (65.9% of Voronezh population size). Labour force are an important part of the city's labour potential, which is a complex characteristic of the ability of the able-bodied population residing in it to work efficiently. The structure of the labour force of the city is significantly influenced by commuting migration, foreign labour migrants, the age structure of the population.

The situation in the sphere of labour and employment of the population is largely determined by demographic processes. In recent years, there has been a small but steady increase in the number of urban population – in the period from 2011 to 2016. The average growth was 1.1% per year. At the same time there is a natural decrease in the population. In conditions of natural decline, the population growth in Voronezh City is provided due to migration growth, which however tends to decrease. In 2016 71.7% of migrants were of working age.

The size of the working-age population is subject to insignificant fluctuations and is in the period under review in the range of 620 ths. people (with a maximum of 625 ths. people in 2013). The trend of the able-bodied population depends on three components: the matched sex-age structure, the level of mortality in working age and the migratory growth (loss) of people of the able-bodied population. In the medium term (until 2025), the number of this population is expected to decline.

Among the cities selected for comparison (Voronezh, Rostov-on-Don, Volgograd, Nizhny Novgorod, Belgorod, Lipetsk), Voronezh ranks third in terms of "The proportion of the able-bodied population in the total population of the city". It should be noted that there is a tendency to decrease the values of this indicator. It is important that this trend is typical for all cities in comparison. Among the cities of the comparison group, Voronezh ranks 1 in the number of migrants, while repeating the overall trend

characteristics. Among positive demographic trends one could single out an increase in the period under consideration of the population below the working age.

In the city of Voronezh, the share of the economically inactive population in the labour force structure is high. This puts on the agenda the need to improve the effectiveness of the employment of the population, which should manifest itself not only in raising the productivity of the already employed population, but also in engaging previously unoccupied categories of the population (women with young children, disabled people, pensioners etc.). In addition, the contribution to this process should involve the attraction of additional labour resources through migration. About half of the economically inactive population is represented by students and pensioners, the rest can be involved in labour activity.

To solve this problem, it will be necessary to organize interaction between the bodies of the employment service, education, medical and social assessment institutions, district departments of the Pension Fund. Particular attention should be paid to the involvement of persons with disabilities in the work activity, considering that out of 23.1 ths. disabled people of working age only 7.5 ths. (32.6%) are engaged in labour activity. To this end, it is necessary to ensure the availability of infrastructure facilities for them, to monitor the implementation by employers of legislation on quotas for workplaces, to create new jobs in enterprises that do not fall under the legislation on quotas. It is also necessary to organize the accompanying employment of disabled people when they are employed.

According to the forecast, it is expected that on the overall labour market the number of unemployed will slightly decrease. The number of employed in such types of economic activity as wholesale and retail trade, manufacturing, transportation and communications will increase. Reducing the number will be observed in health and public administration.

The results of 2016 testify to the progressive development of the city, characterized by socio-demographic stability and control of the processes in the sphere of employment. The number of citizens who applied for assistance in job search remains high. Among the above-mentioned cities chosen for comparison, Voronezh confidently ranks first, although a decrease in the value of this indicator is observed. It is noteworthy that the trend of changing the values of this indicator is quite monotonous throughout the group.

The level of employment of the population of the city of Voronezh throughout the period under review remains virtually unchanged. The values of the indicator vary in the region of 61% and form an average of 61.4%. It is also worth noting that, as of the end of 2016, the significance of the level of employment of the Voronezh population was the smallest among the cities surveyed. Leading positions are held, respectively, Nizhny Novgorod, Belgorod and Lipetsk.

The situation on the city's overall labour market is expressed, first of all, in the reduction of the unemployment rate calculated by the methodology of the International Labour Organization. During the period under review, there was found a stable trend in reducing the number of unemployed, both in full and in its registered segment. The level of registered unemployment in Voronezh declined in 2013 (compared to 2011) from 1.7% to 1.0% and has not exceeded this value since. The situation with unemployment is still somewhat different in the full labour market. Although the initial downward trend from 2011 to 2013, remained, in 2013 the value of the indicator was minimal for the entire period and amounted to 4.0%. In 2016, the value of the indicator was at the level of 4.4%. In comparison with the above-mentioned cities chosen for comparison, Voronezh looks decent, ranking fourth in the comparison group in 2016, slightly behind the leading cities (Belgorod, Lipetsk, Nizhny Novgorod). At the same time, the cities of Rostov and Volgograd lag far behind the leading group.

In general, positive trends have been recorded in the area of household incomes, but some of them have not assumed a sustainable character. In 2016, the average monthly salary rose by 6.2% (in 2015 by 3.6%, and in 2014 – 9.2%) and amounted to 32 727.7 rubles. At the same time in the group of cities of comparison, Voronezh occupies only the fourth place in this indicator (Nizhny Novgorod is leading

with a value of 39 339 rubles). It should also be noted unified trends in the changes in the values of this indicator among the cities of comparison. At the same time, if in 2012 Voronezh took the leading position in terms of the growth rate of wages, then in 2015 the growth rate was minimal in the group. In 2016, Voronezh ahead of the rate of growth only in Lipetsk.

In general, we can say that the main indicators of the sphere of labour and employment in Voronezh show a positive dynamic. A significant lag behind the indicators of other cities of the Russian Federation has not been identified. The main factors affecting the formation and development of labour resources are:

- economic – first of all, the economy's need for labour resources to replace jobs;
- demographic – the state of demographic processes as the main forms of labour resources (able-bodied population);
- educational – general and professional training of labour resources;
- investment – the volume and quality of investments for creating additional jobs, developing education, etc.;
- living standards – factors of income and living standards of the population;
- socio-psychological – first of all, educational and labour motivations.

The change in the number of labour resources is the result of the combined effect of two main and opposing trends:

a) the natural loss (increase) in the number of people of working age in the permanent population;
b) migration growth (loss) of the population.

Thus, the main factor in the replenishment of the city's labour resources is currently the migration increase. Based on the analysis, among the similar in terms of socio-economic development of Russian cities, Voronezh has a high migration attractiveness. Migration growth over the period of 2011-2016. allowed to fully compensate for the natural decline in the population. The migrants arriving in Voronezh mainly represent the internal migration in Russia – 56% in 2016.

Strategic priorities in the policy of the formation and use of labour resources are the following.

1) Formation and effective use of own labour potential of Voronezh City on the basis of:
   - creating conditions and mechanisms for redistributing part of the able-bodied economically inactive population into the sphere of labour activity;
   - increasing the level of employment;
   - increasing the efficiency of the use of labour resources located in the zone of inefficient employment – the household, small-scale production, self-employed, employed by individuals, etc.
2) 2) Formation of a system of general education, vocational training, retraining and upgrading of labour resources in accordance with the innovative potential of the city's economic development.
3) Managing labour migration as a factor in balancing the need for the economy and the social sphere in the missing labour resources of high and special quality. Establishment of a pendulum management system as a means of using the labour potential of suburban areas, providing employment and earning income for their population.

The sphere of employment of the population fulfills a dual function in the development of the city:

- economic – from the point of view of meeting the needs of the city's economy in the labour force on the basis of the organization of the most efficient use of labour resources;
- social – from the position of providing the employed working population with work with decent working conditions and its payment.

The employment situation in the city is changing under the influence of three main groups of factors:

- changes in the objective state of the urban economy and the social sphere;
- motivation of work of employed and job seekers and ongoing shifts in motivations;

- regulatory mechanisms – state and market. Mechanisms of regulation apply to the sphere of employment and the labour market both directly and indirectly through the first two groups of factors. The most targeted and rapid influence is exerted by state regulation.

Formed features of the labour market in Voronezh can be divided into 2 groups in terms of opposing opportunities for using them as strategic resources for the development of the employment system:

a) positive features:
   - a consistent increase in the demand for labour, its qualitative characteristics, a reduction in the quantitative imbalances between the supply and demand of labour;
   - gradual reduction of unemployment and its duration;
   - presence in the structure of employed and unemployed a large segment of persons with a high level of education, young people, graduates of vocational educational institutions;
   - convergence of indicators of admission and dismissal of cadres;
   - reduction in the gap between the rates of registered and overall unemployment;
   - increase in the level of wages, including vacancies.

b) negative features and risks:
   - the dying out of a number of mass professions (primarily traditional manufacturing industries) and the spread of structural unemployment;
   - presence of professional, sex-age, gender and other disproportion;
   - the deterioration of the structure of unemployment due to an increase among the unemployed share of persons in need of special working conditions and social protection, with low motivation for work, etc.;
   - the shortage of qualified personnel, especially of workers – due to their fluidity due to low pay, as well as the restructuring of property;
   - high spread of shadow forms of employment, hidden income of the population against the background of rather low official income indicators;
   - a high proportion of economically inactive population in labour resources.

FINDINGS & CONCLUSIONS

Proceeding from the foregoing, we can draw the following conclusions.

Strengths of the labour market of Voronezh City:
- infrastructure security of the labour market;
- the use of advanced technologies to promote employment in a number of areas corresponding to the best world analogues;
- experience in using social partnership;
- availability of the system of professional education and (re)training.

Weak points of the labour market of Voronezh City:
- inefficient employment, a high proportion of informal employment and discrimination in the labour market;
- a sharp prevalence in the system of financing passive (social) areas of employment support over active, designed to ensure the economic function of filling vacancies and meeting the demand of employers;
- a high proportion of the economically inactive population and persons of working age in it;
- weak interest and participation of employers in the training of cadres.

Opportunities for the development of the Voronezh City's labour market:
- investment potential for creating new modern jobs;
- preserved (supported) intellectual potential;

- creation of new jobs that require modern key competencies and appropriate training of personnel;
- the potential for the growth of labour resources due to a relatively favorable demographic situation in the forecast period;
- the use of migration attractiveness of the city.

Threats to the development of the labour market of the urban district of Voronezh:

- shortage of qualified personnel;
- non-decreasing volume of informal, "shadow" employment;
- toughening of employers' demands for quality of labour with falling quality of education and not always satisfactory training of personnel;
- significant sectoral wage fluctuations, which reduce the attractiveness of some jobs;
- unsatisfactory quality of forecasts of the demand for personnel by different sectors of the economy.

The analysis of the problems and risks identified by the research, the strengths and weaknesses of the city's employment promotion system should be the basis for the goals, objectives, priorities and key measures of Voronezh City Socio-Economic Development Strategy for the period up to 2035.

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Session E: IT MANAGEMENT

Papers (pp. 259-268):

THE IMPORTANCE OF INFORMATION TECHNOLOGIES IN MANAGING HUMAN POTENTIALS OF THE LOGISTIC CENTER

UDC: 004:005.96

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ABSTRACT

At the time of great technological innovations, the human resources management plays an important role in achieving the competitive advantage of logistics centers on the market. With the development of new technologies, it also comes in handy in the very way of managing human resources within companies. Information technologies have a growing presence in the management of human resources within logistics centers, and therefore their application achieves a great competitive advantage on the market. The aim of this paper is to use the analysis and descriptive methods to find a solution to the importance of information technologies in human resources management within a logistics center with the greatest focus on ERP systems.

Key words: information technology, human resources management, logistics center, ERP system

INTRODUCTION

In a business and business environment, the basic resource of each company is made up of people with their abilities, which enable them to solve the assigned tasks, and thus achieve the common goals of the company.

Global competition encourages companies to make steady and rapid progress and progress in order to survive against the new demands posed by globalization. If the company has good human potential, i.e. quality and educated human resources, it is possible to respond to the challenges and demands that it is constantly facing. Human resources are the most important component of any organization. Human resources have the treatment of the most important capital - human capital.

Human resource management is a management activity that focuses on human resources. Human potentials include the total knowledge, skills, abilities, creative possibilities, motivation and loyalty that an organization (or society) has at its disposal. It is the total intellectual and psychic energy an organization can engage in achieving goals and developing a business.

The ability of logistics centers for efficient and effective functioning, at the time of the global expansion of information technologies in the world, depends on the support of various information technologies within the logistics center itself. The main motive for the application of information technologies in the management of logistics and supply chains is their ability to collect a lot of data and information, as well as the savings resulting from sophisticated analysis of these data (Vasiljevic, 2015). Information technologies can be used to manage and monitor business processes within an enterprise, or to transfer information between different businesses or individuals. The application of information technologies within the logistics center itself will increase the competitive advantage of the center on the market. Many companies provide value-added services to their users by applying

modern information technologies, and at the same time it is a means of their differentiation on the market, and on the basis of this, the way of business contributes to the development of strong and long-lasting connections with its users (Bradford, 2015).

At the time of major changes and the daily introduction of modern technologies into all business segments, the most important part of each logistic system is the information flow, which includes the exchange of information between parts of the internal transport system and between the enterprise and the external system. The importance of information as a new production factor in the conditions of increased competition, the opening of new markets, the shortening of the product life cycle and the globalization of the market has grown remarkably, since without the use of a modern information system that would allow the introduction of a flexible and time-optimized business concept, many companies would not be able to successfully to do business or to exist and survive on the market (Bradford, 2015).

Development of human resources management, at a time when globalization of the market has reached its stagnation, shows that this activity occupies its important place in the development of companies that want to maintain their leading position in the market or achieve greater competitiveness. Strategic goals of logistics centers are trying to be realized through better connections with the organizational structure of the company. Personal interests of individuals and teams must be in line with organizational goals, which achieve the strategic goals of the company. A very important link in the chain are human potentials that help their knowledge and possibilities in achieving goals (Bradford, 2015). Using the analysis and the descriptive method in this paper, we find a solution on the importance of information technologies in human resources management within the logistics center and in order to gain a certain competitive advantage in the market.

PROCESSES OF MANAGEMENT OF HUMAN RESOURCES IN LOGISTIC CENTERS

Human resource management is one of the most important sectors of each company, and so in logistics centers, as it is precisely the human resources managers that determine whether the logistics center will achieve the set goals and tasks in its business, and therefore whether it will be competitive on the market or not. Logistic centers daily notice that people are their biggest capital, which gives them a competitive advantage on the market. Increasing the complexity of logistic processes within the logistics centers requires a high-quality, competent and educational staff capable of responding to all the requirements.

Human Resources Management relates to the practice and policies necessary to perform managerial tasks in relation to personal issues, and in particular the recruitment, training, assessment and rewarding of employees in the company and the provision of a secure, ethically acceptable and just environment for them (Bradford, 2015). Human resources management is very important for companies, as the last thing the manager wants is to choose the wrong candidate for the job and thus endanger the performance of a particular sector and the entire company.

With the development of globalization, there is a growing competition and companies are constantly facing new challenges to reduce costs and increase productivity. In addition to globalization, technological progress is very important, that is, human resources management has to find a way to quickly apply new technologies to improve its own work and efficiency. A competitive advantage on the market is achieved with an adequate workforce that is able to respond to market needs and changes that are happening. Human resource planning must be dynamically linked to the needs of creating staff assumptions, timely and successful realization of tasks, or goals of logistics centers (Bradford, 2015).

This process enables logistics centers to make choices and employ the best potentials, develop employee skills, harmonize employee aspirations with business goals, measures and rewards employee results, plan future substitutions in key locations and ensure transition of employees through retirement and exit from the company(Barac & Milovanović, 2003).

Recruiting management is a module used at the earliest stage of employee life cycle to attract the most talented candidates who will become successful employees.

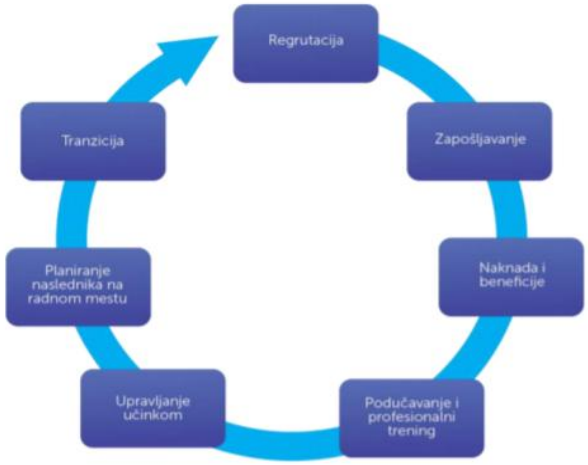

Figure 1:Life cycle of employees in logistics centers

Figure 2:The life cycle of employees in recruiting management

INFORMATION SYSTEM FOR THE MANAGEMENT OF HUMAN RESOURCES OF THE LOGISTIC CENTER

Modern technology plays a very important role in the management of human resources, facilitates and improves its functionality, but it also modernizes, accelerates and improves the work of the human resources department of each logistics center.

In order to maximize the management of the human potentials of various individual logistics centers, it is necessary to have a special organizational unit for human resources that develops the methodology, obtains, analyzes and stores data on employees and proposes to the superiors in the hierarchical system determined. In addition to such systemic hierarchical forms, it is also necessary to use modern IT solutions designed specifically for the management of human potentials (Tan, Kannan, Handfield, and Ghosh, 2009).

The Human Resources Management Information System is used for decision making in management, launching initiatives for improvement in human resources management, and adopting regulations in the field of human resources. The most important functions of the system are updating employee data, maintaining organizational scheme of the company, integrating with other relevant systems, analyzing and creating job descriptions or their structure, producing statistical reports and analyzes, recruiting, analyzing needs for additional training and education, developing training plans and education, assessment of work results and analysis of employee performance and career planning.

Logistic information systems supported by computers are defined as a unique and harmonized system of hardware, software, data, networks and staff that serves for logistic planning, implementation, management and control in all activities that are carried out in order to accomplish the necessary tasks (Vasiljevic, 2015). According to the decision-making method, information systems can be divided into several groups depending on the level of hierarchy in the company. The planning, management and monitoring of the information system as a whole with all interaction influences provides optimal use of synergy and efficient management of the current and segmented processes. Today there is a very large number of information systems that can be found on the market, and whose introduction improves and facilitates the entire business system business, that is, the process of human resources management in companies.

Resource Planning in Corporations (ERP) is a process in which business resources are planned, and in the very implementation of this process, one of the business information systems (commercial software package) is mainly included. Application of certain software packages can contribute to a significant improvement in the quality of services and products (Christopher & Martin 1992).

What is very important for ERP systems is that they have a number of application advantages because they consist of a set of standardized software solutions for business processes. As a consequence, the implementation of these systems leads to the reorganization of existing business processes within logistics centers. Due to the difficult adaptation of existing business processes to the ERP system, its implementation is always closely linked or almost inseparable from reengineering. Adequate implementation of the ERP system in companies enables efficient and effective job management in a number of fields. ERP systems are a combination of managing the entire company's business and modern technology, which makes it easier to manage(Barac & Milovanović, 2003).

Within each ERP system there are specific modules, and a module that supports human resources management contains information about employees, collection and archiving of data about their skills, their positions, and the like.

GOALS OF APPLICATION OF INFORMATION SYSTEMS IN LOGISTIC CENTERS

Logistics information system can be defined as a structure of interaction between people, equipment and procedures that together provide relevant information to the logistics manager for the purpose of planning, implementation and control.

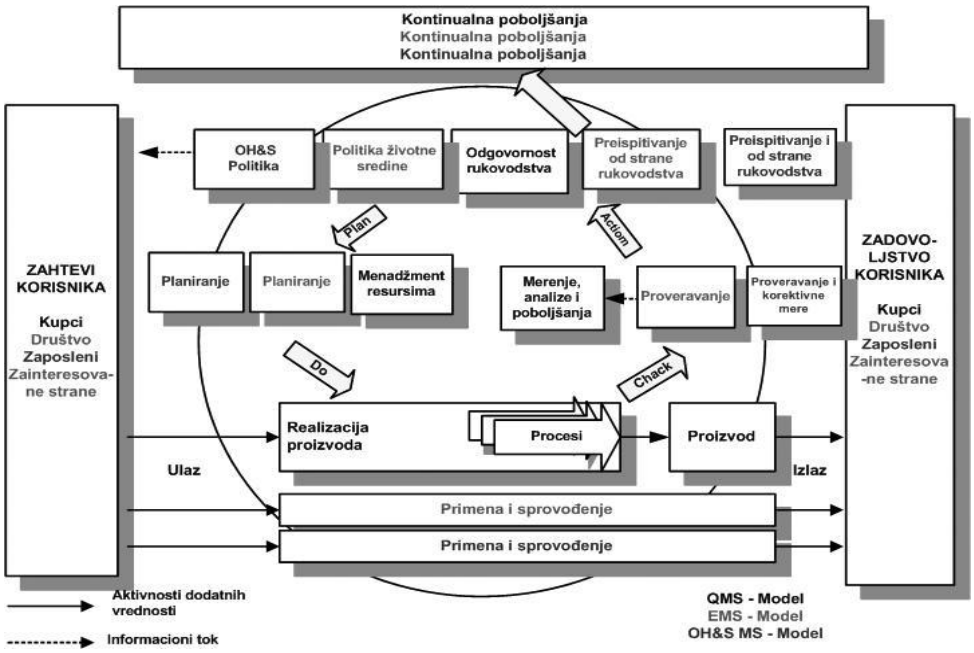

Figure 2:Logistic information system

One of the most important goals of application of information systems within the logistics center is to connect all members from the place of supply of raw materials or semi-finished products for the production process to the place of delivery or ordering, whereby synchronization of the information flow with the goods flow is necessary. In this way, it is possible to plan, monitor and determine the time from the occurrence of a request (order) to the final realization on the basis of real data. Each participant in the chain should have access to information on where the appropriate product is located.

Based on the structure of the chain, different flows of goods and information can be defined. Respecting the needs of chain members for different types of information, the question of the availability of the requested information is raised. The availability of information on the status of raw materials and products is the basis for making appropriate decisions (Porter,1985). In the event that there is a delay in the delivery of raw materials, which significantly influence the realization of the production program, the task of the information system is to forward this information to relevant stakeholders in order to make appropriate correction in the

production process (delay of the planned production plans or consideration of alternative sources of raw materials).

Also, one of the essential goals of the application of information systems is to satisfy conditions in terms of information can be accessed from anywhere, and that information of the same content for all users of that system.

The third goal of information systems application in logistic centers is to analyze data in order to achieve a state of overall functioning within the logistics center. In addition to the possibilities of analysis, the information system should support finding the most efficient ways of production, assembly, storage and product ditribution. On the basis of the information received, operational, tactical and strategic decisions within the center can be made(Meade, & Sarkis, 1998).

Previous studies have shown that the priority of each logistics center should be logistics elements such as deliveries on time, stock levels, orders, tracking, ordering, ordering, downloading from customers and the possibility of replacement. All activities are in the domain of logistics managers, and their successful implementation depends largely on the exact flow of information, and this is successfully achieved through the use of information systems (Barac & Milovanović, 2003). The goal of all of the above is that information solutions, that is, the use of information systems that are maximally convenient and easy for users, support all business functions, i.e. To maximally facilitate the work of the employees within the logistics center.

CONCLUSION

The time of big technological changes, the daily introduction of new information technologies led to the fact that the traditional appearance of the company changed under the influence of numerous changes. The business environment has also undergone major changes in terms of stronger and more modernized market competition, new customer demands, and thus all of this has been reflected in and human resources management within logistics centers.

Logistic centers are forced to rely on the knowledge, abilities and skills of employees within it, and with the use of information technologies in the management of human potentials occupy a significant competitive position on the market, and therefore most logistics centers now see information systems as an area of strategic importance.

Human resource management is an extremely complex business, but in the logistic centers it is first to investigate whether cost-effective introduction of certain innovations in the domain of information technology. It is very important that every company analyzes how each component can contribute to its development and take a competitive position in the market.

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APPLICATION OF THE SERVQUAL METHOD IN MEDICAL INSTITUTIONS IN SERBIA

UDC: 005.6:614(497.11)

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ABSTRACT

Medicine is a service, which is influenced by the patients. There are a lot of challenges in healthcare systems, which require a proper service. Perceptions of service quality are analyzed to position medicine organizations in services. In this paper it is examined the importance of different service quality dimensions by studying their relationship with patient satisfaction. The quality of healthcare can be improved by supportive visionary leadership, education and training, availability of resources, effective management of resources, employees and cooperation among providers. This paper presents the research proposal and analyzes the application by service engineering methods in medicine. The proposed five dimensions of SERVQUAL, are the most commonly used service quality measurement scale. In addition, this paper demonstrates how SERVQUAL method can be applied in medical institutions in Serbia.

Key words: service engineering, servqual method, healthcare;

INTRODUCTION

Service quality is an elusive and abstract construct to measure, and extra effort is required to establish a valid measure (Lee et al. 2000). For many years, the quality of medical services has been a subject ofinterest for both theorists and medical professionals (Węgłowski et al. 2017). Quality is considered as a key factor in differentiation and excellence of services and is a potential source of sustainable competitive advantage (Zarei et al. 2012). With the increase in the awareness of the patient, more and more attention is being paid to the relationships between the patient and medical staff, both in out-patient and in-patient health care (Węgłowski et al. 2016). For the success of healthcare organizations, accurate measurement of healthcare service quality is as important as understanding the nature of the service delivery system (Lee et al. 2000). Because of that in this study will be presented research proposal for application of SERVQUAL method in medical institutions in Serbia. Research will be realized on the group of patients in different medical institutions in Autonomous Province of Vojvodina. The paper will present importance of service quality analysis in the development of patient experience in healthcare.

BACKGROUND

Parasuraman et al. (1988) developed a 22-item scale with five dimensions that can be seen it in the Table 1 below:

Table 1: Attributes of Service Quality (Lee et al. 2000)

Attribute	***Definition***	***Authors***
Assurance	Courtesy displayed by physicians, nurses, or office staff and their ability to inspire patient trust and confidence.	Parasuraman, Zeithaml, and Berry, 1988
Empathy	Caring, individualized attention provided to patients by physicians and their staffs.	Parasuraman, Zeithaml, and Berry, 1988
Reliability	Ability to perform the expected service dependably and accurately.	Parasuraman, Zeithaml, and Berry, 1988
Responsiveness	Willingness to provide prompt service.	Parasuraman, Zeithaml, and Berry, 1988
Tangibles	Physical facilities, equipment, and appearance of contact personnel.	Parasuraman, Zeithaml, and Berry, 1988
Core medical service	The central medical aspects of the service: appropriateness, effectiveness, and benefits to the patient.	
Professionalism/skill	Knowledge, technical expertise, amount of training, and experience.	Swartz and Brown, 1989

The scale of SERVQUAL has paired questions for expectations and perceptions (Kilbourne et al. 2004). Service quality is operational zed as the difference between the measured expectations and perceptions, commonly referred to as the gap score (Kilbourne et al. 2004). The big number of studies in the health domain has used SERVQUAL to measure quality in United States of America (Kilbourne et al. 2004). Taylor (1994) represents those who contend that the SERVQUAL perception portion would be a valid method to operationalize service quality if it was not unidimensional. Dean (1999) identified four stable dimensions when he used SERVQUAL to compare service quality dimensions in two different healthcare settings (medical center and maternal and child health center). After USA, SERVQUAL was applied in the other countries. Many of researchers have emphasized the importance of the role that the quality has in the choice of hospital by the patients, as well as satisfying and retaining customers and have claimed that the improvement of the quality of hospital services will increase the number of satisfied patients and thereby customer loyalty (Zarei et al. 2012). In spite of all this, the situation with the patients in underdeveloped countries is still in poor state. According to the World Health Organization, statistics for Health Systems clearly stand out that they are facing significantly low number of beds, physicians and nurses for people in their respective countries (Umath, Marwah, and Soni 2015). Due to all of the above, it was concluded that an analysis of the quality of service assessment in hospitals in Serbia should be carried out. As Serbia falls among the countries in transition, it would be desirable to conduct the research in this area in order to get insights into the actual situation and to find out the key elements for improvement of healthcare.

RESEARCH DESIGN AND METHODS

As mentioned above, the SERVQUAL method will be used in this paper. More specifically, the specialized SERVPERF method will be used in research. SERVPERF is the performance component of the Service Quality scale SERVQUAL (Fogarty, Catts, and Forlin 2000). Paul (2003) performed a comparison between the two prevalent service quality models, SERVQUAL and SERVPERF. He came to the conclusion that SERVPERF without importance weights appears to be a better measure of service quality (Rumintjap and Wandebori 2017). Literature shows that SERVPERF has outperformed SERVQUAL as it not only cut down the number of variables but also reduced the work load of customer survey and helped in generating unbiased responses (Adil, Ghaswyneh, and Albkour 2013). Therefore, this study favored SERVPERF over SERVQUAL, due to its proven superiority and convenience. Quality in health services entails two dimensions: technical quality (outcome quality) and functional quality (process quality) (Zarei et al. 2012).

The research population of this study will include patients hospitalized in three hospitals in three biggest cities in Vojvodina (Novi Sad, Subotica, Zrenjanin). The study sample was selected from all patients who were hospitalized in these hospitals. Three general hospitals will be considered for the

research and the samples were divided among the three hospitals proportionally to its size. In Table 2 it could be seen the questions for the SERVPERF analysis which are presented in the paper "Importance-performance analysis: Revisiting a tool for the evaluation of clinical services" (Gonçalves et al. 2014).

Table 2: Questions for the SERVPERF analyze

Questions and dimensions	**Scale**						
Tangibles	1	2	3	4	5	6	7
Have up to date equipment	1	2	3	4	5	6	7
Doctors are always well dressed and appear neat	1	2	3	4	5	6	7
The nurses are well dressed clean and appear neat	1	2	3	4	5	6	7
Appropriate Physical facilities for type of services	1	2	3	4	5	6	7
Reliability	1	2	3	4	5	6	7
Staff can be depended upon to do the right things	1	2	3	4	5	6	7
Inform patients precisely when services will be performed	1	2	3	4	5	6	7
Sincerity of clinic staff to try to solve patient problems	1	2	3	4	5	6	7
Waiting time relative to appointment time or schedules time for a service	1	2	3	4	5	6	7
Responsive	1	2	3	4	5	6	7
Receive prompt service from clinic staff	1	2	3	4	5	6	7
Staff are always willing to help patients	1	2	3	4	5	6	7
Prompt response to patient requests and problems	1	2	3	4	5	6	7
Assurance	1	2	3	4	5	6	7
Staff are trustworthy	1	2	3	4	5	6	7
Staff are courteous	1	2	3	4	5	6	7
Staff work together in the patients' best interest	1	2	3	4	5	6	7
Feel secure in receiving services from the staff	1	2	3	4	5	6	7
Empathy	1	2	3	4	5	6	7
Staff know what your needs are	1	2	3	4	5	6	7
Convenient operating hours for patient needs	1	2	3	4	5	6	7
Staff give you personal attention	1	2	3	4	5	6	7

In this Likert scale 1 - strongly disagree with the fact, 7 - strongly agree with the fact. Following the order of the questionnaires, the data will be extracted and the information gained will be analyzed. In data analysis it will be used descriptive statistical methods such as tables, graphs, indexes calculation, etc.

The objective of the study is to analyze subjective assessment of medical service quality made by hospitalized patients in the context of the application of the SERVPERF method. Below the research hypothesis are listed:

H1: The satisfaction measured by the SERVPERF method in all three hospitals will be similar.
H2: There is no significant relationship between responsiveness as service quality dimension and overall patient satisfaction in hospitals.
H3: There is no significant relationship between reliability as service quality dimension and overall patient satisfaction in hospitals.
H4: There is no significant relationship between assurance as service quality dimension and overall patient satisfaction in hospitals.
H5: There is no significant relationship between tangible as service quality dimension and overall patient satisfaction in hospitals.
H6: There is no significant relationship between empathy as service quality dimension and overall patient satisfaction in hospitals.

PRELIMINARY SUPPOSITIONS

Expected results will be compared for three different hospitals. They can be similar or not, and that will represent how local hospitals provide services to their patients. For the public hospitals it could be expected the results which are similar for hospitals in countries in transitions, where according to these studies there was a significant difference between patients' expectations and perceived quality, which indicates that patients were not satisfied with the services provided (Sina, Shibabandani, and Ghara 2015).

The limitations of this study can be similar like in early research (Al-Momani 2016): the convenience sampling, which affected the ability to generalize the findings, and the lack of consideration of the past experience of those admitted to the hospital or the condition for which the patients were admitted, because these variables could have influenced the patients' expectations and perceptions of nursing care.

As a further implication, the gaps can be analyzed in detail and compared to each other in order to see which are the key gaps inside conceptual model of service quality, which is presented on Figure 1.

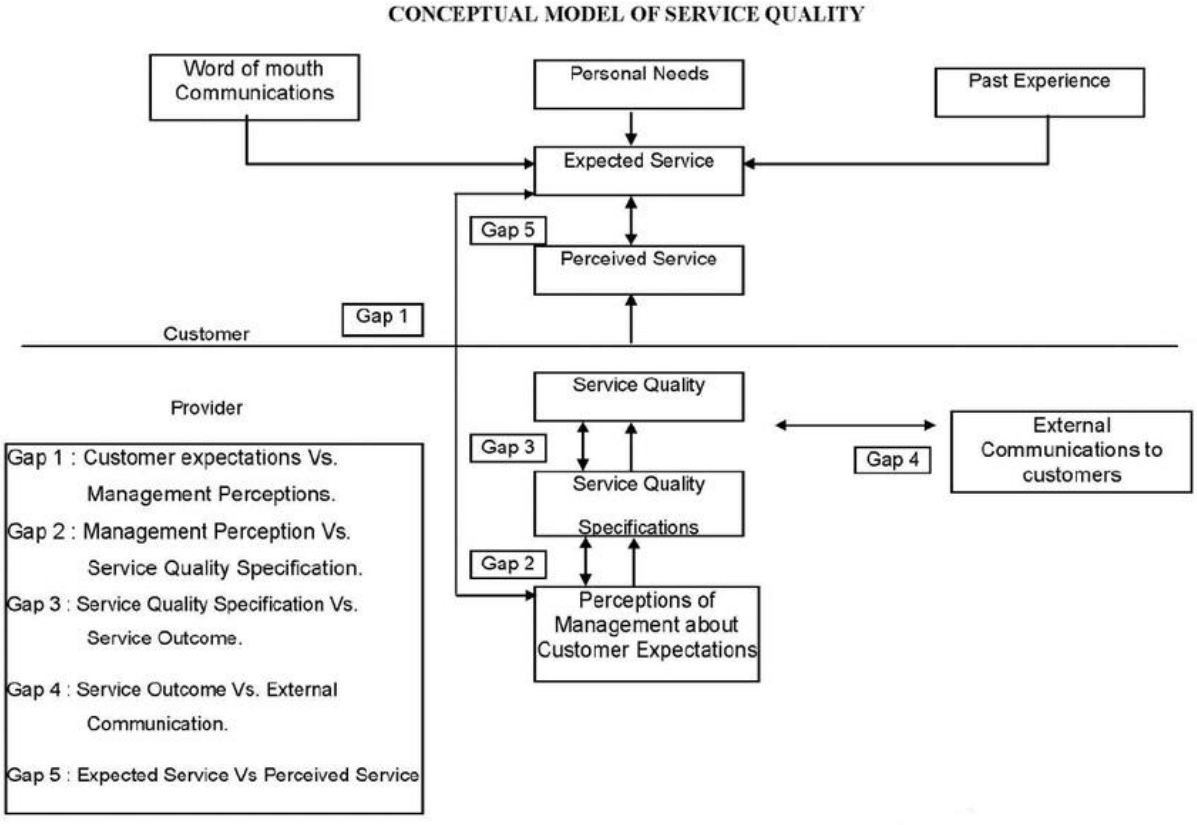

Figure 1: Conceptual model of service quality (Parasuraman, Zeithaml, and Berry 1985)

An additional analysis can help hospital management to see what needs to be done to increase patient satisfaction.

CONCLUSION

This paper proposed a research on the application of SERVPERF method in hospitals in Serbia. Main contribution consists of literature review, proposed hypothesis, research methods, and expected

results. Expected results should be in line with previous research – difference between patients' expectations and perceived quality, which indicates that patients were not satisfied with the services provided. In this way, management in medical institution can better shape their service and focus on the elements of the service which need the improvements. Accordingly, the satisfaction and loyalty of service users would be increased as well as the avoidance of conflict between patients and medical staff. The use of this method will give the results that can significantly indicate the fields that need the improvements in order to develop better health system. The next step is to conduct a core research.

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Session F: OTHER

Other papers and abstracts (pp. 271-284):

BEST SELECTION OF PROJECT PORTFOLIO USING FUZZY AHP AND FUZZY TOPSIS

UDC: 005.8:510.6

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ABSTRACT

Choosing the optimal portfolio for the project is one of the most important and strategic decisions in most organizations, especially project-based organizations. The issue of the project selection is a periodic activity in order to choose the appropriate and optimal portfolio from the proposed projects and ongoing projects within the organization which can meet organizational goals without waste of the resources and taking into account certain constraints. Consequently, the aim of this paper is to select the best project portfolio by using fuzzy AHP and fuzzy TOPSIS methods. The forgoing methods have been used in a case study, and the result and data have been evaluated from different points of view.

Key words: Project, Project Portfolio, Project Portfolio Management, Fuzzy AHP, Fuzzy TOPSIS.

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INFLUENCE OF "LONG SAILING SHIP" AS AN URBAN DYNAMIC SYSTEM FOR PSYCHOSOMATIC HEALTH SEAFARERS

UDC: 656.61:614

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ABSTRACT

Speaking of the "long sailing" ship in the concept of modern navigation, it is necessary to confine itself to ships that have sailed to the world's sea and oceans more than fifty years ago and had the same purpose, ie service transport. The modern ships of the merchant navy are designed so that they differ in many ways from those ships. Contemporary ships not only have the load carrying capacity more than big, but their driving and control system is an unparalleled pose. The modern way of charging cargo and warehousing in the ship's storage space is driven by the commercial service needs dictated by the world's supply and demand. The impression is that everything is aligned exactly when it comes to discussing service requirements, the technique of loading goods and cargoes, the modernization of port infrastructure and the overall information and technical micro and macro structure. However, when dealing with engagement submarines (seafarers) on a "long sailing ship", one particularly disturbing image is being obtained. Current maritime challenges or conditions in modern navigation on "long sailing" shipping companies provide greater comfort, while on the other hand there is specificity when it comes to sociological health diagnosis (a finding) attributable to the ship as an urban dynamic system. This diagnosis justifies the scientific observation and elaboration of the obtained research results, which have been carried out using the matrices and models of psychosomatic status of engaged seafarers on a long sea cruise vessel offered by Maritime Ergosozology.

Key words: Naval, Marine-Dynamic System, Seafarer, Professional Seafarer, Psychosomatic Health, Maritime Ergosozology.

INTRODUCTION

What is special attention is the "sailor" as a very important factor in all service-transport operations. Namely, when it comes to the maritime economy, seafarers are very little or not mentioned at all. His mention is evident in cases where work processes do not lead to reliability, but at risk or some other dangers and working disadvantages.

Humane ecology implements values that are very important for the health and sustainable development of engagement on "long sailing" merchant ships in the scientific and humane building materials that, on the one hand, offers Maritime Ergosozology and, on the other hand, Maritime Ergosozology.

The Maritime Ergososologist offers educational material relating to the "long sailing" ship as an embedded-transport, urban dynamic system. Engaged entities in the work process on a ship as an urban dynamic system are often exposed to various impacts that distort, in the larger or smaller marines, their psychosomatic health.

Boat shake, noise and vibration arising from the work of the ship's propulsion system, fear of possible danger, frequent navigational and maneuvering risks attributable to the human factor, specific working hours, sea pollution, specific conditions in the ship's space, as well as ship dynamics and sailing in imposed geophysical and weather conditions, as well as many others.

In addition, Maritime Ergosozology observes, analyzes and diagnals any foreseeable, actual or potential dangers that, due to vessel dynamics and its associated presence, affect or may affect the detriment of seafarers' health.

Maritime Ergosozology does not accept the usual term "embarked" and "unloaded" sailor, since the term "loaded" or "unloaded" refers to the cargo and goods carriage, which can not apply to a "seaman engaged in a particular ship service ". That is why Maritime Ergosotology emphasizes that it is necessary to choose an adequate term that will refer to the meaning of "engaged person on a long-haul ship".

Also, Maritime Ergosozology suggests that it is necessary to harmonize the terminology for those engaged on a ship in a professional maritime service such as sailors and boatmasters. Nauticaši and shipmasters, from cadets or machine assistants, to the captain of long sailing or machine manager, are professional sailors who have been training for a maritime profession for many years and with additional professional courses. So these are "professional sailors". The other group of engaged agents on a long sailing ship, we see as "seafarers". The term "seafarer" would refer to an engaged person who professionally carries out a certain work on a ship such as a chef, a waiter, a young room and a kitchens, and others who in some way perform additional services on board. The aforementioned persons can also carry out this job on the mainland (waiter, chef, auxiliary worker, etc.), while a nautician and a boatmaker can not do their own professional activities on the land, due to professional maritime specifics.

Whether it is a seafarer or a professional seaman, the impact of the boat dynamics dynamics can not be classified. The ship's urban dynamic presence in its current activity is shared by engaging shipowners depending on their personal biophysical habit and adaptable abilities. Thus, eg rocking a boat affects the subject depending on its adaptability and a healthier, more accurate psychosomatic condition. Diseases, marine disease is evident in loaded vessels on a smaller or larger ship (intensity) depending on the organic functional abilities or adaptability.

The term "Maritime Ergosozology" is a Greek coin: "Ergo"-work; "sozo"-which, with the prefix maritime, refers to the specific technical and any other protection of the engaged person on board, irrespective of his profession or work activity. The term "Maritime Ergosozology" identifies a professionally educational, legal-preventive, obligation that derives from the science of safety of work, ie "safety at work". The study of maritime ergososology as part of organizational legal and technical sciences is mainly related to prevention, conservation and treatment. Work injuries, infections and diseases caused by ciradial destruction are very often diagnosed as chronic illnesses (weak hearing, hearing, sinusitis, headache, pulmonary obstruction, toxicity, radiation, and exposure to many other constipation).

Our research reveals body injuries that have arisen due to the neglect of the subject in carrying out the task, which is easier, harder, more difficult with health problems (fractures, legs, ribs, eyes ...), more difficult to lose one part of the body (finger, arm, leg, ...) and death injuries. These injuries are evident as open and closed, which, in the event of a ship's ocean-going ship (and not while in the harbor, the anchorage in the port of the ocean, the dock or any link to the land terminal) indicates that expert medical assistance modern communication systems and footwear training of the first deck officer, possibly not expertly performing, which is one type of health risk to the ship's arrival or until a professional medical team from the land arrives. This team arrives by air (helicopter) at the invitation of the responsible person-captain of the ship, in so far as it is assumed that the state of health is in danger, or that special expert assistance is necessary, a "unexpectedly busy". Our research has shown that 47.83% of our respondents, seamen, have problems with prostatitis, rheumatism, diabetes, frequent headaches (sinusitis).

The second group of our respondents has problems with vision, hearing, meteoropathic phenomena, and neurosis. Psychotic phenomena are attributed to the conditions of navigation, with a special

reference to the ship with a dynamic system, evident in the opus of nostalgia, working time (guardianship), ship's age, cruising speed, as well as the time to keep the boat on the treadmill and sailing in the cold (polar) warm (trope) belts. Work injuries or, as we often call them "trauma," in the study of Maritime Ergososology, we observe not only as health (body) but as legal, organizational, moral, technical, psychological and other destruction. These surveys have been conducted for almost three years on merchant navy vessels that sailed under Yugoslav and foreign patrols. ("Jugooceanija" Kotor, "Prekookeanska plovidba" Bar, "Atlanska plovidba" Dubrovnik, "Jugolinija" Rijeka, "Beoplov" Belgrade, "Tankerska plovidba" Zadar, as well as engaged seafarers at the company "Dabinovic" Monaco.

The research project has gained more value when it is known that it has been implemented through Maritime Ergosozology and its scientific "sister" Maritime Ergosophology. For our research to be of scientific quality we consider it necessary to state what all Maritime Ergosozology as well as its "sister" Maritime Ergosophology used to shape his scientific mile.

PSYCHOLOGY (Psychology of Ability, Personnel Psychology, Maritime Psychology, Maritime Psychosociology, Psychoanalytic, Psychology Information, ..)
SOCIOLOGY (Sociology of Labor and Occupational Safety, Sociology of Labor and Environment, Maritime Sociology, Sociology of religion, Maritime sociopsihology..)
PHYSIOLOGY (Physiology of work, Physiology of the environment, physiology of geometeorological variables..)
ANATOMY (Anthropometry, biomechanics, bionomics..).
TECHNICAL KNOWLEDGE (boat science, meteorology, boat maneuvering, fire protection techniques and tactics, risks, etc.)
MEDICAL INSPECTIONS (Medicine, Stress Prevention, Stress Effects and Stressed Fields, Epidemics, contagious and contagious (related) diseases, sedatives, medications, emergency surgery, urgent cardiology, first aid...)
LAW (Maritime Law, International Maritime Law, Sea and Sea Protection...)
ECOLOGY (Basic Ecology, Ecology of the Environment, Urban Ecology, Moral and Mental Ecology, Marine Management...)
MARITIME PRACTICE (Prakseology, Ergonomics, Ergosozology, Ecosystemology, Urbosozology, Urbosophology...)

When considering the number of scientific knowledge used and their implementation in the maritime professions, it is worth to adhere to multidisciplinary science such as Maritime Ergosophology and its "sister" Maritime Ergosophology.

The aim, task and scientific educational subject of Maritime Ergososology and Maritime Ergosophology is the first time as a teaching subject at the Maritime Faculty in Kotor, Montenegro, whose author is prof. dr sci. Danilo A. Đurović. Both of these scientific subjects have a very clear educational character that is recognized in the prevention of circadian rhythm and the regime of life of each engaged person on a "long sailing ship", thereby reducing any work, life and any other risks in the urban marine system, whether or not the same observes it as dynamic or restraining.

CONCLUSION

It is indisputable that the "long sailing" ship as an urban dynamic system, which is a multidimensional working and living habitat of "seafarers" and a professional seaman, is a special, specific profession that can hardly be compared to any profession on the mainland.

One of the arguments in favor of recommending that the aforementioned educational material is used in maritime teaching is not a small number of bodily injuries to engaged subjects on "long sailing" vessels, as well as premature and sudden deaths, as well as physical and verbal conflicts that are mentioned as "coincidence". In addition to the above, there is an enormous irritability that can be

attributed to many factors that disturb the circadian rhythm and life and work regimen. Obvious circadian destruction strongly affects the development of psychosomatic disorders and sociophysiological alterations that are diagnosed as "disease without diagnosis". Many will be asked, "What is this disease without a diagnosis?" This definition does not apply to a single diagnosis but to a set of evident destructions that disturb the psychosomatic and sociophysical health of current subjects. In conclusion, we can conclude that there are many arguments that support the introduction of Maritime Ergosophology and its "Sister" Maritime Ergososology as an obligatory educational professional maritime scientific preventive measure.

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INFLUENCE OF "LONG SAILING SHIP" AS THE URBO OF A RESTRICTIVE SYSTEM FOR PSYCHOSOMATIC HEALTH SEAFARERS

UDC: 656.61:614

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ABSTRACT

Speaking of a "long-sailing" ship as a wake-up area and influencing the restriction of urban space to the engaged entourage, it requires serious scientific and professional professional observation that should offer validly applicable scientific models and methods for the ultimate result. The "long sailing" boat is not only a convertible dynamic system, but it is also a restraint urban system that imposes specific conditions on navigation, anchorage, construction, and port facilities. In all these conditions (navigation, anchorage, docking, transhipment terminals, etc.), the "long sailing" boat is always urban restrained regardless of all its contemporary housing, recreational, techno-physical, control, driving, safety and other mechanisms.

Key words: "long sailing ship", ship as a restraining system, sailor, professional seaman, psychosomatic health, nostalgia, nausea, sociophysical alteration.

INTRODUCTION

Any restriction in the very concept, regardless of whether it is observed in the air (sea-going), in vehicles for longer journeys (land vehicles), under the sea (submarine) of legal-penalties (jail), longer hospitalization (hospital treatment), internships, military and other organizational rules, rectreatment-creative constraints, affect more or less, faster or slower the occurrence of destruction in the opus of real biophysical and physical-mental vitality. The influence of the restriction on the ship's space on the psychosomatic and sociophysiological health of the engaged vessel on the ship is strongly influenced by the occurrence of certain destructions that are observed in the concept of disturbing its circadian vitality. Our long-term research suggests that the occurrence of circadian destruction is almost subdivided by external (76.2%) as well as internal (79.6%) disturbance factors. Under external factors, we have included all those factors that are expected or unexpected to arise outside the human biophysical and psychosomatic mechanism, such as the impossibility (restriction) of movement, communication with dear or desirable persons (associativity), the inability of a physical contact that implies innovation, creativity, spiritual and professional educational training, the use of better therapy, the wider (and possibly better) selection of professional medical diagnosis, prevention and curative. Inability to receive adequate hospitalization during the necessary reanimation or therapeutic treatment. When we say this, then we think that a person (seafarer and professional sailor) who needs adequate health care, whether in a ship's dwelling (cabin) or ship station, can not be compared to the same landing space. The main reason is that the ship as an urban restraint and urban dynamic system is always subject to swing and foreseeable vibration effects, which prevents adequate health care and rest. "Long boat navigation" is a working and domicile urban system in which an engaged subcontract carries on constantly 24 hours more minks under specific, both working and living conditions (enforced). Working time of the Guard ("4-8" as the still active time on many "long sailing" ships) requires a special and urgent biophysical adaptation that is not always possible. The inability to meet adaptable demands creates less or greater, easier or harder consequences for the health of the engaged

person on the "long sailing" vessel that we can not say is "painless" when it comes to the harmonious functioning of the circadian rhythm and the regime of life and work. Severe sleep and rest, swinging of the ship, constant-weak or stronger vibrational effects, sexual abstinence or eventual sexual aberration, homosexual tenderness, alcoholism, over-blackness of black coffee and cigarettes, sedation, poor nutrition especially in conditions caused by rocking (orchids, restless sea, ...), aggressive (manic) behavior of the individual, depression, nostalgic effects, the influence of monotony due to long sailing, fear of drowning, creeping and collision of the ship, potential dangers, fear of cannibing (afflicting) illness, fear of possible bodily injury (open or closed fractures, poor quality of orthopedic and surgical care due to the distance from land to sea), physical assaults on the other person, threats or killing, suicidal thoughts, separation from family members, suspicion of wickedness, parent or other disease family members, meteoropathy, associativity, inferiority of hierarchical relationships on r the "presumed-subordinate" and vice versa, and the like. When it comes to religious, racial, national and political affiliation (in the case of engaged vessels on a "long sailing ship"), our research records a very high percentage of mutual tolerance.

Whether this degree of tolerance (98.23%) occurs due to the fear of possible potentiation of the mentioned differences is likely to cause conflicts, intolerance and fear of possible excesses, is not known to us, but we can certainly conclude that part of this privilege is mixed in the knowledge that one the other "closest" and, in the case of danger, the most necessary.

A certain percentage of such high tolerance can be freely attributed to the family and educational quality of education (education and training). When it comes to professional orientation, professional education, personal policy, respect for the ship's hierarchy, the promotion and preservation of the quality of interpersonal relationships among the crew members, the behavior of traveling and staying in foreign and domestic ports, the acquisition of professional practitioners, the preservation of health, respect for diversity, and much more is studying in maritime ergosophology and her "sister" Maritime ergosozology with the aim of quality, prevention and sustainable development of maritime professionalism in the domain of all her tangent activities with special attention to the protection and preservation of every engaged person on a "long sailing ship".

CONCLUSION

Maritime as a specific service-transport activity, with special reference to "long-haul shipping" cargo ships, inevitably requires educational material called Maritime Ergosophology and Maritime Ergososology, which in its articulation clearly point to the prevention of the effects of the restriction as well as the dynamics of the ship as a transportable system to the health of employed (engaged) subjects.

In psychological, sociological, health care (preventive-curative), geometeorological and legal protection areas, it is known that the restriction of space to be observed in the domain of work or life opulence strongly affects the disturbance of the circadian rhythm and the regime of life and work of the current personality.

Restrictions on ship space (life and work) pose a particular risk when considering that a ship as a restrained and dynamic system of multi-dimensional space is affected by many disturbing and therefore risky factors. For this reason it is necessary to observe, elaborate and set a clear boundary between the risk factors affecting the occurrence of psychosomatic suffering and sociophysiological alteration, professionally, scientifically and sociologically. Our findings are in support of the study of Meteoropathology as a modern and current, preventive medicine.

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CONTRIBUTION OF MENTAL ECOLOGY TO MODERN MARITIME

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ABSTRACT

It is indisputable that a modern ship, as an urban mobile system, imposes a certain specification that inter alia applies to "embedded" seamen. The current specification for decades has been recognized by prof. dr sci. Danilo A. Djurovic, who is teaching at the Faculty of Maritime Sciences, introduces a lecture entitled "Maritime ergosophology". This subject in the educational matrix, among other things, offers preventive and developmentally sustainable validity that is from professional aspectsimplemented in the opus of Mental Ecology. Mental ecology is based on practical scientific validity aimed at improving the quality and safety of employees on the long-haul, freight, ship management system, as well as many other professional tasks in the regular and state of emergency. Mental ecology in the concept of Maritime ergosophology aims to realize moral and mental vitality as a basic precondition for overall ecological, development-sustainable validity.

Keywords: mental ecology, ship collective, ergosophology, psychosocial work, ship as an urban mobile system.

INTRODUCTION

In modern maritime, there is little evidence of destruction that is perceived as psychosomatic suffering and sociophysiological alteration. Due to such occurrences and fair relations with seafarers sailing on the "long sailing" ships at the Maritime Faculty of Kotor (now the Maritime Faculty Kotor), more than twenty years of teaching is a subject that in its gradual educational vitality recognizes the need to implement the Mental Ecology segments.

Mental ecology has a very strong educational character through preventative sharing whereas on the other hand it is curative or part of the current event. Modern navigation on "long sailing ships" involves many destructive phenomena that affect the distraction of the circadian rhythm and the regime of life and work of "embedded" sailor. Current disturbances can be observed in the prisms of circadian destructions that are very difficult to be recorded in the given matrices as mandatory and regular occurrences or assignments to the general members of the ship's collective. Since the seafarer is a "persona per se", the statement itself indicates a very wide range of preventative methods and models.

By studying Mental Ecology as a teaching educational achievement for the before mentioned profession, "has taken care of" Maritime Ergosophology, whose scientific foundations are given by prof. dr sci. Danilo A. Đurović, who as a seafarer, innovator and expert in this field, wants candidates for maritime science to get acquainted with the manner and behavior of multidisciplinary life and work on board.

A "long-sailing ship" represents the working-environment for each "engaged" in the profiles of its professional activities. When we say this then we have in mind that a "long sailing" boat is engaged by people who are classified as Maritime Ergosophology as "professional sailors" and "seafarer". The difference in this terminology (seafarer and professional sailor) is not only a literary character, but this qualification is very important in a professional maritime opus that multidisciplinaryly coincides with

persons from the profile of a naval profession (sailor, marine engineer) and persons from other professions (waiters, , auxiliary staff, ...) who are employed in the economy on land. Maritime ergosophology is a science that observes, studies, analyzes and offers the most optimal models and methods in combining a very specific maritime profession, through work-wisdom learning. Mental ecology is built from the knowledge of long-known terms: lat. Mentalis-spirit, soul, mind and cramp. term "Oikos" which in the original Greek language has the meaning of family, home,.... The united terms "mentalis" and "oikos" in translation has the meaning of "home-education behavior" with the right to study scientific material in these areas because the "long sailing" boat. From this ,as well as many other reasons, Maritime ergosophology seeks to work through wisdom learning and the application of mental ecology contribute to the development of modern maritime and all its subsystems. Thus, mental ecology, as a teaching subject, aims to produce as many sociomorphic and mentally disposed subjects as possible, which will affect the protection and sustainable development of overall living values in such behavior.

The specificity of the maritime call requires a serious and devoted scientific approach to ascertain as clearly as possible the present issues affecting the integrity of the seafarers' personality, which in the sequence is dispersed also to other members of the ship's collective.

In maritime professionalism, little attention is devoted to protecting the integrity of the seafarers' personality, while the other, techno-service aspect, such as increasing economic efficiency, increasing ship speed, increasing load capacity, overloading technology and control mechanisms, we can observe constant developing, . The particularity of a maritime call is reflected through a living and working atmosphere that represents a professional specific, especially on the system platform of "restriction" and "dynamics". Therefore, a ship as a working environment can, on the one hand, be an urborritristic and, second, an urban system. These features of the ship system have a negative impact on the psychosomatic, sociophysiological, geometeorological and biophysical condition of sailors.

Ergosophology as a wise science of work seeks to find the best way to make sure that the subject in its professional and living conditions is adaptable and feels secure in realizing the concept of life processes. Maritime ergosophology aims and tasks to point to the destructions that may arise from homotehnological and tehnosistematic omissions. Current maritime professional issues are not only an individual and / or organizational problem, but can be categorized into serious general social problems. These problems have a serious impact on overall work-life, social and environmental vitality. For this reason, Maritime ergosophology between sociological scientific gradations uses the values given in the work of Mental Ecology, as human educational matter for the purpose of preserving the psychosomatic and sociophysiological-health status of the observed persons on a "long sailing ship". The obstacles the sailor faces during the realization of his or her wishes are accompanied by many types of conflicts, in which the seafarer, using psycho-physical resources, strives to achieve the goal. By leveraging adaptable resources to solve current issues, whether they are observed in the work or life style, at least a minima of value tolerance is achieved that helps solve the current problem. However, the unwillingness of poor quality relationships and the answers to the present problems are attributed to the depleted psychophysical condition as well as the severity of the present problem that is imposed by the urorestriction and urbodynamic marine environment. Mental Ecology in the Study of Maritime Ergosophology, the solution is seen in the application of prescribed working-life norms, which are implemented through the actualization of the marine regime. . Preventing or regulating daily burden on seafarers Mental ecology offers certain preventive methods and models as creative, human progressive and socio-individual vitalities. Also, as a solution to improving the overall engagement of seafarers on board, within Maritime Ergosophology and Mental Ecology, it is necessary to include contemporary multidisciplinary exacting sciences that can contribute to the resolution or prevention of current circadian destruction through which seafarers are passing daily. It is unquestionable that the contacts with socio-cultural values contribute to the knowledge and refinement of the mind and spirit of the seaman, which implies the creation of additional adaptable capital. Humane education in its matrix offers a scientifically authoritative effect that will, without simulation, create a public observatory elaboration that has a character of preventive corrective value for the purpose of real and precise diagnosis of the current condition. Following the fulfillment of the envisaged matrix requirements, it is

necessary to engage adequate preventive mechanisms aimed at preventing further ecosystem disturbance and protecting the overall socio-planetary, biocenosis-biotopes and restoring them on the scale of sustainable development.

CONCLUSION

Based on the present work, it is evident that in the context of the prevention of circadian rhythm and regime of the engaged sailor on the "long sailing" ship, more attention is paid to sailors as individuals, which are the main factor in the execution of one of the world's very important activities. By studying Maritime Ergosophology and its Human Consciousness-Mental Ecology, realistic and preventive acquaintance of future candidates for the maritime call as well as already engaged seafarers on the ship with the task and aim of the successful realization of modern maritime activity are envisaged. The contribution of the Mental Ecology within Maritime Ergosophology will provide visible results in preserving the mental and physical integrity of the sailor "long sailing" through the educational value of the adaptable resources.

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CONTROLLING SYSTEMATIC ERRORS IN ROCK TESTING BY MEASUREMENT UNCERTAINTY ANALYSIS

UDC: 621.317

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ABSTRACT

Many important decisions in engineering sciences are based on the results of quantitative measurements. When an observation result is stated, it is also required to determine the uncertainty associated with the observation. A measurement uncertainty consists of random and systematic components. Different from the random fluctuations, systematic uncertainties are resourced from the specifications, calibration and other heuristic critical factors. This study assesses the systematic and random effects which create some uncertainty on a Schmidt Hammer (SH) rebound hardness test. As the certain probability terms, systematic uncertainties are quantified and appraised by measurement uncertainty evaluation framework. The importance of elemental uncertainty and coverage term are discussed from a statistical control perspective. In the same ground, the effective number of degrees of freedom is also evaluated. Use of an uncertainty term as a measurement parameter in decision making can provide some reliable and realistic information for engineering risk management and quality control.

Key words: measurement uncertainty, systematic error, Schmidt hammer, coverage factor.

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AN ASSESSMENT ON OCCUPATIONAL HEALTH AND SAFETY SPECIALIST TRAININGS IN TURKEY

UDC: 331.45(560)

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ABSTRACT

Work life should be regarded as a process that constitutes a large part of people's lives rather than the actions they take to maintain their lives. In this sense, it is not possible for people not to be affected by their work lives. Occupational health and safety studies basically regulate working standards worthy of human dignity. Occupational health and safety specialist is an occupational group with vital functions in terms of their duties and responsibilities at workplaces. For this reason, the education and training processes they take to fulfill these tasks are extremely important. Because the training they receive is a factor that determines their competencies and efficiency in the organization. Due to major work accidents in Turkey, the importance given to the area of OHS is increasing. However, many OHS departments have begun to offer vocational training, a certification system for other branches has been established and occupational health and safety specialization certificate has started to be given. In this study, the level of competence of these trainings for OHS specialization in Turkey will be discussed in terms of fulfilling the duties and authorities.

Key words: Occupational health and safety, Education, Specialist.

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