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Institutional framework for development
of the third mission of universities in Serbia

Conference on the third mission of the university

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PREFACE

These conference proceedings contain reviewed and presented papers of the IF4TM International Conference on the third mission of universities held on November 23-24, 2018 in Belgrade, Serbia. The conference was organized as the final event of the project "Institutional framework for the development of the third mission of universities in Serbia" under the Erasmus + program. At this event, five distinguished keynote speakers and 35 authors presented their papers in the areas of three pillars of the university third mission: technology transfer and innovation, continuing education and social engagement.

The aim of the conference was to serve as a platform for academics and researchers to present their latest research and good practices in topics covered by the conference and to exchange their ideas on cooperative development of modern universities with their strong links to society. Moreover, the main results and achievements of IF4TM project were also presented and discussed in the sense of their sustainability and overcoming major obstacles in developing and the implementation of all three dimensions of the third university mission.

Finally, we would like to express our gratitude to the members of the Programme Committee and the Organizing Committee for their work and great contribution to the conference success. We also acknowledge the authors themselves, without whose expert inputs there would have been no conference.

Editor-in-chief

Prof. Dr. Vesna Mandic

TABLE OF CONTENT

SESSION 1:

TECHNOLOGY TRANSFER AND INNOVATION

NEW TRENDS IN DIGITAL ECONOMY

Ivana Marinović Matović[1]

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Abstract: *The digital economy brings significant business advantages in modern business conditions, such as the improvement of business performance organizations, the application of new business models, the introduction of new products and services. The aim of the paper is to point to new trends in the digital economy and describe their influence on the optimization of business processes. The paper analyzes the advantages and disadvantages of the use of new digital trends and processing large amounts of data in order to support the decision making process. The author also looks at the obstacles that occur in the Republic of Serbia, which are limiting factors for the full implementation of new digital trends.*

KEY WORDS: Digital economy, Republic of Serbia, Big data, Business organization, Business models

1. INTRODUCTION

The digital economy has a history for nearly two decades, and the first description of the digital economy can be found in the work of the author Tapscott (Tapscott, 1997). In addition to the terms digital economy, there are also other terms - the internet economy, the web economy and the new economy. The real explosion in the development of the digital economy is recorded at the beginning of the 21st century with the increasing use of the Internet and its involvement in business processes. The beginning of 21st century is characterized by the establishment of a large number of business organizations that connect their business model to the functioning of the internet. A relatively small number of these business organizations achieved business success, largely due to the absence of well-designed business models. The next period brought improvements in terms of improving existing and creating new business models, so the development of the digital economy has entered stable currents. Today, we can say that we are in the era of a mature digital economy, characterized by a significant share of data in the management of business processes, as well as in the business decision-making process. The new economy is often described in the literature as a data-driven economy.

2. APPLICATION OF LARGE QUANTITY OF DATA IN DIGITAL ECONOMY

The dynamic and vibrant development of the digital economy was stimulated and driven by technological innovations. One of the major technological novelties refers to the possibilities of widespread use of a large amount of data (structured, semistructured and unstructured data) in the public and private sectors. It is therefore considered to be of great importance a new trend in the digital economy - Big Data. Digitalization itself does not represent a special novelty, as well as everyday use of the internet and mobile technologies, but the use of numerous devices with built-in sensors, RFID technologies, as well as the development of Internet of Things (IoT) and Internet of Everything (IoE) concepts. All these technologies have contributed to generating a huge amount of data, Big Data. In the literature, a number of examples and statistics can be found indicating the presence of the Big Data trend. According to IBM's Big Data (IBM 2013) reports, as much as 90% of all data collected throughout the history of humanity was created in the last two years, and the data growth rate in recent years is 40%. Estimates are that the application of digitization is growing at a rate of 30% in the period 2000-2020 (World Economic Forum & Insead, 2014). Trends in accelerated data generation and flow are of paramount importance for all business areas. It is anticipated that the average business organization will have at its disposal 50 times the amount of data and information available in 2020 than it is today, while the average number of employees in the IT sector will increase only 1.5 times (EMC2, 2013).

Today there is no single definition for Big Data. According to the European Commission's definition, Big Data represents a large amount of data that is quickly generated from many different sources. In academic literature, the explanation that comes from the concept of Big data can be defined

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by 3V (Laney, 2001), which means volume, velocity, and velocity. An increasing amount of data is transmitted over IP networks. The main drivers for the growth of data transmitted through IP networks are the following (World Economic Forum & Insead, 2014):

- Internet protocol (IP) becomes a common language for most communication systems;
- Many things, people, processes, and places that have not been connected before, are connected for the first time, becoming the head of the Internet of Things concept - IoT;
- Most of the data stored in the analog format is converted to digital format. It is estimated that during the past decade, the share of digital content in total content has increased from 25% to 98%;
- Internet protocol version 6 Ipv6, allows connection to Internet 1038 devices.

In addition to the large amount of data, Big Data phenomenon also implies a constant flow and inflow of data from different devices (RFID readers, sensors) in real time, and for which the traditional storage and processing systems can not be used. It can be noted that a significant part of the data is collected by machine to machine transactions, in which the user is mostly not actively involved.

It is customary that the Big Data Phenomenon refers to data that is static (data-in-rest) and streaming (data-in motion). These data represent a significant information resource, which is why technologies for their storage and analysis are being developed. Regarding the speed of data flow, an important issue is the consistency and completeness of the data. Another important issue concerns the use value of data, i.e. how long the data will have value. The third dimension of velocity, as a feature of the Big Data phenomenon, relates to Real Time Big Data Analytics (RTBDA), which today is one of the main constraints on the application and development of the Big Data concept. This issue is devoted to a significant part of Big Data development. The Big Data phenomenon implies that the data come from different sources and have different formats. It can be structured data, such as numerical data shown in a tabular form, data of many software for statistical analysis, data in traditional relational databases, and the like. Then, there are semi-structured data, such as log files, emails, XML and HTML documents, and unstructured data, such as video images, folders, diagrams, sound recordings, machine-generated data from active or passive systems, GPS signals with mobile devices, etc. The growth in the volume of unstructured data is much faster than the growth in the volume of structured data. The amount of unstructured data is tripled every three months, or new seven million websites are generated each day (Gartnet, 2017).

In addition to the above three dimensions 3V, there are still some other Big Data variables in the literature, such as variability, truthfulness, or accuracy, and complexity of data. Variable is the fact that data transfer can be very uneven at time intervals. In the context of variability, the existence of extreme values in the statistical sense is checked. Bearing in mind the fact that today data comes from different sources, there is a problem that these data are transformed and linked, which creates complexity in the management of the data and systems in which they are stored.

It is extremely important for business systems to be able to use the available data in the business decision making process. In this sense, it is important to know the technology necessary for the operational use of a large amount of data. Big data consists of large amounts of data that can not be processed by conventional data processing systems, but for this purpose special technologies based on networked computers and parallel processing are used. New technologies also require new data analysis procedures, opening up space for the development of existing ones as well as creating new business analytics techniques. A large amount of data contributes to the further development of the field of predictive analysis, where Business Intelligence technology is used. Predictive analysis techniques can contribute to significant competitive advantages of organizations and become an important tool for achieving the strategic goals of business systems. It is estimated that this area is also rapidly evolving, at a rate of 8% to 10% per annum (Siegel, 2015).

3. APPLICATION OF BIG DATA IN CONTEMPORARY BUSINESS ORGANIZATIONS

It is clear that business systems are facing an increasing amount of data. But, against this growing trend in data volumes, there is a downward trend in the volume of data that business systems really use. According to the estimates of the World Economic Forum today, only 0.5% of all available data is used (World Economic Forum, 2015). Today there is almost no area in which there is no

significant increase in the amount of data. The significance of Big Data technology and analytics is indisputable, and for business organizations large amounts of data can represent their weak point or will be a comparative advantage.

The main advantages for business systems originating from Big Data are (Manyika, et al., 2013):

- transparency,
- improving the performance of the system,
- opportunities for more detailed database segmentation of clients,
- support to the business decision making process and
- new business models, products and services.

Transparency of data is extremely important, as it opposes the established practice of isolated data by business functions. Potential improvements relate to: generating new products and services, optimizing business processes and supply chains, targeted marketing, improving organizational management, and improving research and development (Organization for Economic Cooperation and Development, 2013). A data-driven economy based on the use of large amounts of data can generate significant added economic value. Today, many business organizations that already use a large amount of data in their business have some advantages. For example, Wal-Mart has improved its supply chain using a large amount of data, and, on this basis, has increased its profits by 16% over the past four years (Kennedy, 2014).

Despite the observed trend of rapid growth in the amount of data, which is called the data revolution, there are arguments that come from the field of IT support to the business decision-making process, and they support the fact that the Big Data phenomenon is observed before in the evolutionary, but in terms of the revolution. Namely, even before this phenomenon, long-term practice of using data and various information technologies, as well as all the more complex analytical techniques, is being documented in the business decision-making process. This practice dates back to the '60s and' 70s, when the first analytical procedures for supporting decision-making appear on the basis of available data, such as the application of various statistical techniques, the technique of management science, the technique of operational research, and others. From information technologies, various database generators were used, then decision support technologies and systems, expert systems and other intelligent decision support systems, advanced data mining techniques, and business intelligence technologies. All these technologies were based on the idea of collecting, storing and analyzing data for business decision-making (Zikopoulos et al., 2012). When it comes to the impact of Big Data on business performance, some research has shown that there is a close link between the business use of large amounts of data and enterprise performance (McAfee & Brynjolfsson, 2012). According to this survey, business organizations that are at the top in their industry and are intensely using data in the business decision-making process, are on average 5% -6% more profitable than competitors (McAfee & Brynjolfsson, 2012). The significant change brought about by generating an increasing amount of data in business systems is creating the conditions for a new kind of competitiveness - competition based on analytics. This is a competition that is based on extensive use of data, analytics and business decision-making based on objective facts. The conducted research pointed to the essential prerequisites and steps that business systems can take to use this new type of competition (Devenport, 2006). Benefits of business analytics and competitiveness can be applied in all business areas. In practice, there is no clear division into organizations using business analytics and those that do not. Several stages can be distinguished through which business organizations pass on the way of using business analytics as a competitive advantage (Devenport, 2006). In the first phase there are organizations that are faced with significant organizational and technical barriers to using analytics; in the second phase companies that use analytics in the organic scope are only in business functions; in the third group are organizations that have a clear vision, but the difficulties in its implementation, while in the fourth phase of the organization with significant application of analytics in business, and in the last stage, organizations that use analytics as a necessary tool in the business, that is, where analytics is the most important dimension of their business strategy.

In addition to the significant advantages that can provide a large amount of data, there is a gap between the amount of data and data values. According to some surveys, only 0.5% of all available data is used today (World Economic Forum, 2015). This is due to the fact that the data themselves are not

interesting, and they have a declining value over time. The information value curve over time at the time of a large amount of data is getting steadier in terms of declining values, because the amount, speed, and diversity of data influence organizations with more challenges in an increasingly complex environment (Hackathorne, 2004). Therefore, the key question is how to extract knowledge and business value from a large and complex amount of data. In this regard, it is important to look at possible data transformation processes within the hierarchy of knowledge (Michael & Miller, 2013). Other barriers to the wider application of the Big Data concept may be the lack of well-trained and qualified professionals; problems with fragmented data, problem with data quality; inadequate organizational culture, especially culture in the field of business decision-making, where in many cases the intuition in making business decisions is mostly used. In addition to these internal barriers, other external limiting factors are public regulation, privacy, and data security.

4.CONCLUSION

The Big Data concept is an important novel in the functioning and development of the digital economy. Although there are different definitions of this phenomenon, most authors agree that this is a phenomenon that expresses the need for a new way of using and managing a large amount of data in business systems and in the public sector. A large amount of data opens up new opportunities, but also challenges for business systems and government organizations. In addition to the structured data, this is an enormous amount of semi-structured and unstructured data. For their storage and processing, new technologies are used, which are known as Big Data technologies and Big Data analytics. A large amount of data provides the potential for significant changes in business, both in terms of how business processes and models work, and in generating new products and services, able to increase transparency in business, to improve marketing activities, to improve the business decision making process through a new analytics and in improving the functioning of public sector institutions. The most important internal obstacles to the successful implementation of the Big Data concept are organizational culture, lack of staff, data quality, and external issues are the dominant issue of security and data protection, as well as the lack of an appropriate legal framework for the implementation of this concept.

REFERENCE LITERATURE

Davenport, T. (2006), *Competing on Analytics*, Harvard Business Review.

EMC2, (2013), *Digital Universe*, http://www.emc.com/leadership/programs/digital-universe.html

Gartnet Inc., (2017), "Data and Analytics: Big data", Avaiable at: http://www.gartner.com/technology/topics/data-analytics.jsp

Hackathorne, R., (2004), "The BI Watch: Real-Time to Real-Value". DM Review, January 2004, http://www.bolder.com/pubs/DMR200401-Real-Time%20to%20Real-Value.pdf

IBM, (2013), *Big Data*, http://www.ibm.com/bigdata/us/en/

Kennedy, J., (2014), "Data-driven economy", U.S, Chamber of Commerce Foundation, https://www.uschamberfoundation.org/data-driven-economy

Laney, D. (2001), *3D Data Management : Controlling Data Volume, Velocity and Variety*, Technical Report, META Group Inc.

Manyika, J., et al. (2013), "Open Data: Unlocking Innovation and Performance with Liquid Information", McKinsey & Company, McKinsey Global Institute.

Michael K., & Miller K. W., (2013), "Big Data: New Opportunities and New Challenges", IEEE Computer Society, 0018-9162/13, pp.22-24.

McAfee, A., & E. Brynjolfsson, (2012), *Big Data: The Management Revolution*, Harvard Business Review, October. Available at: http://hbr.org/2012/10/big-data-the-management-revolution

Organization for Economic Cooperation and Development, (2013), "Exploring Data-Driven Innovation as a Source of Growth", OECD Digital Economy Papers, No. 222, June 2013.

Siegel, E. (2015), *Seven Reasons You Need Predictive Analytics Today*, Prediction Impact, Inc., Predictive Analytics for Business and Marketing.

Tapscott, D. (1997), *The Digirtal Economy: Promise and Peril in The Age of Networked Intelligence*, McGraw-Hill.

World Economic Forum and INSEAD, (2014), "The Global Information Technology Report 2014", Rewards and Risks of Big Data, Bilbao-Osorio,B., Dutta, S., Lanvin, B. (eds).

World Economic Forum, (2015), "The Global Information Technology Report 2015", ICTs for Inclusive Growth, Dutta, S., Geiger, G., Lanvin, B , (eds).

Zikopoulos, P.C., Eaton, C., de Roos, D., Deutch, T., & Lapis, G. (2012), *Understanding Big Data*, Analytics for Enterprice Class Hadoop and Streaming Data, McGraw Hill, New York, 2012.

FROM PUBLISHED MANUSCRIPT TO THE INNOVATION PROJECT AND TECHNOLOGY TRANSFER

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Abstract: *The paper presents a good example of technology transfer and a pathway from scientific result to successfully implemented project. Methodology shows the steps which lead from the original idea to technology transfer process. The result is a web-based and mobile application for predicting yield for apple and apricot. Future work is related to promotional activities of the application.*

KEY WORDS: TECHNOLOGY TRANSFER, INNOVATION, AGRICULTURE, INFORMATION TECHNOLOGY

JEL CLASSIFICATION: O3 Innovation, Research and Development, Technological Change, Intellectual Property Rights

1. INTRODUCTION

One of the most important factors for economic development is transfer of advanced technology. This is one of the methods for acquiring advanced skills, knowledge and experience to improve current processes or products.

There are many definitions of transfer technology:

- The Code (UNCTAD (1985)) defined transfer of technology as "the transfer of systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service and does not extend to the mere sale or lease of goods".
- "The movement, transfer or exchange can also be within and between firms and institutions and in this case is sometimes cited as technology transfer", according to Robinson (2009).

For every technology transfer the first step is innovative value or innovation. Innovation could be described as a "new process, product, service, design, form of organization, or function of production that may lead to productivity increases and widespread market adoption and expansion", according to Flichy (2007).

Researchers usually have very interesting ideas and there are many high-quality published manuscripts. The question is related to the pathways leading from idea and published manuscripts to technology transfer project and its results.

The goal of this research is the presentation of the steps required for technology transfer in the field of "Information technology".

After the introductory section, the author gives brief methodology, followed by results with discussion and conclusion.

2. METHODOLOGY

For technology transfer the first step is an idea, or some innovative approach in product or process development. In this case, the first step is an innovative idea related to the application of data mining technique in agriculture. The author has written a manuscript which presents the application of neural networks in predicting fruit yield. Blagojević et al. (2016).

After the paper had been successfully published, the call for technology transfer program of Innovation Fond Serbia was presented, and the second step has begun.

All steps necessary for successful evaluation were completed and the project began.

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Invention started with data selection. The data were collected in village Milićevci, near Čačak. The process of data collecting took place over the course of ten years, starting from 2006. Those data cover ten years of measuring some parameters: fertilizer, date of harvest, irrigation system, number of treatments with pesticides, pruning type, hail protection, maintance of the land, average annual temperature, average annual precipitation, early frost, yield. The invention should predict yield in future years. Application is tested with examples of future data.

This invention shows the use of artificial neural networks for predicting the apricot yield per hectare. The invention could be applied in other fields of agriculture, for predicting yield of other fruits or vegetables, or other parameter(s). The goal of this invention is to determine possibilities for using artificial neural networks for predicting the apricot yield per hectare if the following items are used as input parameters: fertilizer, date of harvest, irrigation system, number of treatments with pesticides, pruning type, hail protection, land maintenance, average annual temperature, average annual precipitation and early frost. The goal of this invention also includes the creation of an application that displays final research results received through neural networks.

Figure 1 shows a neural network model.

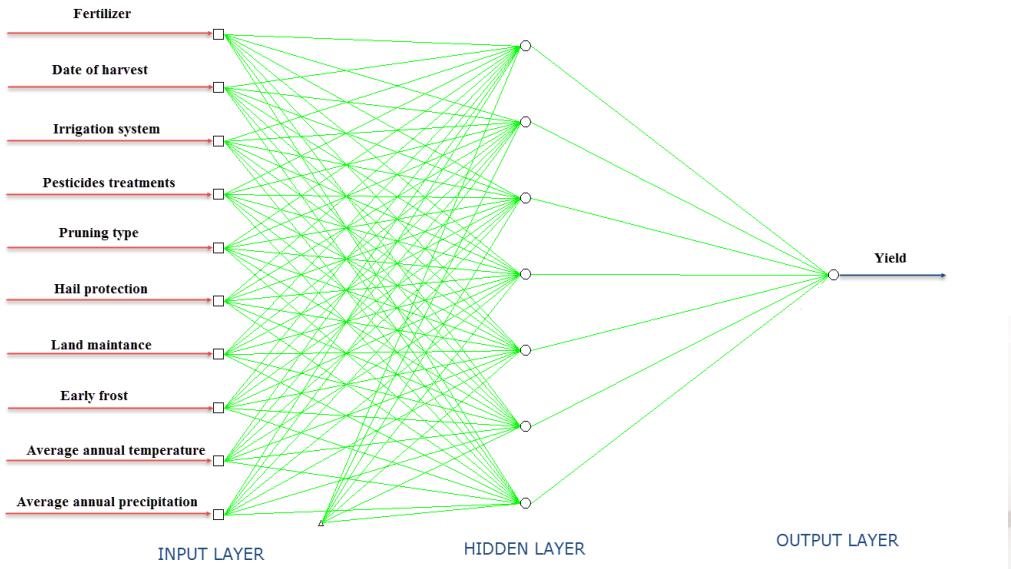

Figure 1. Neural network model

3. RESULTS AND DISCUSSION

This section presents the project results and cooperation with the first interested company. A mobile application and Web service were developed within the proposed project. The mobile application is presented in subsection 2.1, while Web service is presented within the cooperation with Agrivi.

3.1. Mobile application

AgriviClient Android application was developed in Android studio 2.3.3 (Android studio) with minimal support for Android API 14, i.e. Android 4.0 (Ice cream sandwich, Figure 2).

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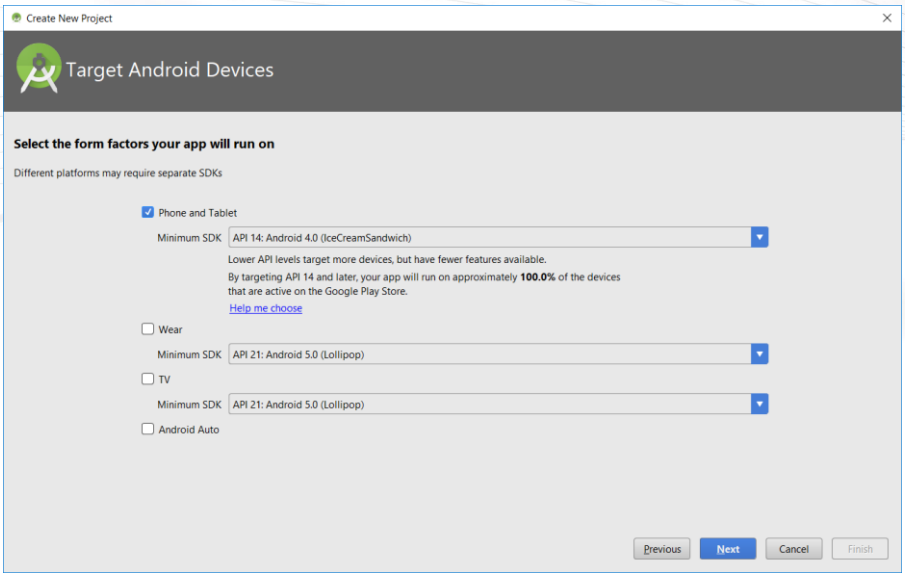

Figure 2. Minimal support

The application consists of two windows (Activities) supporting 3 languages (English, Italian, Serbian).

3.2 Communication with RestWeb service

The main function of the application is sending requests to RestWeb service.

The service accepts 12 parameters in requests which support one of the following formats:

- application/json, text/json
- application/xml, text/xml
- application/x-www-form-urlencoded

The service is located at HTTPS protocol and it is protected by the AuthenticationKey.

The request sent to a remote internet resource in the form of RestWS is organised into a separate thread using the AsyncTask class for more secure functionality of the application.

Figures 3-5 present the functionality of the application.

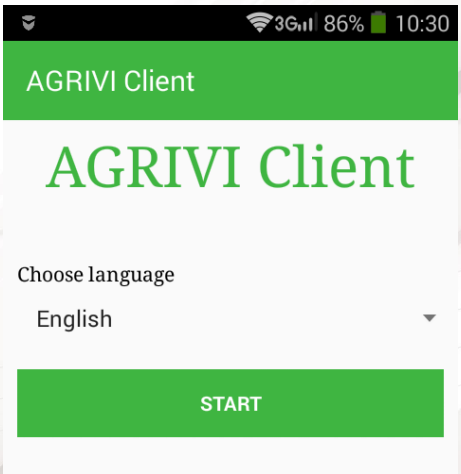

Figure 3. Display of the home screen – language selection

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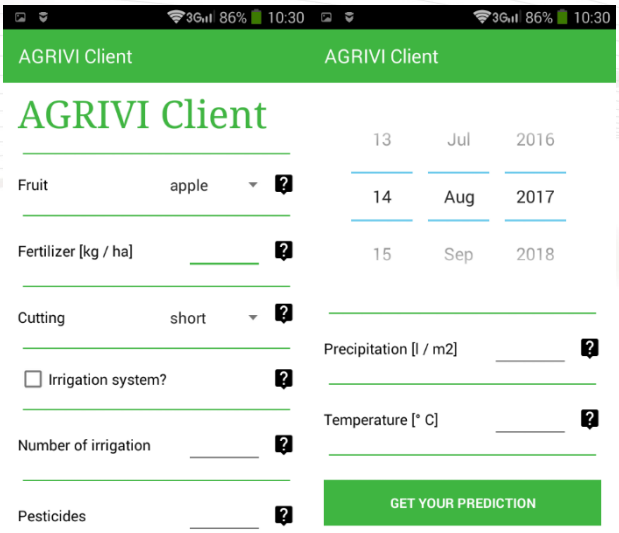

Figure 4. Display of the first and second part of the second screen.

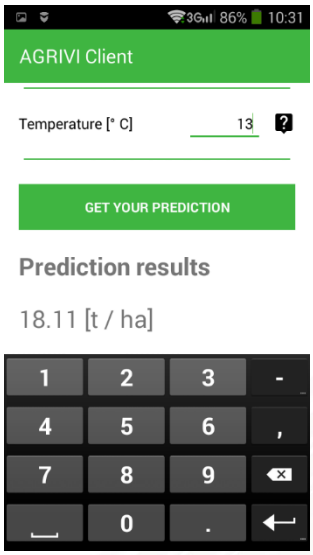

Figure 5. Display of prediction results

3.3 Cooperation with Agrivi

Agrivi (agrivi.com) is a company from Croatia which was interested to implement the solution as one of their modules. The process of implementation is described in the following section:

Use case

Scenario: A farmer who uses the software for farm management wants the information about the expected yield on his plantation.

Description:

- User/farmer logs in the application
- User/farmer enters the parameters for yield calculation and clicks “Calculate yield” button
- Input values are then sent to the Web service
- If the Web service responds successfully:
- The message “Predicted yield is [XX.YY] t/ha.“ appears on the screen.
- The values stay on the screen until the user clicks on “Reset values” button
- If the Web service fails to respond:
- “ The message “There was an error retrieving data. Please try again.“ appears on the screen.
- The values stay on the screen until the user clicks on “Reset values” button

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Implementation

It is neccessary and the next steps were performed:

- A new Web page within the Agrivi application
- The page is available to all Agrivi application users,
- It is not located in any menu, but it can only be accessed by direct URL entry,
- The interface language is English.

The Web page contains:

- Sections for the input of parameter values – input parameters are sent to the Web service,
- "Calculate yield" button – by clicking on this button Agrivi WebService is called,
- "Reset values" button – clicking on this button resets the input values are reset,
- The standard Agrivi menu.

Table 1. The display on the front-end – label and tooltip

Parameter name	Parameter name (web servis)	Front-end	Tooltip
Crop	Vrsta	Crop	
Fertilizer	djubrivo	Amount of fertilizer [kg/ha]	
Pruning	rezidba	Pruning type	
Irrigation	NavE	Do you have an irrigation system?	
Irrigation number	NavX	Number of irrigations	Enter how many times the field was irrigated
Pesticides	Pesticidi	Number of treatments with pesticides	Enter the number of pesticides treatment throughout the year
Hail protection	Protivgrad	Is there a hail protection system?	
Soil type	zemljiste	Soil type	
Frost	mraz	Was there some early frost?	
Harvest date	DBerbe	Harvest date	
Rainfall	Padavine	Rainfall average [m^3/ha]	Enter the rainfall average for this year [m^3/ha]
Temperature	Temperatura	Temperature average [°C]	Enter the temperature average for this year [°C]

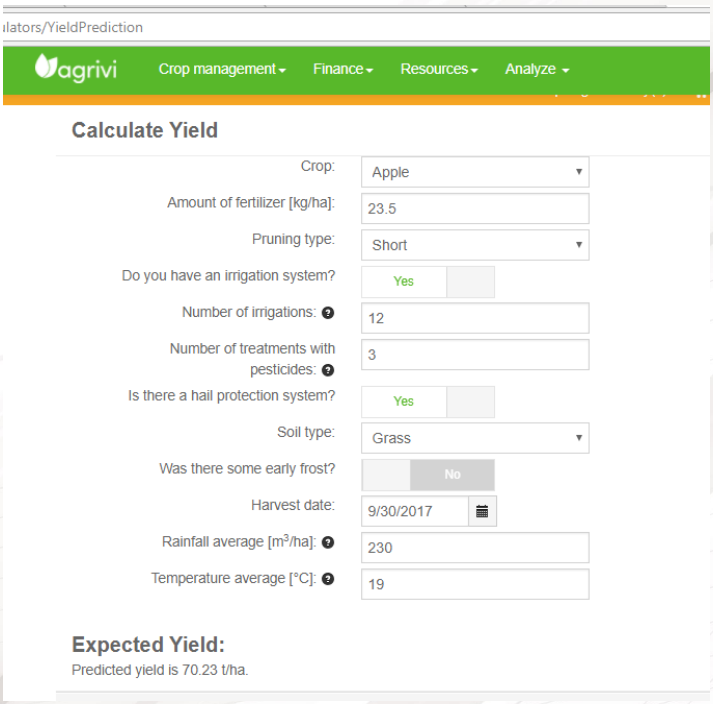

Figure 6. The message displayed when the yield is successfully predicted

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4. CONCLUSION

According to the presented results we can draw the following conclusions:

- There are not many steps leading from the idea to the published manuscript and ultimately to technology transfer, but those steps are very demanding;
- In addition to theoretical analysis, researchers should constantly look for a possibility to cooperate with industry and make applicable solutions;
- Limitation of the proposed approach and project is lack of information among people who work as farmers. Therefore, the sale of the product is still at unsatisfactory level.

Future work is related to further promotion of the results and also, application of neural networks in other fileds of science.

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REFERENCE LITERATURE

Agrivi doo, www.agrivi.com [accessed 21/10/2018]

Android studio, https://developer.android.com/studio/install [accessed 21/10/2018]

Blagojević, M., Blagojević, M. and Ličina, V. (2016), "Web-based intelligent system for predicting apricot yields using artificial neural networks", Scientia Horticulurae, Volume 213, pp 125-131

Flichy, P. (2007), "Understanding Technological Innovation: A Socio-Technical Approach", Cheltenham, UK and Northampton, MA: Edward Elgar.

Robinson, S. (2009), "Innovation Diffusion and Technology Transfer", http://www.sscqueens.org/sites/default/files/2009-05-Robinson-ABII.pdf [accessed 21/10/2018]

UNCTAD (1985), Draft International Code of Conduct on the Transfer of Technology. Draft as at the close of the sixth session of Conference on 5 June 1985, TD/CODE TOT/47.

THIRD MISSION AT SERBIAN UNIVERISTIES – CURRENT STATE

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Abstract: *Universities have for long been a spot for generation and acquisition of knowledge, conducting the basic science and research which constituted the two tradition missions of education and research. However, in the recent period there is a tendency that universities engage more actively in the development of both industry and community and to become the key actors in development of knowledge and innovation based societies. This paper presents some of the elements of third mission developed at the Serbian universities, showing the current state-of-the-art in this area.*

KEY WORDS: THIRD MISSION, CONTINUING EDUCATION, INNOVATION, TECHNOLOGY TRANSFER, SOCIAL ENGAGEMENT, UNIVERSITY

JEL CLASSIFICATION: O3 Innovation, Research and Development, Technological Change, Intellectual Property Rights.

1. INTRODUCTION

The development of universities throughout the history was concentrated around two core directions: education and research. From the aspect of education, their role has long been to train students and generate highly qualified force for the labour market. On the other hand, somewhat separately from this activity, universities have been actively engaged in research activities, generating the base for further development of science and developing the technologies that can be applied in the real-life and industrial environment.

Although, basically, these two aspects of university can be considered as targeted to the benefits of society and general welfare, not many actions have been taken to bring this kind of university engagement to higher institutional level and to define the ways and objectives of such engagement.

Only in the past decades, due to the globalization and internationalization, the direction of university's development and growth shifted towards its more comprehensive society- and industry-oriented role. Globalisation and internationalization created new potential markets for students, with increasing access to research collaboration, opening the universities to competition with and comparison against institutions in other countries. The new role of universities as generators of knowledge and innovations created whole new ground for development and challenges the traditional societal privileges and monopolies which they have long enjoyed [1].

This new direction of development combines two existing university missions (education and research) but this time directed towards the solving of societal and industrial challenges and contributing to the economic development and welfare of a country. This new mission is commonly referred as "**third mission**" of the universities. By one of the definitions, the "third mission activities in universities stimulate and direct the application and exploitation of knowledge to the benefit of the social, cultural and economic development of our society." [2]

This is achieved through development and implementation of activities in three main areas: i) technology transfer and innovations, ii) continuing education, and iii) social engagement, more commonly known as **three dimensions** of the third mission.

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In order to enable and support the third mission activities at universities, it is necessary to create the environment for their development and implementation. This means that firstly the legal framework needs to be developed, both national and institutional, that will define, regulate and encourage the realization of third mission activities. Additionally, universities need to show the strong will and commitment to engage in the economic and social development, clearly identified in a form of a policy or a strategy adopted by the university management.

Having set up the sound regulatory and strategic ground, the universities need to focus on the development and improvement of its capacities, both material and human, to carry out the concrete actions within the three dimensions of the third mission.

This paper focuses on the definition of each of three dimensions of the third mission at higher education institutions in general and potential opportunities and threats for their implementation at Serbian universities. It also provides the insight into the activities that are currently realized in scope of the third mission and that can be seen as examples of good practices and common ground for further upgrades in the following period.

2. LEGAL FRAMEWORK FOR DEVELOPMENT OF THE THIRD MISSION IN SERBIA

In the previous period, especially during the period of implementation of the Erasmus+ project IF4TM (Institutional framework for development of the third mission of universities in Serbia), some national legal framework was developed in order to support universities to engage in the third mission and to set up the sound ground for the development of its three dimensions.

Strategy of scientific and technological development of the Republic of Serbia – Research for Innovation [4], adopted in March 2016, is crucial in many ways in supporting the development of different aspects of the third mission. The mission of the Strategy is to create national research and innovation system integrated in the European Research contributing thus to the economic, societal and cultural progress of the country and raising the standard and quality of life of its citizens. This will be achieved through the support to introduction of joint innovation projects of private and public sector; development of scientific infrastructure, promotion of science and innovations; establishment of spin-off companies; encouraging application of scientific and research results; improvement of legal framework; increase of investments in research and development from public funds, private sector, national and international sources, etc.

The Strategy is accompanied by the **Action Plan** that defines the set of measures for realization of the Strategy followed by specific outcomes (indicators), source of financing and implementing institutions.

Law on Higher Education [5] (adopted in September 2017) focuses on generating of creative population of young people who constantly adopt and create new knowledge. It encompasses many aspects of the third mission starting from intellectual management in innovation processes, through establishment of business entities with the purpose of commercialization of research results to the lifelong learning aspects.

National Recommendations for IP Management in Technology Transfer Activities [6] were developed by the Higher Education Reform Experts Team and adopted in May 2016. This strategic document is designed for the professors and students of Serbian universities and provides the information on how to understand the third mission of universities and how to manage intellectual property and transfer knowledge efficiently for the purpose of its practical application.

The document represents the initiative to build the strong ground for establishment of the third mission of the universities, starting from the identification of the state-of-the-art in this area at Serbian higher education institutions and review of policies and recommendations from European Union. Based on the comparative analysis of current state in Serbia and existing mechanisms from EU best practices, it provides the set of eighteen recommendations on how to develop the IP management policy at universities and what steps to undertake to develop, improve and implement such a policy.

Prior to these, Serbian universities had no or very few acts to define the management of third mission activities. The University of Belgrade already had developed the Rules on legal protection and Economic exploitation of intellectual property and on the work of the centre for technology transfer University of Belgrade whereas the University of Nis had the elements of intellectual property, legal protection and reward system only marginally regulated by founding act and regulations of procedure of Centre for Technology Transfer.

Upon the regulation of this area at national level, many institutional acts were developed and adopted.

***Table 1**: Preview of institutional acts developed and/or adopted at Serbian higher education institutions*

University of Kragujevac	• Decision on Establishment of Technology Transfer Centre [8] (established) • Website of the Technology Transfer Centre (developed) • Bylaw on the management of intellectual property (adopted) • Forms for IP management (developed) • Bylaw on IP reviewing procedures (adopted)
University of Novi Sad	• Rulebook for Social Engagement and Volunteering (draft) • Rulebook for LifeLong Learning (draft) • Rulebook for Intellectual Property Rights (draft)
University of Belgrade	• Lifelong Learning Development Strategy (updated) • Statute of the University of Belgrade (updated) • By-Law on Minimal Conditions for Obtaining an Academic Position at the University of Belgrade (Addendum and Corrections of the By-law)
University of Nis	• Statute (updated) • Bylaw on valuation of students' extra-curricular activities (updated)
Technical College of Applied Sciences Zrenjanin	• Draft Bylaw on IP management • Draft Bylaw on organization of teaching within continuing education • Draft Bylaw on social engagement

3. TECHNOLOGY TRANSFER AND INNOVATIONS

For most universities and research institutions technology transfer is defined in the words of the Association of University Technology Managers (AUTM) as "the process of transferring scientific findings from one organization to another for the purpose of further development and commercialization." [7].

The universities are the greatest generators of knowledge and new technologies in a country and as such they must not be seen as isolated entities but firmly embedded in the society of a country. However, for decades, the primary role of universities was to produce highly educated work force and to conduct basic scientific research. This research was purely scientific-driven and have seldom found its way for industrial application.

As in the last decades, the global market becomes growingly competitive, business and industrial entities are compelled to constantly seek for new solutions to the challenges and demands they are facing. To stay competitive very often means to be able to quickly adapt to new trends and market demands, most frequently by innovating processes, products and services. However, the process of innovating requires high technologies, modern laboratories, expensive equipment and highly qualified human resources, that most of the enterprises do not have.

In Serbia, more than 90% of enterprises are categorized as small and medium ones that do not have their own resources, neither material (technologies, laboratories, equipment) nor human, to carry out the whole innovation process.

On the other hand, there has been a trend at Serbian universities to carry out research activities merely for the purpose of the research itself, for educational purposes or for writing the scientific papers.

The generated knowledge, developed technologies and modern equipment remain "locked" at universities without being disseminated to or applied in the industry [8].

Having this in mind, the need to create the stronger links between the offer (universities) and the demand (industry) has become the imperative in Serbia in the recent period with a goal to boost the economic development.

Following the examples of renowned universities in the world and benefits they have achieved from the technology transfer, Serbian universities started engaging in the technology transfer to reach the wider national and international recognition, to attract and retain talented students, to attract more funding, make profit from technology transfer revenues for further research and education, etc.

The examples of technology transfer and creating innovations at Serbian universities are numerous, however in most of the cases they have been rather the results of the individual efforts of researchers more than a strategic approach.

Some examples of the technology transfer mechanisms and initiatives at Serbian universities are presented in the sections below.

3.1 Technology transfer units

Technology transfer units are responsible for technology transfer and other aspects of commercialization of research conducted at a university. Their scope of activities include identification of technologies, IP protection, matching the universities' offer with the industrial and economic demands, etc. and communication between the universities and industry. In Serbia, the technology transfer units were established at the several universities: Technology Transfer Offices at University of Belgrade, University of Kragujevac, University of Nis and Danube technology transfer centre at University of Novi Sad.

These units provide university researchers with the support in the process of commercialization, through preliminary analysis of research results and IP identification, market research, development of feasibility study and commercialization strategy, organization of training for research teams in the area of intellectual property, technology licensing, establishment of start-up and spin-off companies, etc.

3.2 Establishing start-up and spin-off companies

Although basic research results can be channelled to industry via either collaborative research schemes or licensing arrangements of patented university inventions, spinning off is the entrepreneurial route to commercializing public research [9]. There are many definitions of the spin-off and various models to establish such an entity, but basically we can say that the university spin-off company is an outcome of an entrepreneurial process based on exploitation of a university technology [10]. Start-ups are also born from innovative business ideas, but, unlike spinoffs, they are created outside the university.

Establishing spin-off companies strongly depends on the existence of legal framework that regulates conditions and terms for their establishment. Previous laws and acts in Serbia did not include these topics and establishment of such entities was not legally regulated. New Law on Higher Education (adopted in September 2017) gives the opportunity to professors, researchers and students to establish spin-offs and start-ups, as the way to commercialize research results generated at the university.

This is the reason why this mechanism has been very limited in Serbia in previous period. However, example of good practice can still be found at University of Novi Sad, which has 121 spin-off and start-up companies, as reported on University's official website [11]. These companies are main focused on IT sector and computer programing, manufacture of measuring, research and navigation instruments and equipment, research and development in other natural and technical-technological sciences, business and other management consulting activities, etc.

With the new Law on Higher Education, it is expected that the number of these companies will grow at other universities in Serbia as well.

3.4 Intellectual property management at Serbian universities

With the development of awareness on the significance of the technology transfer and development of innovations, universities in Serbia have become more aware of the importance of having intellectual property issues regulated at the level of universities.

Most of the universities in Serbia did not have any legal acts that regulated the management of intellectual property generated in-house, which hindered the technology transfer to a great extent.

University of Belgrade was the only mapped university in Serbia that had the IP management regulated through two university acts, Rules on legal protection and Economic exploitation of intellectual property and on the work of the centre for technology transfer University of Belgrade. Apart from this, at the University of Nis the topics of intellectual property, legal protection and reward system are only lightly regulated by founding act and regulations of Centre for Technology Transfer.

Great contribution to the introduction of systematic approach in this area at universities without the regulated IP management was made by IF4TM project, that through various documents and reports firstly mapped existing acts related to the IP management [12], then pointed out the necessity of developing and introducing new ones at university level relying on the examples of good practice of EU institutions [13] and finally by offering the number of recommendations and models on how to regulate the area [14].

This initiative led to the development and adoption of a number of IP management related acts at Serbian universities, such as the Rulebook of the management of intellectual property at the University of Kragujevac, draft of the Rulebook for Intellectual property rights at University of Novi Sad and draft of Rulebook on IP protection at the Technical College of Applied Studies in Zrenjanin.

4. CONTINUING EDUCATION

Continuing education (CE) is a process of permanent adoption of knowledge with the aim to achieve personal development, gain new competences and in this way to adapt more efficiently to new technologies and labour market requirements. This includes processes of a formal education, non-formal education (programs and activities of education and learning outside the school system) and informal education (gaining knowledge, skills and capacities by oneself, i.e. learning in everyday life and work environment) [15].

Benefits for universities can be various, from fostering the integrative function of university, through additional source of income, creation of stronger links with labour market and society, to increased attractiveness and national and international recognition. Having this in mind, some initiatives have already been launched at several Serbian universities taking various forms depending on the size of universities and field of interest of their members (faculties, institutes, centres, etc.).

Following the EU practice, there are several Lifelong Learning centres established at the universities in Serbia, particularly at University of Belgrade, University of Kragujevac and University of Nis. These centres are founded as organizational units of the universities that define, develop and realize the training, courses and modules in the area of lifelong learning. Apart from these, there are several examples of similar units established at the university's member institutions, such as faculties and research centres:

- Lifelong learning centre at Faculty of Mechanical Engineering University of Belgrade
- Department of Permanent Education of the Institute of Nuclear Sciences University of Belgrade
- Regional Centre for permanent education at the Faculty of Engineering University of Kragujevac
- Centre for Permanent Education Faculty of Law University of Nis
- Centre for Professional Education of the Faculty of Sport and Physical Education University of Belgrade,
- Cooperative Training Centre of the University of Kragujevac
- Business Support Offices of the University of Kragujevac and University of Novi Sad

- Centres for career development and student counselling at University of Kragujevac, University of Belgrade, University of Novi Sad, University of Nis, State University of Novi Pazar, Belgrade Metropolitan University, and others.

The existence of such a number of units dealing with the continuing education can however lead to the duplication of services provided to their users as well as bring to question their complementarity. In such a situation, it is highly recommended to introduce the centralized unit for monitoring and coordination of existing continuing education units, a concept known as the *integrative approach to continuing education* [15].

The introduction of integrative approach can be very demanding task, which requires the mapping of existing units dealing with any kind of continuing education activities. Such mapping was conducted within IF4TM project at seven Serbian higher education institutions (University of Kragujevac, University of Belgrade, University of Novi Sad, University of Nis, State University of Novi Pazar, Belgrade Metropolitan University and Technical College of Applied Sciences Zrenjanin).

The mapping was realized using two questionnaires developed within IF4TM project: Questionnaire for higher education institutions management (Questionnaire#1) and Questionnaire for professors, researchers and associates (Questionnaire#2).

During the mapping, 35 Questionnares#1 filled in by the university/faculty management representatives and 705 Questionnaires#2 filled in by professors, researchers and associates were collected.

***Table 2**: Number of collected questionnaires per institution*

University	Questionnares#1	Questionnares#2
University of Kragujevac	11	375
University of Belgrade	9	50
University of Novi Sad	7	97
University of Nis	6	84
State University of Novi Pazar	1	44
Belgrade Metropolitan University	0	34
Technical College of Applied Sciences Zrenjanin	1	21
Total	**35**	**705**

***Source**: D4.1 Guidelines for the establishment of integrative approach in continuing education at university level*

The data collected during the mapping indicate clearly the lack of centralized or integrative approach to the continuing education activities at university level and the non-existence of any kind of supporting information system that would be updated regularly with the information on available continuing education activities.

Another point that needs to be addressed more in the future is the model of financing of the continuing education activities. The mapping results show that the existing programs are realized either through the financial support of EU funds or by the users themselves, which can hinder the development of the continuing education in Serbia.

Based on the findings of the collected data, the D4.1 Guidelines for the establishment of integrative approach in continuing education at university level provide the set of recommendations on how to promote the continuing education, both at the institutional level and the level of organizers and authors of these programs. Briefly, these recommendations refer to:

- Defining the university policy for continuing education
- Prioritizing the continuing education in general acts of universities and faculties (e.g. statutes)

- Introducing the information system for mapping, monitoring and updating the information on continuing education activities at university level
- Making the collection of information mandatory for all parties
- Developing clear procedures for all new programs
- Monitoring the needs of business community in order to provide the most appropriate programs.
- Promoting continuing education activities.
- Providing the incentives systems for participants in continuing education programs.
- Increasing the investment in teaching staff at university.

Some of these aspects have been already addressed by some of the mapped higher education institutions, and the level of development of continuing education can vary from university to university. Individual state-of-the-art at the seven Serbian higher education institutions included in the mapping are provided in the form of individual mapping reports for the University of Kragujevac, University of Belgrade, University of Novi Sad, University of Nis, State University of Novi Pazar, Belgrade Metropolitan University and Technical College of Applied Sciences Zrenjanin.

5. SOCIAL ENGAGEMENT

The universities are typically regarded as the primary site for the acquisition of knowledge, conducting the research and addressing the scientific challenges. Although this role of university has been ultimately directed toward the wellbeing of a society at large, it is only recently that the universities have adapted their role and developed into more active participants and key actors of economic and social changes.

Benefits for the society in terms of advanced research results, generation of new ideas and innovations, increase of employability serve as positive incentive for universities to step forward from two traditional missions (teaching and basic research) and focus more intensively on solving the society needs. This kind of interaction between the university and society gravitating towards it, known as university's "social engagement", has become an imperative in the recent period and more attention is paid to those activities that transform universities into socially responsible institutions.

5.1 Research for and to the industry

The significant research and innovation potential of Serbian universities has been a great asset used to establish the cooperation with business and industry, most commonly through collaborative development projects, joint projects or services for enterprises.

The examples of this practice now exist at several faculties of the Serbian universities, although not sufficiently promoted and declared as socially responsible. Such research activities can be found at medical faculties in the areas of research, tests and experiments for the purpose of development of new medical treatments, medicines, etc., that directly addresses the problems of health care, disadvantaged people, etc.; technical and engineering faculties carry out joint projects with enterprises within the topics of IT, energy efficiency, waste management, bioengineering, etc.

5.2 Outreach activities

Science outreach is an umbrella term for a "*variety of activities by research institutes, universities, and institutions such as science museums, aimed at promoting public awareness (and understanding) of science and making informal contributions to science education*" [17]

Researchers' night is an event dedicated to the popularization of science and learning through fun and aims to present the research work to young people through inventive workshops, games, interactions with researchers, interesting experiments, etc.

The content of the Researchers' Night is by default interactive and adjusted to all ages, and they provide a unique opportunity for meeting the most eminent scientists and researchers and to discover how the science influences on people's everyday life. It was organized for the first time in 2005 and since than it has been held every year all around Europe. Last Researchers' night was organized in 340 cities across Europe and in neighbouring countries.

Source: http://ec.europa.eu/research/mariecurieactions/actions/european-researchers-night_en

In 2018, Serbian universities and other educational insitutions participated for the 6th time organizing the Researchers' night in 26 cities and towns: Belgrade, Novi Sad, Kragujevac, Nis, Indjija, Zrenjanin, Sabac, Subotica, Cacak, Krusevac, Knjazevac, Leskovac, Novi Pazar, Ranovac, Smederevo, Uzice, Kikinda, Becej, Ub, Svilajnac, Cuprija, Jagodina, Despotovac, Trstenik, Negotin and Zajecar.

According to the estimations of the organizers, the most visited Researchers' night was in Belgrade, where during the two nights 30000 visitors participated at 16 locations in the city. Research night in Nis attracted more than 8000 visitors, Pomoravlje (Jagodina, Cuprija, Svilajnac and Despotovac) 4500 visitors and the Indjija had around 1500 people attending. In Vojvodina, organizers estimate there was more than 35000 visitors (20000 in Novi Sad, 9000 in Subotica, 5000 in Zrenjanin, more than 1000 visitors in Sabac, Kikinda and Kanjiza [18]

These numbers confirm that the universities invest increasingly more efforts into promotion of research and sciences that creates the impact on the most various target groups.

Open door days is an event that is usually held every year by universities prior to enrolment in order to present the university, study programs and other university activities to pupils choosing their future careers and students continuing their professional development and research career. The direct contact with young people proved to be very efficient mechanism in hearing their needs and using these information for planning their future activities and strategies. In the previous period, open door days were held at Belgrade Metropolitan University, Faculty of Technical Sciences University of Novi Sad, Faculty of Medicine Sciences University of Kragujevac, Faculty of Pharmacy University of Belgrade, at the State University of Novi Pazar and many other institutions.

Start-up Weekend is a global franchise that started in 2007 in the USA. Today this event is organized in more than 160 countries, with Serbia among them. The event aims to promote entrepreneurship and to provide the opportunity to all interested parties to try themselves in the role of entrepreneurs during the 54 hours.

The start-up weekends have been traditionally organized in Serbia since 2013 and have continued to be organized traditionally every year. Some of the events were organized at universities as the way of support and promotion to the development of entrepreneurial spirit among people: Start-up weekend organized at University of Kragujevac, Start-up weekend at University of Novi Sad and Start-up weekend at University of Belgrade.

Competition for best student idea aims to promote entrepreneurial culture among student population, boost their creativity and provide them with the support in the development of their ideas. It is a mechanism to promote the entrepreneurship and creativity among the young population. The Competition was organized for the first time in 2015 within the Tempus project Modernization of WBC universities through strengthening of structures and services for knowledge transfer, research and innovation).

In 2017 and 2018, the Competition was held at seven Serbian higher education institutions within the IF4TM project, with total of 134 ideas submitted. Since total of 420 students participated during these two years, it is expected that they should become the lead promoters of this activity among the rest of the young population at universities and community gravitating to it, and being the part of university, to promote the support universities provide for the young population.

5.3 Flexible study programmes

Flexible study programmes are the efficient way to make an impact on the local community by creating the labour force that is clearly targeted to the demands of the local labour marker and community needs. This has a positive influence on the employability of young people, reducing the unemployment rate and raising the standard of living.

As an example, after the revival of the automobile industry and opening of the Fiat factory in Kragujevac, the Faculty of Engineering University of Kragujevac developed the new study program the Automobile Engineering in order to generate enough labour force to fit the newly emerged labour market needs. Using the same logic, the same faculty introduced the Military Industrial Engineering study program, once the defence industry showed the need for the specific type of educated work force [19]

The University of Nis accredited and realized the multidisciplinary master study program Multimedia Technologies (accredited on September, 2010). Engineers graduated from this study program, gain the knowledge in multimedia technologies that are required for further development of the overall society. There was a clear social need for education of such engineers with specific skills and competencies in the scope of multimedia content creation, leading production process of audio and video programs, as well as the efficient transfer of information, and the accredited program was the direct answer of the University to the newly emerged situation [20].

The Belgrade Metropolitan University analysed the market needs and global trends and based on the findings incorporated in their curriculum plan for the following period the extension of their existing programs in terms of introduction of short programs, lasting form 3 to 12 months, providing 30 to 60 ECTS, preparing students for a specific job. This kind of program are to be introduced with the aim to answer the needs of freshmen seeking for a fast track education for jobs on demand on the labor market, graduate bachelor or master students that needs to get knowledge and skills in other disciplines, due to the needs of their jobs, or that need to change their profession and are looking the get education for jobs offered on the labor market, as well as unsuccessful bachelor students that dropped out their studies and want to get a short education for a job offered on the labour market [21].

5.4 Volunteering

Volunteering is one of the strongest means of impact of the university environment to the society. This social component rests upon the engagement of students and employees at the university in the various social events and charity work.

Motivation of students, teaching and non-teaching staff to engage in the volunteering activities is mostly based on providing the help and assistance to people and improving the situation in the local community, improving the individual skills, gaining work experience, building the personal opinion and creating the contacts important for further development of their careers. On the other hand, universities as institutions develop the positive links with the local community and strengthen the communication.

Within the IF4TM project, a comprehensive analysis of volunteering opportunities and activities was conducted at six Serbian higher education institutions participating in the project [22].

The following table presents the volunteering opportunity in numbers reported at the university level. It is important to notice that these numbers are far from the real situation at universities, since there is evidently larger engagement in the volunteering than it is reported due to the lack of centralized monitoring at the universities' level.

Table 3: Number of volunteering opportunities at Serbian universities

Institution	Number of students	Number of academic staff
University of Kragujevac	178	4
University of Belgrade	36	31
University of Novi Sad	39	7
University of Nis	32	45
State University of Novi Pazar	28	10
Technical College of Applied Sciences	19	11

Source: D5.4.1 Realised volunteering activities of students and staff at HEIs

Events such as sports and charity events are very important as part of universities social life. The most regular activities are blood donation activities and charity events where the students participate actively.

Besides, there are University Sport Alliances that include student both in the organization of the sport events and as competitors, such as University Sports Federation Kragujevac, University Sports Association Belgrade, University Sports Association Novi Sad, University Sports Association Nis and University Sports Association Novi Pazar.

6. CONCLUSION

This paper presents the state-of-the-art in the area of third mission at the seven higher education institutions in Serbia, based on the findings and experiences gained within the IF4TM project. Although there are numerous examples of good practice in developing and implementing all three dimensions of the third mission, there seems to be a lot of space for further development.

In order to achieve further improvements and strengthen the development and implementation of third mission at Serbian higher education institutions, its benefits for universities and society needs need to be more actively promoted, seeking to change first the mind-set of the academic community and then to influence the universities management structures to take an active role in the process of turning universities into socially responsible organizations.

REFERENCE LITERATURE

[1] Zomer A., Benneworth P. (2011) The Rise of the University's Third Mission. In: Enders J., de Boer H.F., Westerheijden D.F. (eds) Reform of Higher Education in Europe. SensePublishers

[2] http://www.hefcw.ac.uk/BusinessCommunity_Docs

[3] IF4TM (Institutional framework for development of the third mission of universities in Serbia) official website http://www.if4tm.kg.ac.rs/

[4] Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016 – 2020, Belgrade, 2016

[5] Law on Higher Education, "Official Gazette RS", no. 88/2017

[6] National Recommendations for IP Management in Technology Transfer Activities, HERE team, Belgrade, May 2016

[7] WIPO magazine, http://www.wipo.int/wipo_magazine/en/2006/05/article_0005.html

[8] Guidelines for the development of technology transfer and innovations dimension of the university third mission, IF4TM Consortium, 2017

[9] Macho-Stadler, Ines and Pérez-Castrillo, David and Veugelers, Reinhilde, Designing Contracts for University Spin-Offs. Journal of Economics & Management Strategy, Vol. 17, Issue 1, pp. 185-218, Spring 2008

[10] Einar Rasmussen, Spin-off venture creation in a university context-An entrepreneurial process view, 2006)

[11] Official web page of the University of Novi Sad, https://www.uns.ac.rs/index.php/en/start-up-spin-off

[12] D1.4 Reports on existing university regulatory documents and structures supporting third mission activities, IF4TM Consortium, 2016

[13] D1.5 Benchmarking report, IF4TM Consortium, 2016

[14] Guidelines for the development of TTI dimensions of the third mission of universities, IF4TM Consortium, 2017

[15] D4.1 Guidelines for the establishment of integrative approach in continuing education at university level, IF4TM Consortium, 2018

[16] J.Lee, H.N.Winb, Technology transfer between university research centres and industry in Singapore, Technovation Volume 24, Issue 5, May 2004, Pages 433-442

[17] [Varner, Johanna (2014). "Scientific outreach: toward effective public engagement with biological science". BioScience. 64 (4): 333–340. doi:10.1093/biosci/biu021.

[18] Researchers' Night official web page http://nocistrazivaca.rs/en/home

[19] Individual social engagement plan for University of Kragujevac, IF4TM project, University of Kragujevac, 2016

[20] Individual social engagement plan for University of Niš, IF4TM project, University of Nis, 2017

[21] Individual social engagement plan for Belgrade Metropolitan University, IF4TM project, Belgrade Metropolitan University, 2017

[22] D5.4 Document on social engagement of members of academic and scientific community, IF4TM Consortium, 2018

SUPPORT TO THE DEVELOPMENT OF ENTREPRENEURSHIP AND INNOVATIONS THROUGH COMPETITION FOR BEST STUDENT IDEAS

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Abstract: *Development of entrepreneurship of young population has a great significance as it can be seen in many papers and studies. There are various ways to realize the open innovation concept in order to draw these resources from the limitless source of ideas coming primarily from young people, which is seen as the efficient direction of development of different segments of a society. This paper is focused on the support to the development and entrepreneurial culture through the organization of the competition for best student ideas. It presents the methodology for the competition, collaborative student platform and the results of the competition.*

KEY WORDS: INNOVATIONS, ENTREPRENEURSHIP, YOUNG PEOPLE, STAGE GATE, START-UP

JEL CLASSIFICATION: O320 Management of Technological Innovation and R&D

1. INTRODUCTION

The research conducted in 2006 showed that the world population is growing in the period when the traditional, stable markets are decreasing. The fact which has remained unchanged until today is that in the population of more than 1 billion people of age between 15 and 24, which is almost 40% of the world population, is under the age of 20. The International Labour Organization (ILO) estimates that 47% of all unemployed people at the global level are young women and men and 660 million young people who have or are seeking for a job (Ulrichet al. 2006).

The immediate success of technology companies such as Microsoft, Youtube, Google and Facebook witnesses that in the previous decade, the small teams made of young entrepreneurs are grown to worlds giants. Entrepreneurship is seen as one of the basic skills gained through the lifelong learning. Additionally, encouraging the development of entrepreneurial skills and mindset through education, especial of young people, can significantly contribute to the development of entrepreneurship (Fonseca et al. 1993).

One of the key components in the economic development of both micro and macro-economics are competition and competitiveness. The benefits of economic development have an impact generally to consumers in terms of improved quality and lower prices (Ignatious et al. 2015).

One of the most popular and key words within the community of open innovation is Crowdsourcing. Identification and exploitation of the large potential of so-called „collective brain“ is one of the key elements for research and business since it is crucial for broadening of the scope of open research and innovation (Winfried et al. 2009).

To all appearances, the competition related to the ideas and innovations are a promising tool for all open innovation processes, particularly of business-to-business software companies. Active participation of potential users is key to the success. One of the definition of the ideas or innovations competitions is that the competition is the invitation of the organizer (the company, for example) addressed to the society at large or to particular target groups that need to provide their contribution to the specific topic during the defined time period (Leimeister et al. 2009).

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[2] Institution/Affiliation: The Faculty of Engineering, University of Kragujevac

The competition for best technological innovation that has been organized since 2005 under the auspices of the Ministry of Education, Science and Technological Development of the Republic of Serbia, seeks to promote the entrepreneurial innovative climate in Serbia and assistance to potential high-tech entrepreneurs and researchers who are ready to transform their ideas into innovations valorised at the market (*http://inovacija.org/o-такмичењу*).

Analysis of the papers related to the student innovations and entrepreneurship of young people clearly show the significance of this segment and need to apply the concept of public and open presentation of ideas generated by the young population. Very successful competition of open innovations in Serbia has a focus primarily on already formed entrepreneurs and researchers, rather than on students and pupils.

The competition for best student ideas has found here its niche by focusing on the largest population of Serbian students and providing them direct support, and in this way to motivate them to develop an entrepreneurial culture and understand the market needs.

2. THE CONCEPT OF THE COMPETITION FOR BEST STUDENT IDEAS

2.1. About the Competition

The Competition for best student ideas was organized for the first time in 2015 within the Tempus project WBCInno (*Modernization of WBC universities through the strengthening of structures and services for knowledge transfer, research, and innovation*).

As the competition for best student ideas organized in 2015 proved to be very successful, this practice was continued through Erasmus+ project "*Institutional framework for the development of the third mission of universities in Serbia*" (IF4TM) and the Competition was organized in 2017 and 2018 in somewhat changed format.

2.2 Competition objectives

The objective of the Competition for best student ideas is to promote an entrepreneurial culture within the population of not only students but also researchers and professors at higher education institutions in Serbia. It encourages the development of creativity within students and supports the development of ideas, allowing the transfer of new ideas into products and services at the market and acquiring new knowledge and skills for starting students' businesses. The Competition builds team spirit and teaches students to share and organize work within the team, encouraging them at the same time to establish their own *spin-off* and *start-up* companies.

2.3 Promotion of Competition

Although competition calls like this are very interesting to the student population in Serbia, it is necessary to promote competition using various promotion tools. It is necessary to help the students to overcome certain barriers, make the first step and apply to the competition for best student ideas.

The promotion of the competition is primarily carried out through the official *Facebook* page of the competition, through the emails, internet web pages of universities and faculties, their official *Facebook* pages, internet pages of competition and the project, etc. The local and national media provides significant support to the promotion by dedicating their columns and TV shows to the competition and this information can be usually found at their official websites, social networks and similar media channels.

The most significant promotion is through the organization of info days and distribution of competition's flyers. Although some students have heard for the Competition, they do not have a clear picture of what it represents and what the benefits are. This is the reason why the direct contact with students during these activities is more efficient.

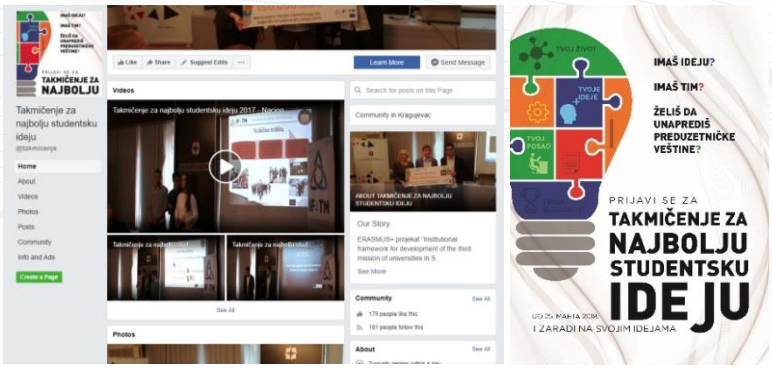

Figure 1 – Promotion of the Competition for best student ideas

3. METHODOLOGY OF COMPETITION FOR BEST STUDENT IDEAS

The primary version of the Methodology for competition for best student ideas was developed within the Tempus project WBCInno (Modernization of WBC universities through the strengthening of structures and services for knowledge transfer, research, and innovation). After rich experience in the organization of competition, facing the challenges and shortcomings in its organization, the methodology for the competition for best student ideas was significantly improved within the Erasmus+ project "*Institutional framework for the development of the third mission of universities in Serbia*" (IF4TM). This methodology was completed and published at the beginning of 2017, immediately before the call for competition 2017. This section shortly explains the rules and the course of competition for best student ideas.

3.1. Competition rules

The competition is designed for students of all study levels at seven higher education institutions in Serbia (the University of Kragujevac, University of Belgrade, University of Novi Sad, University of Niš, State University of Novi Pazar, Belgrade Metropolitan University, Technical College of Applied Science) participating the IF4TM project that are realizing the competition in cooperation with the business incubators (Business Innovation Centre Kragujevac, Business Incubator of Technical Faculties Belgrade, and Business Incubator Novi Sad) also participating in the project.

The student teams made of 2-4 members can apply to the competition by sending the Application Form to the organizer of a local competition which is the part of the Competition call. Based on the data provided in the Application Form, the local competition organizer creates the account for all team members at the Student INNO Platform where they can post, discuss and develop their ideas.

3.2. The course of the competition

Competition for best student ideas is organized traditionally at the beginning of each year, usually in the middle of February. The Call for participation is published at the same time by all participating universities. The competition itself is realized through six phases as shown in Figure 2.

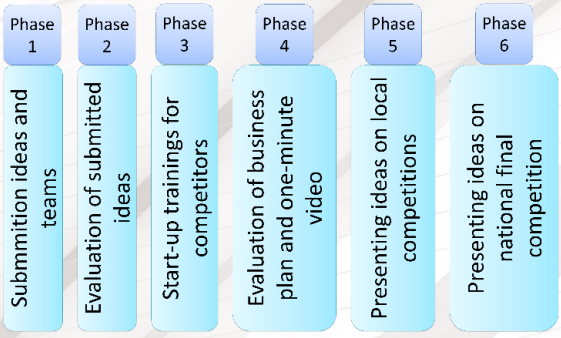

Figure 2 – The course of competition through phases

4. STUDENT INNOVATIVE PLATFORM

Student Innovative Platform (Figure 3) was designed as an online collaborative tool used by students to elaborate the ideas submitted within the Competition for best student ideas. Upon the completion of the competition, the Student Innovative Platform was improved and shortcomings identified during the real testing within the first competition were removed.

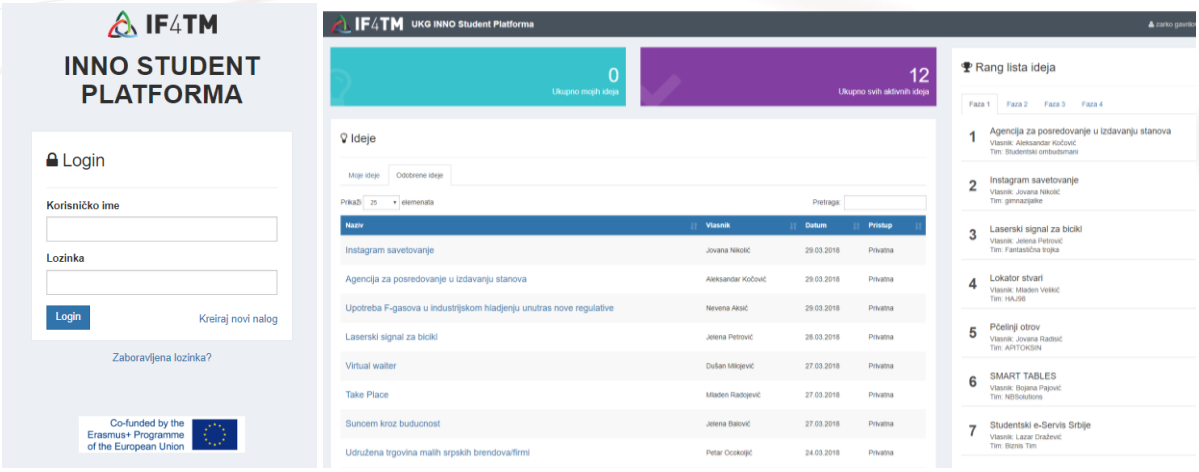

Figure 3 – Inno Student Platform

Within the IF4TM project, seven platforms were designed for all higher education institutions organizing the competition for best student ideas and each of them has its own domain. Student INNO platforms are in the ownership of higher education institutions and they can be found on the following web addresses:

1. www.inno-student.kg.ac.rs – University of Kragujevac
2. www.inno-student.bg.ac.rs – University of Belgrade
3. www.inno-student.uns.ac.rs – University of Novi Sad
4. www.inno-student.ni.ac.rs – University of Niš
5. www.inno-student.np.ac.rs – State University of Novi Pazar
6. www.inno-student.metropolitan.ac.rs – Belgrade Metropolitan University
7. www.inno-student.vts-zr.edu.rs – Technical College of Applied Sciences

Protection of data on the platform is guaranteed with an electronic confidentiality agreement that each user needs to accept in order to register on the platform.

The platform has three types of users: administrator, reviewer, and student.

Administrator's role is to open the accounts for other users on the platform, review video materials and transfer the competition via the platform to the next phase.

Reviewers' responsibilities are to evaluate business models posted on the platform by students, the participants in the competition. Reviewers are actually experts from academic and business sector, selected based on the area of their expertize to provide their expert opinion for the ideas submitted on the platform.

Student user is the participant in the competition who connects through the platform with other student users within his/her team.

All seven platforms have more than 600 users in total.

5. RESULTS

Through three cycles of competition for best student ideas (2015, 2017 and 2018.) more than 700 students have submitted more than 230 ideas and went through start-up trainings for development of their ideas – Figure 4.

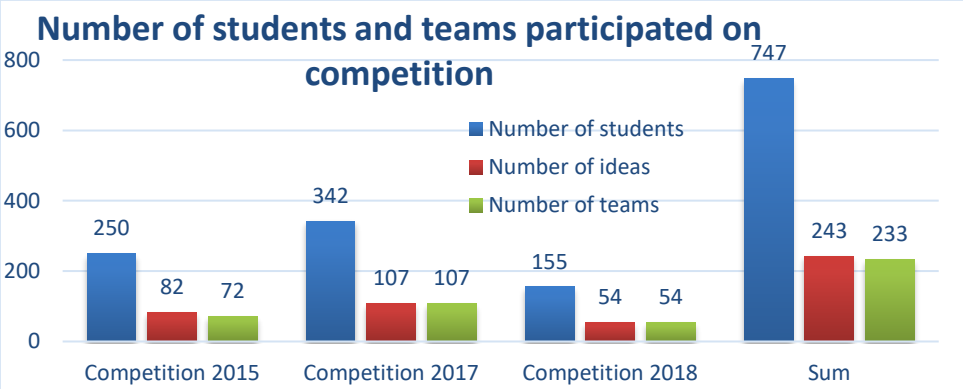

Figure 4 - Number of students and teams participated in competition in 2015, 2017 and 2018

The largest number of students and ideas are coming from the University of Novi Sad – Figure 5. Having in mind that the Faculty of Technical Sciences University of Novi Sad is co-organizers of competition for best technological innovations, this information seems to be the logical result. This is one of the indicators of how a competition can improve the entrepreneurial culture and directs the young people on activities such as competition for best student ideas.

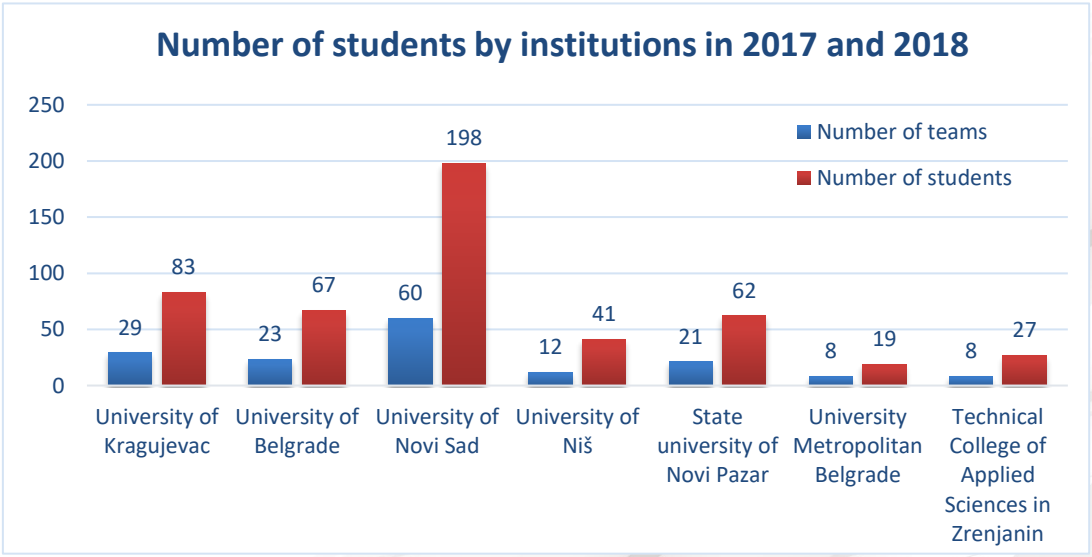

Figure 5 – Number of students participated in competition by institutions in 2017 and 2018

Number of start-up trainings and trained students is proportionate to the number of student participants within the competition for best student ideas – Figure 6. The number of trained students is larger than 900 but this number includes the students who participated in one or more trainings so the exact number cannot be established.

The total of 880 users opened the accounts on Student INNO platforms – Figure 7. Having in mind that the platform for the competition for 2015 was modified, the new platform used for the competitions 2017 (and to be used in the future) has 610 users at the moment.

Users participated in the competition remain on the platforms, while new ones are joining within the new competitions. In this way, the user base is increasing all the time, and users can see new calls for competition, open innovations, and similar activities.

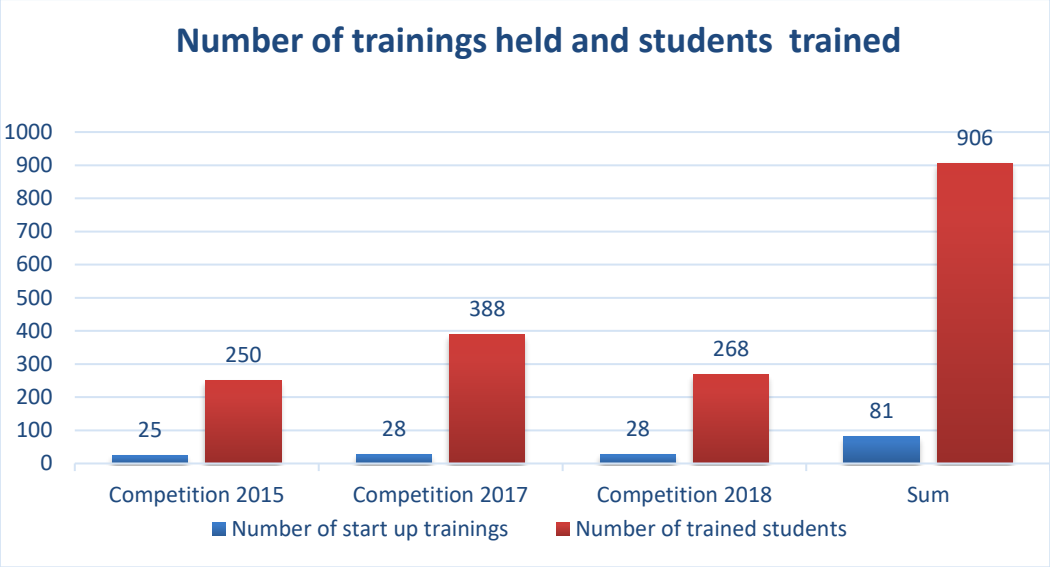

Figure 6 – Number of trainings held and students trained within competition in 2015, 2017 and 2018

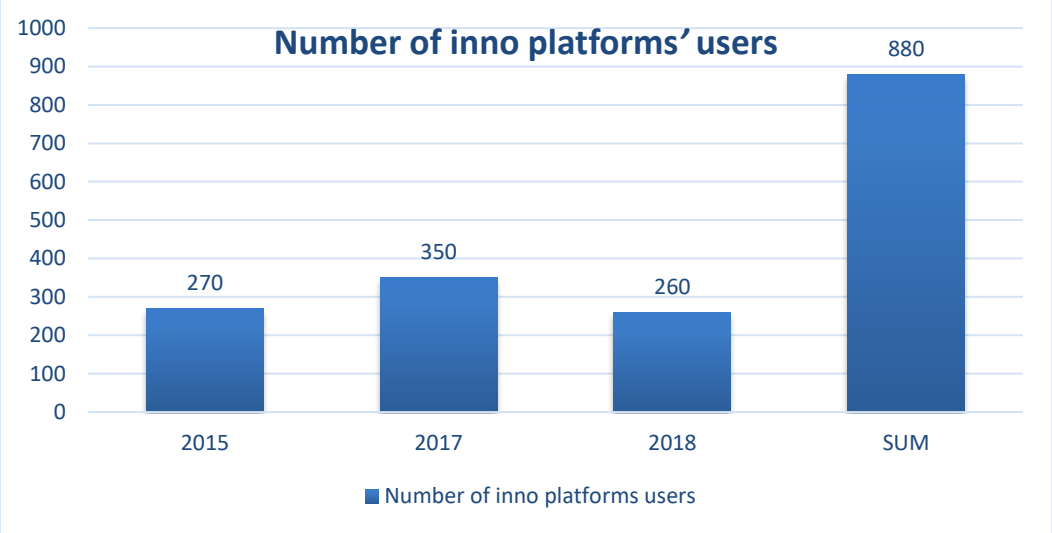

Figure 7– Number of inno platforms' users within competition in 2015, 2017 and 2018

The number of current users on the platform is proportional to the number of users on the competition for best student ideas across the institutions. In that sense, the University of Novi Sad has the largest number of users, more than one-third of users on all seven platforms – Figure 8.

Winners of local and national finals on the competition for best student ideas gained valuable awards as incentives for further work on their ideas and as support to engage in the business endeavor by establishing the start-up and spin-off companies. The finalists of the local competitions also had the opportunity to travel to the EU partner institutions within the project. The costs of the travel were covered with the EU funding. Within the three cycles of competition, more than 60 students from higher education institutions in Serbia visited the University of Maribor in Slovenia, Technical Universty in Graz, Austria and Danube University of Krems in Austria. Within the study visits, students exchanged experience with their colleagues from other countries, visited renowned higher education institutions, research centers, start-ups and spin-offs.

After the competition cycle was completed, some of the students materialized their ideas and started their own business with the resources, knowledge, and skills gained during the competition.

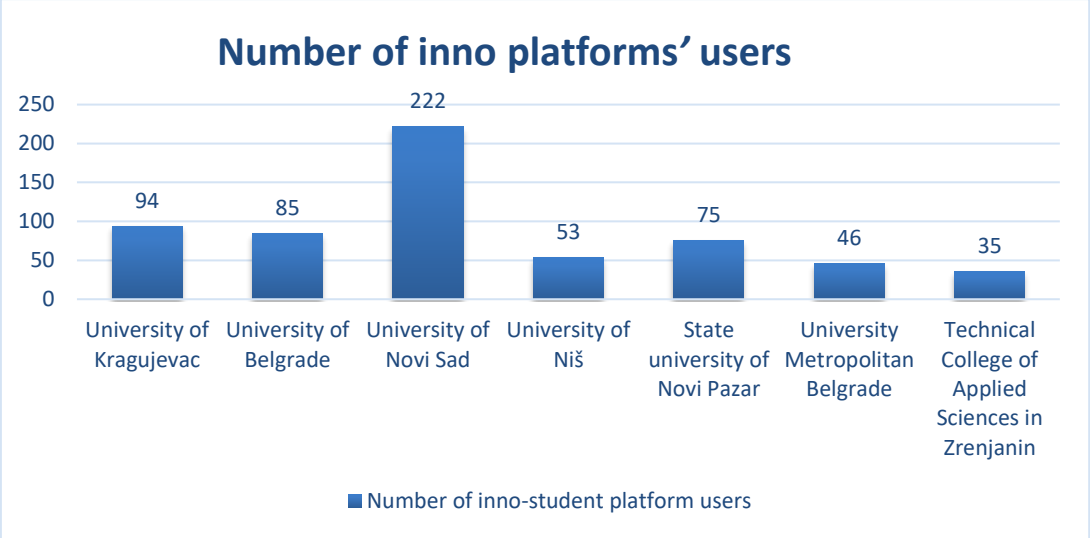

Figure 8 – Number of inno platforms' users within competition in 2015, 2017 and 2018

Encouraged with their results, some teams participated on similar events and obtained additional funds from various resources which enabled them to further develop their business ideas. Additionally, some students participated in earlier competitions apply again in new rounds with new ideas, which confirms they understand of such activities and consider entrepreneurship as a part of their studies.

6. CONCLUSION

This paper shows the mechanisms to raise an entrepreneurial spirit in student population in Serbia through the competition for best student ideas. The competition has been recognized and become traditional due to good promotion and excellent results the students achieved. For raising and spreading the entrepreneurial culture, the competition provides very strong contribution and it aims to attract an even larger number of students and researchers so that this process can continue in the future and further improve.

We can say with certainty that the next competitions will include increased number of students but it is necessary to provide the sustainability of the competition after the end of the project, which requires additional financial resources. This is why the analysis needs to be conducted in order to create a sustainability plan for the competition for best student ideas for the next period as a continuation of the support to the development of entrepreneurship of young people.

LITERATURE

Ignatious, Nzero ``Competition regulation as nexus to competition, innovation and competitiveness`` *LLB, LLM, LLD (RSA) *Senior Lecturer Department of Accounting Sciences and Finance, Chinhoyi University of Technology.* Paper presented at the Second Chinhoyi University of Technology International Research Conference, 20-21 July 2015, Chinhoyi University of Technology Hotel, Chinhoyi.

Fonseca B., Morgado L., Paredes H. (1993), ``PLAYER – a European Project and a Game to Foster Entrepreneurship Education for Young People``. *Journal of Universal Computer Science, vol. 18, no. 1 (2012), 86-105*

http://inovacija.org/o-такмичењу [Accessed 30/08/18]

Leimeister, J. M.; Huber, M.; Bretschneider, U. & Krcmar, H. (2009): Leveraging Crowdsourcing: ``Activation-Supporting components for IT-based ideas competition``. *Journal of Management*

Information Systems (JMIS), Ausgabe/Number: 1, Vol. 26, Erscheinungsjahr/Year: 2009. Seiten/Pages: 197-224.

Ulrich Schoof, ``Stimulating Youth Entrepreneurship: Barriers and incentives to enterprise start-ups by young people``, International Labour Office . Geneva, SEED Working Paper No. 76, 2006.

Winfried, E.; Jan, M. L.; Helmut, K. ``Community engineering for innovations: the ideas competition as a method to nurture a virtual community for innovations R&D Management`` 39, 4, 2009. r 2009. *Journal compilation r 2009 Blackwell Publishing Ltd. 2009,*

STUDENT INNOVATION PROJECTS IN SLOVENIAN HIGHER EDUCATION SYSTEM

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Abstract: *This paper presents two mechanisms to foster student innovation capabilities in different business environments in Slovenia. These mechanisms are a part of a program supported by Ministry of education, science and sport and the European social fund and carried out by The Public Scholarship, Development, Disability and Maintenance Fund of the Republic of Slovenia. The first mechanism deals with student innovation projects in industry and the second deals with student innovation projects in non-economic and non-profit sectors. The paper also presents two specific case studies (student projects) for both of the mechanisms.*

KEY WORDS: STUDENT PROJECT, INNOVATION, INDUSTRY, NON-PROFIT SECTORS, SLOVENIA

JEL CLASSIFICATION: O (Economic Development, Innovation, Technological Change, and Growth)

1. INTRODUCTION

On 15 July 2016, Slovenian Government Office for Development and European Cohesion Policy endorsed the program "Open, responsive and quality system of higher education – Project work with the economy and the non-economy sectors in the local and regional environment – Creative Path to Knowledge 2016-2020". One year later, Slovenian Government Office for Development and European Cohesion Policy endorsed additional program "Project work with the non-economic and non-profit sector – Student Innovative Projects for the Social Benefit of 2016-2018". The overall program is supported by Ministry of education, science and sport and the European social fund and carried out by The Public Scholarship, Development, Disability and Maintenance Fund of the Republic of Slovenia.

The program, through its creative path to knowledge in different environments, enables the integration of higher education institutions with the labour market and thus gives students the opportunity to gain practical experience. In the framework of co-funded projects, students explore creative and innovative solutions to the challenges of the economic and social environment. The purpose of the program is to ensure the integration of education and/including higher education institutions with the labour market, and enable students to acquire practical experience.

Hundreds of student projects in both programs have been implemented since 2014 in Slovenia. They combined a huge number of companies and non-profit organisations, all Slovenian universities and other higher-education institutions and, of course, thousands of Slovenian and foreign students. The overall budget for the period form 2014 until 2020 is approaching 20 million EUR. Faculty of Mechanical Engineering from University of Maribor has been throughout the program one of the most active participant and we gained many experiences in managing such projects. The results of student projects from our faculty have also been recognised as excellent.

The remainder of this paper is organised as follows: Section 2 gives an overview of the Creative Path to Practical Knowledge program, while Section 3 presents Student Innovative Projects for the Social Benefit program. Sections 4 and 5 present two case studies from Faculty of Mechanical Engineering from University of Maribor, one from each program. We conclude the paper with our experiences with managing these projects.

[1] Institution/Affiliation: University of Maribor, Faculty of Mechanical Engineering, Slovenia

2. THE PROGRAM CREATIVE PATH TO PRACTICAL KNOWLEDGE

The acquired education nowadays is only a stepping stone in finding a job, therefore it is necessary for young people to acquire practical experience and, consequently, the competencies, skills and skills that are necessary for them to be able to get involved in the work at the end of their studies. Creativity, innovation, the ability to solve problem tasks, team work, self-initiative and other specific competences are the skills that young people can gain by working on individual projects, work practices and other activities that take place between the educational sphere and the economy. The latter enables young people to get acquainted with the employer's work process at the time they are educated, under the guidance of a mentor, they are involved in individual fields, thus deepening theoretical and practical knowledge.

The purpose of the program Creative Path to Practical Knowledge is to support the development of competences, acquire practical knowledge and experience of students by using an innovative, problematic and group approach to solving practical problems by including them in projects that were implemented in the direct partnership of higher education institutions with the economy. With the help of mentors from the educational and economic sphere, the students, within the framework of project activities, which are held as a complement to the regular learning process, develop innovations, creative thinking and other competences that enabled them to move from education to employment.

Program goals:

- By using an innovative, problematic and group approach to solving practical problems, students are given the opportunity to support the development of competences, acquire practical knowledge and experience;
- By encouraging innovation, creative thinking, entrepreneurial thinking and subject-specific competences in the field of study and competencies in the field of other, improve the employability of students and stimulate the creation of new jobs;
- Facilitating the transfer of knowledge to higher education institutions and industry to facilitate the exchange of expertise, which contributes to strengthening the long-term integration of higher education institutions with industry and, consequently, adapting the education system to the needs of the industry.

Creative Path to Practical Knowledge is a program that targets students who in addition to their studies, wish to participate in “small research projects”. The focus is for these students to find creative and innovative solutions to practical challenges in the corporate sector. These students are guided by mentors offering expert support. The program was created that students could gain competence and experience that are needed for transitioning from school into working life.

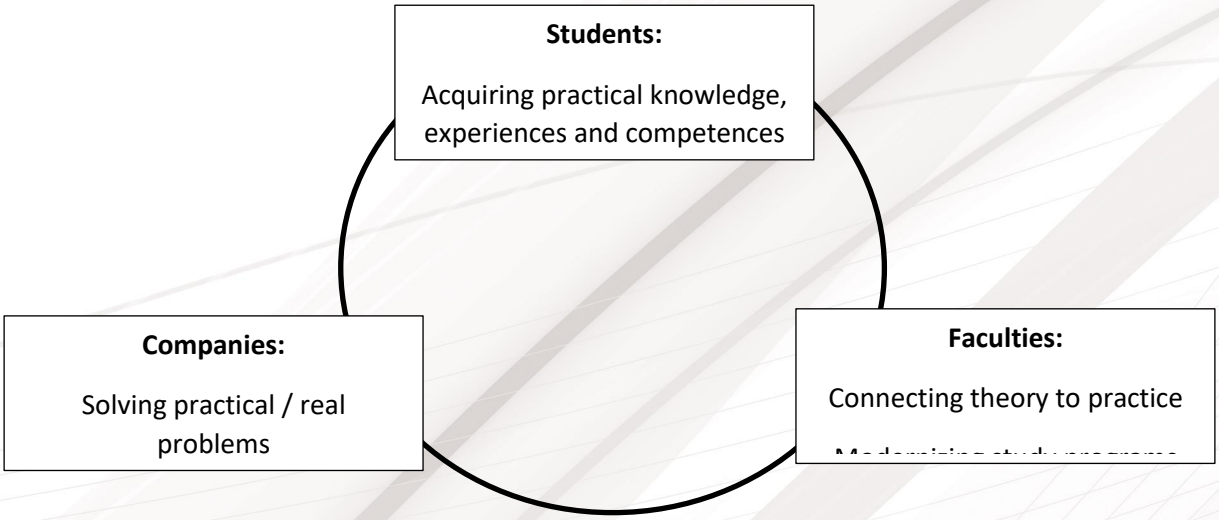

Figure 1. Connecting Students-Companies-Faculties

The projects include many different fields and variations depending on the field of study. The environments can be very different as well, projects range from medical to chemical laboratories to

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forests and faculty gardens. Projects that the students participate in are extremely useful since they usually help society as a whole. Previous projects include musical lessons for infants, research and development of paraplegic clothing, online application for gene data analysis and for conducting bio information procedures and many more.

There are numerous benefits for this program, it connects students, companies and education faculties. Students gain practical knowledge, experience as well as make connections that can further advance their future careers. Companies gain help with problem solving and find employment candidates. Faculties can connect theory with practice and can practically update their study programs.

Competence gained from the program include:
- Interdisciplinary and team work;
- Analytical and creative thinking and problem solving;
- Corporate and organizational competence;
- Communication skills.

Effects from this program include:
- Increasing employability of students thanks to experience and competence;
- Actually employed students;
- Updating study syllabus. A new approach to employing young people in companies;
- Connections students create with companies.

The program enables co-financing of projects that are carried out in groups of 6 to 8 students under the mentorship of the pedagogical and working mentor. In addition, an organization from an economic or social field can join the project. Projects can last from 3 to 5 months.

The program also introduces an additional activity, namely the promotion of mutual exchange of knowledge, experience and good practices of higher education teachers and experts from industry. The main purpose of this activity is the transfer of professional and academic knowledge, which will consequently encourage higher education institutions to modernize study programs and introduce an innovative teaching approach.

This program is a great way to learn how to work as team and find new ways to deal and solve challenges which can happen in working life. Students learn useful knowledge and skills. It’s a great way for students to network and make new connections in their own professional field and find employment.

3. THE PROGRAM STUDENT INNOVATIVE PROJECTS FOR THE SOCIAL BENEFIT

The background of the program is similar as for the Creative Path to Practical Knowledge program, so we will describe in short only the most specific characteristics. The purpose of the Student Innovative Projects for the Social Benefit program is to connect higher education institutions with a non-economic and non-profit sector in the local/regional environment and to implement innovative flexible forms of learning for the development of students' competences and practical experience. The subject of the program is co-financing of projects, which will be carried out in groups of 6 to 10 students under the mentorship of a pedagogical mentor and expert associate from the local/regional environment. Within selected projects, students will explore various creative and innovative solutions to the challenges of the non-economic and non-profit sector (in the local/regional environment).

Program objectives:
- Enhanced cooperation and integration of the higher education system with a non-economic and non-profit sector in a local and regional environment;
- Implementing models of an open and flexible transition between education and the labour market, which will help young people to acquire concrete and practical experience during education;
- The development of the skills needed for direct participation in the realization of ideas and the acquisition of experience to increase the employment prospects.

4. CASE STUDY FROM CREATIVE PATH TO PRACTICAL KNOWLEDGE PROGRAM

One of the projects from Creative Path to Practical Knowledge program is a joint effort by Faculty of Mechanical Engineering (University of Maribor) and Faculty of Economics (University of Ljubljana). A group of 3 students from each faculty together with two pedagogical mentors collaborated on a project with a company GKN Driveline Slovenia, a producer of automotive parts for the majority of car manufacturers. The company also provided a working mentor. The title of the project was Automation of the cutting process and hardness measurement. The project duration was 5 months. Students from Faculty of Economics had background in IT management and logistics, while students from Faculty of Mechanical Engineering had background in mechanical engineering and mechatronics.

GKN Driveline Slovenia must introduce a new internal GKN standard 207020A by the beginning of 2019, which means that hardness measurements and microstructure verification must be carried out every shift and every time the batch is being replaced, it must also perform a large number of hardness measurements on individual piece as required by the existing standard. With the current mode of operation, this would take 29 hours a day, so the project goal was to optimize cutting processes and hardness measurements. The task given to students was to design a verification process with which all the necessary measurements could be carried out in the company in three shifts. In resolving the problem, solutions were sought, which require less human work, and in particular company wanted to achieve a paperless system, i.e. updating the current information system, so that the data will no longer need to be manually entered into the forms several times, but will be recorded in digital databases.

Students worked on the project very systematically. At the first meeting, students and both pedagogical mentors were informed by the working mentor about the problem, who described the existing situation and the new standard 207020A, which the company must introduce into production by the end of the year 2018. At the next meeting in the company, the students, together with the work mentor, went to production, where they examined the current production process, which included inductive hardening, cross-section on the orbital machine, embossing in bakelite, grinding, polishing, cleaning, hardness measurement by the Vickers HV 5 method, microstructure checking and archiving. The students then made a LTA analysis of the current state, suggesting improvements that would save time. In the continuation of the project, they searched for various machines and other solutions in various professional magazines, books and on the Internet. They contacted the number of companies who were agents for the sale of machines, and thus obtained bids for the machines they needed to determine whether a particular solution was economically justified. In the end, the students presented the results to the management of the company.

Figure 2. Existing method to measure hardness

The result of the project had three variant solutions. The first variant of the solution was based on the existing system, whereby students submitted suggestions for time saving measures using the LTA method. Another variant solution is to update the production line with new machines, whereby the worker is still the one who serves the line. The third variant solution is a system that would work without human workers. With their solution, students helped the company to introduce a new standard, which is

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a prerequisite for the successful operation of the company in the future. The primary goal was to enable (new) measurements to be performed within 24 hours. A group of students carried out three different variants of improvement. The first, the cheapest and the easiest, is to eliminate the current "waste-removal" errors. The next, second version, is already capable of carrying out a new type of measurements within one day. In this solution, they proposed a new, better way of performing work, with some new appliances. With this version, the help of the workforce is also needed. Lastly, the group proposed the most effective version, which should perform measurements in a shorter time. This version is fully automated. A person is required exclusively at the very beginning, as he is responsible for the contribution of the hair and the choice of the type of measurements. This solution is also costly most expensive.

Students presented three proposed solutions to the company, which will have to decide for the most suitable one based on the financial resources. The students proposed version two, since it is suitable for the needs of the company, because it allows the required measurements to be made, all at a lower level of the required investment. The final solution for the improved cutting process and the hardness measurement is the upgrade of the existing manual work. The proposed automated process solution is a step forward to i.e. Industry 4.0, where focus is on use advanced technologies and automatic data capture, which both contribute to greater efficiency and the speed of the hardness measurement process, as well as the increase in the quality of work and the relief of employees. Such measures increase productivity in the company, thereby increasing the added value per employee of the company, which is one of the key criteria for the competitiveness of the company and the entire industry. Such and similar solutions in Slovenian companies consequently raise the level of technological progress of Slovenian production industry as a whole.

A part of the project was also knowledge transfer from working mentor from the company, who had lectures at Faculty of Economics for larger group of students. On the other side both pedagogical mentors performed short workshops in company on a specific subject (Erjavec et al., 2018).

5. CASE STUDY FROM STUDENT INNOVATIVE PROJECTS FOR THE SOCIAL BENEFIT PROGRAM

Intergenerational socializing in a modern society is gaining increasing importance and validity. For the successful implementation of activities for socializing and learning, it is necessary to provide adequate space with adequate infrastructure. The main goal of the project for the establishment of a multi-generational centre in the municipality of Hoče-Slivnica was to create an appropriate environment for socializing all generations and vulnerable groups and to prepare a program for activities that will be carried out in a multi-generational centre. A Student Innovative Projects for the Social Benefit project was carried out by a team of 9 students from different study programmes from the University of Maribor (mechanical engineering, economical engineering, business economics, transport engineering and pedagogical education), two pedagogical mentors, a professional associate from the public institute PIP and municipal authorities of the municipality of Hoče-Slivnica.

At the beginning of the project, we were looking for an appropriate location and an existing building with the representatives of the municipality of Hoče-Slivnica and defining the basic purpose of the project. We worked on the project approach, defined the activities and timely evaluated them, divided the tasks and identified the operators, and in order to gather information, they first examined examples of good practice (the house of all generations in another municipality). The analysis widened our horizons, gave us a wider view of the problems and possible solutions. The next step in the project was a detailed analysis of the existing situation in the future multi-generational centre. This work included a detailed overview of the existing technical documentation of the building and its surroundings. We visited the site several times and performed additional measurements to complete the technical documentation. The definition of generational groups and vulnerable groups followed. Good knowledge of future visitors to the centre is crucial for the preparation of space and the preparation of the program of activities. We have prepared the planned activities that will be carried out in a multi-generational centre. We have defined the necessary equipment for carrying out the activities. Using the methodological work, we designed an optimal spatial distribution and equipment arrangement. The

entire centre is designed in such a way that it also enables people with disabilities access and use of the premises, participation in activities. We have made installation plans for electricity, water, drains and lighting. A calculation was made of the estimated costs for establishing a centre, which gave us a better overview of the investment to establish a more generational centre. We proposed ways of informing the public and monitoring the visit. It is all in the interest of the more generations to be visited as much as possible.

The design of several generations centre and all necessary documentation were presented and given to the representatives of the municipality of Hoče-Slivnica, who also provided some comments, and this project was also realized this year.

Figure 2. Interior of the building

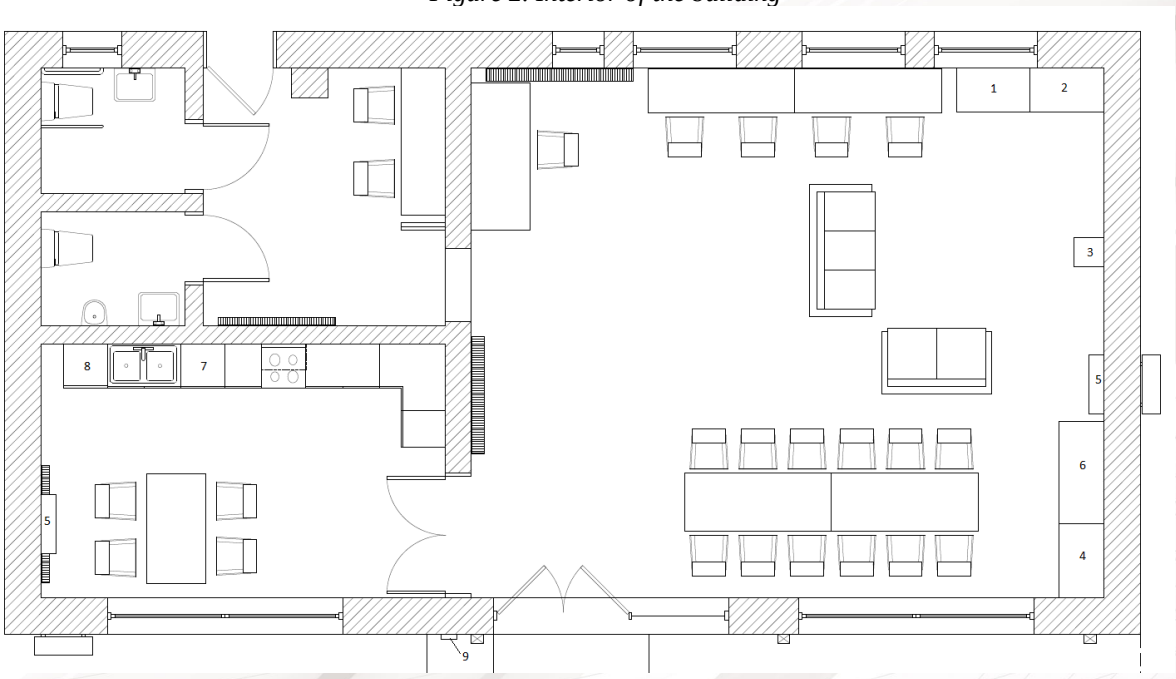

Figure 3. Plan for redesign of the centre

Students were enthusiastically involved in this project and worked creatively in the spirit of interdisciplinary team work, and above all, they took advantage of this opportunity to implement

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theoretical knowledge in practice. That is why, of course, they want more similar challenges, where they could contribute to the development of a wider society and its surroundings with their ideas (Leber et al., 2017).

Figure 4. The multi-generational centre today

6. CONCLUSION

Selected lecturers at Faculty of Mechanical Engineering from University of Maribor mentored several student innovation projects from both programs in the last 4 years (authors of this paper included), where we gained many valuable experiences. We can confirm that the program met its purpose and it is extremely welcomed by students, companies and mentors from faculties. Although considerable budget is appointed to the program and hundreds of project have been financed, the number of application within each call exceeds the planned number of financed projects. The benefits for all the stakeholders that have been described in theory, proved to be real judging on the feedback from mentioned stakeholders. There are not many weaknesses of this program, the only major weakness standing out is the scope of bureaucracy required before project implementation, between project implementation in the form of reporting and at the end of the project. Nevertheless, the benefits of the program are clear and the government continues with the program at least by the end of 2020.

REFERENCES

Erjavec, J., Palčič, I., Šega, U., Novak, M., Obolnar, A., Tomič, K., Butolen, U., Gal, E. and Stradovnik, S. (2018), Avtomatizacija prerezov in merjenje trdote, Fakulteta za strojništvo, Maribor.

Leber, M., Schmidt, M., Robnik, M., Sirc, R., Bogša, M., Copot, M., Pukšič, P., Jesih, M., Družovec, D., Žlaus, A., Rodošek, J. and Vrbanić, M. (2017), *Zasnova več generacijskega centra za vseživljenjsko učenje in prosti čas*, Fakulteta za strojništvo, Maribor.

http://www.sklad-kadri.si/si/razvoj-kadrov/po-kreativni-poti-do-znanja-pkp/ [Accessed 23/10/18]

http://www.sklad-kadri.si/si/razvoj-kadrov/studentski-inovativni-projekti-za-druzbeno-korist-sipk/ [Accessed 24/10/18]

BOOSTING TECHNOLOGY TRANSFER AND INNOVATION AT UNIVERSITY LEVEL IN SERBIA THROUGH PROOF OF CONCEPT PROGRAMME

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Abstract: *This paper presents various approaches and experience in the launch and implementation of Proof of Concept programs and funding to support technology validation and the development of functional prototypes, raising the level of technological readiness (TRL) or the level of production readiness (MRL). Recommendations are given on how universities and national institutions should set up a PoC program and successfully implement it in order to achieve the expected impact. The basic elements of the Operational Guide for the Proof of Concept Program in Serbia developed within the IF4TM project are presented, as well as the results of the piloting of the PoC program in Serbia within the same project.*

KEY WORDS: PROOF OF CONCEPT, TECHNOLOGY TRANSFER, INNOVATION, UNIVERSITY, COMMERCIALISATION

JEL CLASSIFICATION: O3 Innovation, Research and Development, Intellectual Property Rights.

1. INTRODUCTION

Public investment in science, fundamental and applied research carried out at universities should be linked to technology transfer processes and their commercialization wherever possible, in order to achieve a positive impacts on the economy of a knowledge-based society. For this purpose, consideration should be given to all forms of technology transfer, including licensing, establishing spin-off or start-up companies, as well as the application of research results through contract or collaborative research projects with industry and the joint development of innovations.

It has been shown that a significant amount of research results is not at the level that allows commercialization and commercial exploitation, whether the level of these results is far from market exploitation, whether the protection of intellectual property, the first stage in technology transfer, patent or otherwise, is prevented by premature publishing results in scientific publications.

The first measure of the readiness of the technology for commercialization can be quantified by defining the level of technology development in a particular industrial sector using accepted industrial scales such as Technology Readiness Levels (TRLs) or Manufacturing Readiness Levels (MRLs). The application of these scales has been on the rise in recent years, especially in the areas of air and automotive industry, transport, and wider production. These approaches have also been applied in evaluation of projects and defining the expected impacts, as is the case in the H2020 program.

Depending on the technology development stage, there are nine TRL levels defined [1]:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space).

In order to improve the relevance of the research and raise the level of their technological readiness (TRL), to develop the technologies at universities and institutes as close as possible to the

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market conditions and enable their commercialization and application in the economy, a Proof of Concept program (PoC) can be introduced on the level of national publicly funded programs by the responsible ministries, as well as by the university itself. In this way the research results, laboratory-developed technologies and prototypes can be additionally verified and validated, in order to develop functional prototypes as the basis for writing quality patent applications, to promote technology and finally to use them as a powerful tool for negotiating with business partners and investors in their commercialization.

Within the Erasmus IF4TM project [2], Operational Guide for the Proof of Concept Program for Serbia [3] has been developed, and based on the manula PoC programme has been piloted under the project in 2017 and 2018. This paper presents the basic elements of suggested PoC program and the results of its pilot implementation.

The Proof of concept programme is also included in the Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016-2020, within strategic measure "Strengthening the link between science, economy and society to encourage innovation" and its Action plan adopted in 2018 [4]. In addition, PoC implementation is suggested in "Guidelines for the development of technology transfer and innovations dimension of the university third mission" [5].

2. REVIEW OF SETTING UP PROOF OF CONCEPT SUPPORT AND FUNDING

Although the definition of the Proof of Concept in the vocabulary is quite simple (the term that denotes the product/technology development phase in which the product/technology functions as intended or validated in their functionality, there are different ways in the world for research institutions and business sectors apply PoC in practice, which support activities offer to researchers and how they finance them.

Innovate UK, the UK's innovation agency, has identified in the United Kingdom as many as 25 national PoC funding sources and 14 regional ones as well as a number of individual (institutional) internally managed Poc funds [6]. In this survey, from the broader list of Innovate UK support activities for the PoC implementation, the most responses of the interviewed universities and research institutions were given for the following eight activities that include PoC:

- Technical feasibility studies
- Prototyping
- Specialist testing and/or demonstration testing
- Market research
- Market testing and competitor analysis
- Intellectual property protection
- Intellectual property position assessment
- Investigation of production and assembly options

Figure 1 gives an overview of the application of these support activities for 88 respondents from the university and 76 from companies.

In researches conducted by Samantha and Bradley [7], 32 universities have been identified in the United States, on which the Proof of Concept Centers (POCC) have been established to support the development of technology and the application of the PoC program with significant economic role of the centers with results that have been achieved over the years. They also ivestigated and presented numerous challenges in technology transfer during the implementation of the PoC program and the current activities of the POCCs. It was concluded that PoCCs is a growing infrastructure in the United States and they are definitely an important element of their national innovation system and the network of support institutions.

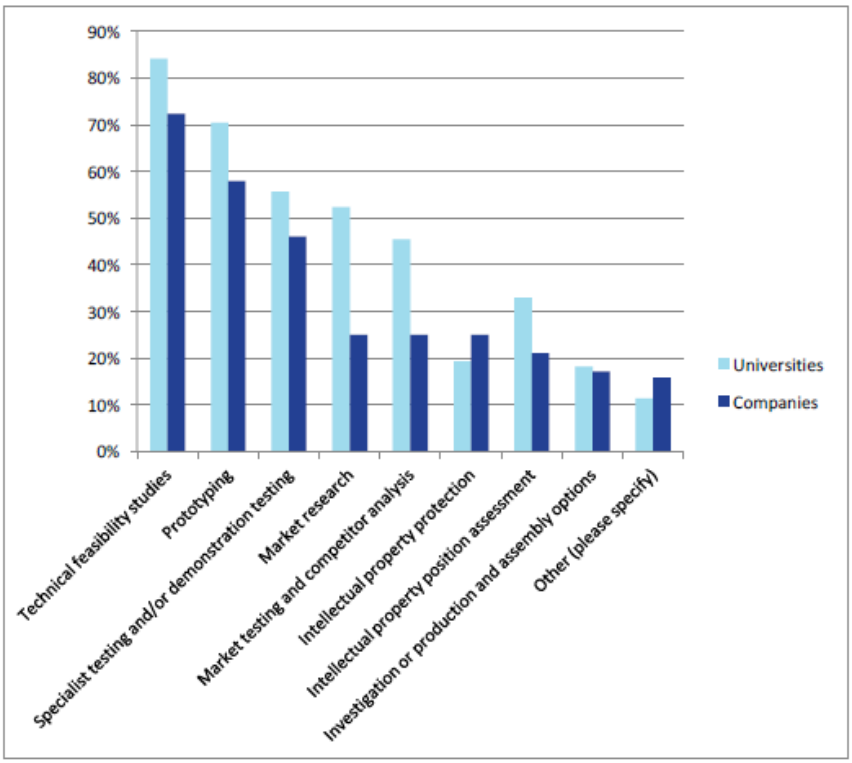

Figure 1 - Percentage respondents who had applied for and/or received PoC funding in the past 3 years for each activity [6].

Other quantitative and qualitative indicators of the influence of POCCs on the performance of the national innovation system in the US have been presented in paper [8], such as the number of supported PoC projects by universities, the amount of funding, the number of university start-ups before and after the establishment of the POCC etc. It was also pointed out on two models of financing PoC activities, the first by the state, as a national program, and the second by the own resources of the university. It is pointed out that the second model is better for the interests of universities because it develops an internal innovative network and improves profitability of invested money in PoC projects and protection of intellectual property, as well as the promotion of innovative and entrepreneurial culture.

One of the best examples of internal (university) financing of PoC projects and a comprehensive technology transfer process is a model that is applied by the University of Oxford who founded Isis Innovation Ltd in 1988. as its wholly owned technology transfer company. In 2017, the university established the new Oxford University Innovation (OUI) company, while ISIS is known as Oxentia from April 2017. The two organizations continued to work closely together, sharing information on best practice in technology transfer and providing support to researchers. The University has created three investment funds in recent years for the development of technologies and funding PoC projects:

1. University challenge seed fund
2. The oxford invention fund
3. Proof of concept fund

The University of Oxford and ISIS implemented the PoC program and funded projects for more than ten years. Based on the experience of ISIS managers (Andrea Alunni and Steve Cleverley), tips and advice on how to structure a successful PoC program and fund were prepared [9]:

1. Have a simple application procedure.
2. Be open minded about intellectual property and patents: in some fields a patent is essential, in others it may be a ‘nice-to have.’
3. Aim to capitalize on and leverage other types of funding, where possible.
4. Ensure that the fund administrators have a plan and contacts for securing follow on funds.
5. Set up the fund to invest in projects as well as companies.
6. Capture returns from licensing as well as spinouts.

7. Have a clear and transparent project evaluation process.

In order for the PoC program to be successful and had the expected impacts on the University and economy, the following should be avoided [9]:

1. Apply a one-size-fits-all investment criteria, such as a requirement that a company must achieve revenue by the end of year one. Many university-based companies won't and shouldn't be set up to achieve this type of goal.
2. Spread available funds too thin.
3. Deviate from the funds' agreed investment scope and project selection criteria.

In the Work Program 2019 for the European Research Council, funded by the European Union's Horizon 2020 Framework Programme for Research and Innovation it is planned to pilot the award of Proof of Concept grants for Principal Investigators of ERC frontier research grants on the basis of a lump sum of EUR 150 000. The funding covers activities in the initial steps for turning research outputs into a commercial valuable proposition and verifying the innovation potential of ideas arising from ERC funded projects. PoC grants can be used to [10]:

- Establish viability, technical issues and overall direction
- Clarify intellectual property rights position and strategy
- Provide feedback for budgeting and other forms of commercial discussion
- Provide connections to later stage funding
- Cover initial expenses for establishing a company

3. OPERATIONAL MANUAL FOR PROOF OF CONCEPT PROGRAM IN SERBIA

The ultimate goal of the suggested Operational Manual for Proof of Concept Program in Serbia, elaborated within IF4TM project is to provide the set of instructions and guidelines for researchers on how to validate their laboratory prototypes and make them more marketable in order to facilitate the transition from publically funded high-impact research to market-wise viable innovations [3]. Implementation of this PoC program will also lead to the increased capacity of university staff and researchers to be more engaged in contract and collaborative research projects with industrial partners. Additionally, the Programme will contribute to the raise of Technology Readiness Level (TRL) and improve the ability of the research institution to understand the technology status as an important tool for determining the further activities and possible commercialization strategy.

3.1 PoC programme objectives

PoC Programme's main objective is to provide the support to university research teams to validate their research results, technologies, laboratory prototypes, etc. (hereinafter Technology) in order to facilitate the process of their competitive development and commercialization.

The Programme is designed to address the lack of support to the development of research concept into applicable and commercial products and services. More specifically, it strives to [3]:

- Improve the commercialization capacity of Serbian higher education institutions
- Build and upgrade capacities of Serbian researchers for applied research and development of commercialization strategies
- Encourage and support the process of generating, valuation and protecting of intellectual property resulting from research work
- Encourage researchers to engage in entrepreneurial ventures
- Support the commercialization of research results of high economic and social impact
- Strengthen the cooperation between the academic and business sector

3.2 Support activities

The PoC Programme provides the support to university research teams in the phase of pre-commercialization of technologies (development projects, feasibility studies, working prototypes, etc.) that have promising innovation potential and that are in the range from TRL 2 to TRL 6.

Suggested Proof-of-Concept Programme covers following support activities [3]:

- **Market Research** – assessment of the technology in terms of commercial value, intellectual property exploitation, competitive position and definition of commercialization requirements such as costs, time framework, scope of funding, etc.
- **Business model development** – validation of idea or research results using CANVAS method;
- **Commercialization strategy** – definition of the strategy and recommendations of the necessary steps in order to introduce a new product or production method on the market based on the scientific and research results
- **IP evaluation and protection** – identification of the potential for IP protection and most feasible exploitation model (sell, license, develop with partnership, establish spin-off or start-up), taking into account all legal, economic and financial aspects of the IP asset in question.
- **Technology/concept validation** – confirmation that the technology meets the expected requirements and produces expected results under realistic operating environment, i.e. to demonstrate that the technology works as intended.
- **Development of prototype** – supporting the projects in their pre-production phase in terms of development of prototypes, product design, testing the technology/product, in order to make it ready for acquiring the initial funding for its development or ready for commercialization depending on the type and stage of the project.
- **Technical feasibility study** – defining the strengths and weaknesses of proposed research results, opportunities and threats, as well as resources required to develop the product, process or service (human, financial, material, etc.).
- **Fundraising or crowdfunding support** – searching for and collecting the necessary financial resources to support the realization of research using various mechanisms such as EU grants, national grants, crowdfunding, etc.

3.3 Evaluation procedure and criteria

At the level of PoC Programme, the Evaluation Committee is to be formed, consisting of five members who will be responsible for the whole evaluation process. Evaluation Committee will assign three independent reviewers (two from the Serbian HEIs and one from the EU HEIs) for each application received in a timely manner respecting the set deadline, dully filled and completed in English.

The PoC projects are evaluated on the bases of four evaluation criteria accompanied by the weight factors, as follows:

- **Technology** (30%) – Applicants need to clearly describe the technology in question and to demonstrate its innovativeness. Opportunity to protect intellectual property related to the technology will also be assessed. Additionally, the impact on raising Technology Readiness Level will be taken into account within this criteria.
- **Application** (25%) – Potential for industrial application of technology including the definition of target groups' problems, proposed solutions, technical feasibility as well as regulatory and other barriers.
- **Market** (20%) – Market potential will be assessed in terms of competitive advantage, sales potential and market size.
- **Team competences** (25%) – Competences and skills of researcher/s to carry out and manage the project such as research competences, market and project management skills and available resources.

3.4 Duration and eligible costs

The duration of PoC Programme is up to 6 months. There will be one annual call for applying to PoC programme. The call will be open until all financial resources allocated to the particular call are exploited.

The PoC grants can be used by selected applicants for following types of costs as eligible:

- Consultancy services

- Training, coaching and mentoring costs
- Consumables for experiments, tests, etc.
- Subcontracting (development of prototypes, feasibility study, etc.)
- Travel costs (trainings, capacity building, etc.)

3.5 Eligible applicants for PoC projects

Applicants of PoC projects are research teams from accredited higher education institutions and institutes in Serbia, from any field of science. For the purposes of statistical monitoring of the PoC program implementation, all scientific disciplines are classified into six scientific fields and the corresponding scientific sub-fields:

1. Natural Sciences (Mathematics, Computer and information sciences, Physical sciences, Chemical sciences, Earth and related environmental sciences, Biological sciences, Other natural sciences)
2. Medical and health sciences (Basic medicine, Clinical medicine, Health sciences, Health biotechnology, Other medical sciences)
3. Engineering and technology (Civil engineering, Electrical engineering, electronic engineering, information engineering, Mechanical engineering, Chemical engineering, Materials) engineering, Medical engineering, Environmental engineering, Environmental biotechnology, Industrial Biotechnology, Nano-technology, Other engineering and technologies)
4. Agricultural sciences (Agriculture, forestry and fisheries, Animal and dairy science , Veterinary science, Agricultural biotechnology, Other agricultural sciences)
5. Humanities (History and archaeology, Languages and literature, Philosophy, ethics and religion, Art (arts, history of arts, performing arts, music), Other humanities)
6. Social sciences (Psychology, Economics and business, Educational sciences, Sociology, Law, Political Science, Social and economic geography, Media and communications, Other social sciences).

Teams made of researchers from different institutions can also apply in which case the team leader needs to be appointed and their home institutions have to provide their approval. In such a case of multi-institutional research teams, aspects of intellectual property need to be regulated for both background (knowledge/IP supplied by the partners at the start of the project) and foreground IP (knowledge/IP produced within the project). These regulations need to be in line with the legal frameworks for IP management at those institutions.

3.6 Application form

The research teams apply for the support of PoC programme by submitting the Application Form and Proposed Budget Table (provided as annexes of the Operational manual for PoC programme). Application form is structured with following sections:

1. Title of the project or technology
2. Field of science
3. Research team members
4. Description of PoC project (description of the technology, TRL, what the proposed technology enables, alternative technologies, innovativeness, ownership of intellectual property, the public information on the technology (papers, patents, etc.), partners involved and their role, kind of support requested, further development of the technology in the next twelve months, any other support (financial and non-financial) for development the technology etc.)
5. Application of the technology (description of the problem technology addresses, proposed solution, market potential, target groups and competitive advantage, any regulatory issues or other barriers etc.)

6. Capacity to implement the PoC Programme (competences of the research team relevant for the implementation of PoC project (entrepreneurship, IP management, commercialization, innovations, technology transfer, etc,) capacity of the home institution etc.)
7. Specific information
8. Exclusion criteria
9. Proposed Budget Table

4. PILOT IMPLEMENTATION OF PROOF OF CONCEPT PROGRAM IN SERBIA

The Proof of concept program has been piloted in Serbia within the IF4TM project in 2018. In the pilot implementation of the program IF4TM project partners participated: University of Kragujevac as leading partner, University of Novi Sad, University of Belgrade, University of Nis, State University in Novi Pazar and Technical College for Applied Sciences Zrenjanin, University of Maribor and Danube University of Krems).

The first call was announced in December 2017 and the phase of collecting PoC project proposals lasted until the end of February. During this period, a number of promotional activities were carried out in order to introduce the academic and scientific community with the possibilities of the PoC program, since it is being implemented for the first time in Serbia. All seven HEIs in Serbia, listed above, have appointed a contact person to promote and monitor the implementation of the PoC projects at their institutions.

PoC projects have been applied in various fields of science (as shown in Section 3.5 in this paper), and analysis the representation of scientific disciplines for the proposed projects was done by processing the submitted project proposals. The results of the analysis are shown in Figure 2.

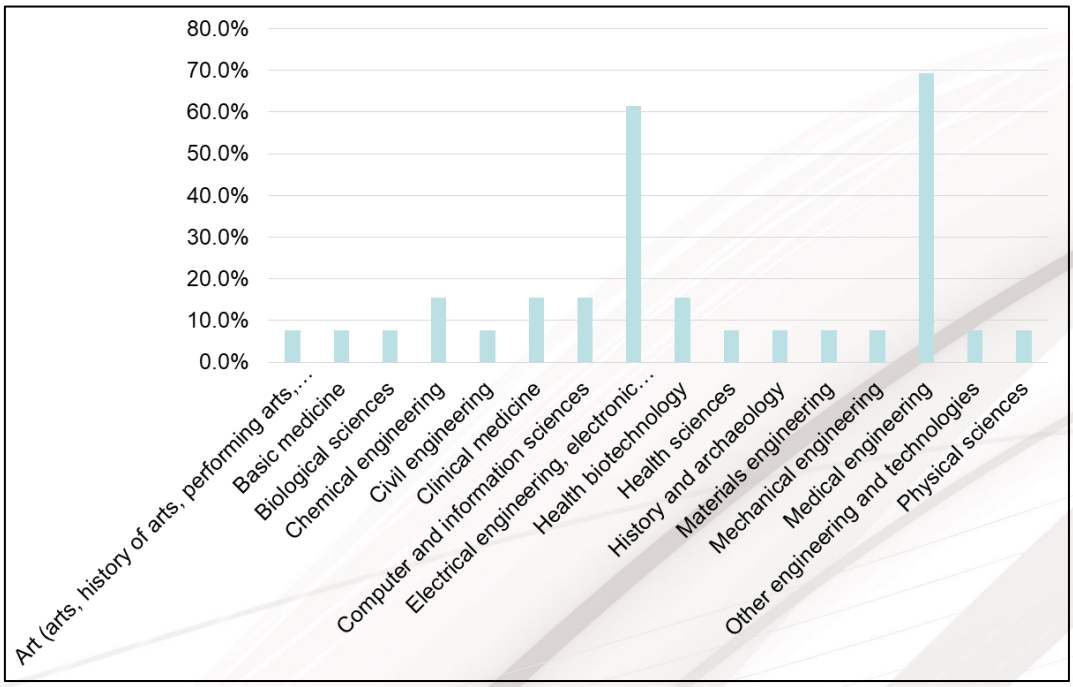

Figure 2 - PoC applications across the scientific fields

It is evident that the largest number of projects and technologies that need to be validated and improved at higher TRL levels are in the field of *Engineering and technology*, and belong to sub- fields of *Medical engineering* and *Electrical engineering, electronic engineering, information engineering*, They are followed by technologies in the sub-fields of *Chemical engineering* and *Computer and Information Sciences*, as well as disciplines within the scientific field of *Medical and Health Sciences*, the sub-fields of *Clinical Medicine* and *Health biotechnology*. There were very few applications for other fields of science, in only two sub-fields *Arts* and *History and archaeology*.

Research teams were in the process of improving technology and its validation as well as further commercialization in their PoC projects required the most support activities related to *Market Research* (62%) and *Development of prototype* (54%), while 45% required for support in *IP evaluation* and *Commercialization strategy* (see Figure 3). For support activities *Technology/concept validation* and *Business model development* 38% of applicants opted for this type of support in PoC program. The *IP protection* activity follows with 31% of the requests, and the least interest was for support through the PoC program in *Fundraising or crowdfunding activities* (22%), as well as elaborating the *Technical feasibility study* (15%).

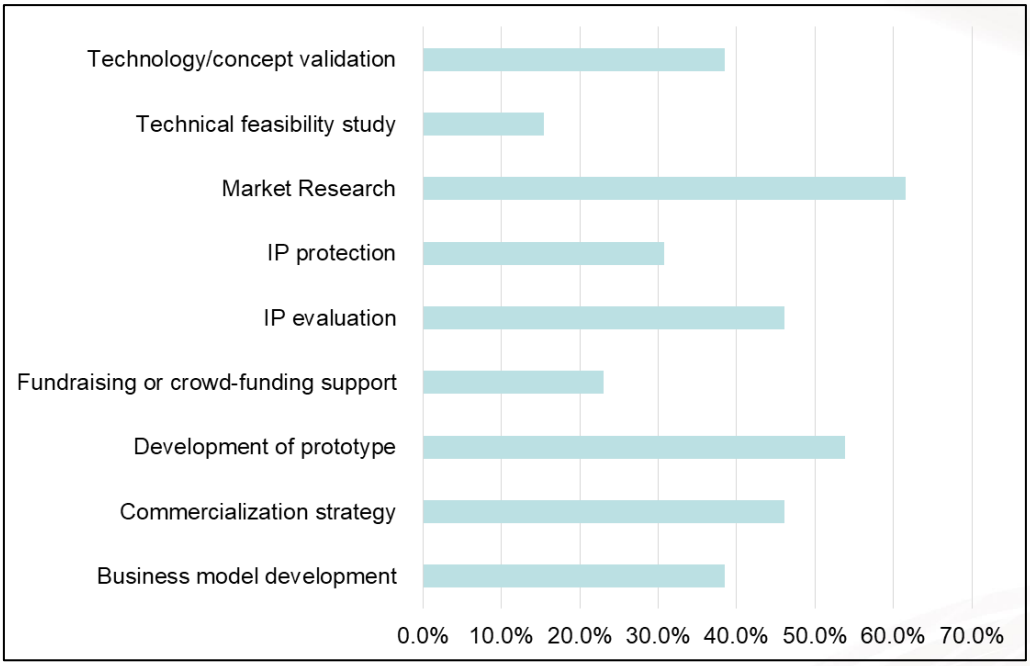

Figure 3 - Support activities requested by PoC applicants

After the completion of the application phase, five members of the Evaluation Committee were nominated, one representative of the Ministry of Education, Science and Technological Development, one representative of the Innovation Fund in Serbia and three representatives of the universities in Serbia. The Evaluation Committee assigned to each application three reviewers based on the proposals of partner institutions in IF4TM. The reviewers were introduced with the evaluation criteria and the method of evaluation, so within two months the evaluation of all PoC applications and the ranking list was completed. Ten first-ranked PoC projects were selected by the decision of the Evaluation Committee for support in their implementation and partially funding. Approved PoC projects are listed in Table 1.

Based on requested support activities in PoC applications, some of following consultancy and other services are provided in pilot phase to research teams in order to improve TRL level:

- Mentoring and consultancy services (experts from Serbian and EU partner institution in IF4TM project)
- Support to IP valuation (provided by Intellectual Property Office in Serbia, as partner in IF4TM project)
- Elaboration of commercialization strategy (experts from Serbian and EU partner institution in IF4TM project)
- Production of rapid prototypes (provided by Serbian and EU partner universities participating in IF4TM)
- Access to the modern equipment for development/validation of technology/product (provided by Serbian and EU partners in IF4TM)
- Information on funding opportunities through national and EU funding schemes and support in fundraising - writing winning project proposals (provided by experienced researchers from partner universities in IF4TM)

- Study visits to EU partner institutions (in Maribor, Lisbon, Brighton, Bari and Krems)

***Table 1**: List of approved PoC projects for the support within the PoC Program in pilot phase*

No	PoC project	Project full name	Applicant's institution
1	3Phase	3 PHASE voltage converter	University of Niš - Faculty of Electronic Engineering
2	Art-boneFIX	Fixture for fabrication of custom made artificial bone grafts at dental CAD/CAM systems	University of Novi Sad - Faculty of Technical Sciences
3	Combined Biomass Gasifier	Development of a combined biomass gasifier for the use in combined heat and power systems	University of Kragujevac - Faculty of Mechanical and Civil Engineering in Kraljevo
4	MedIn	Device for ultrasound washing and disin-fection of medical instruments and vessels	University of Niš Faculty of Electronic Engineering
5	FOS2D	Robust low-cost fiber-optic 2D deflection sensor	University of Novi Sad - Faculty of Technical Sciences
6	Goldfinger	Keystone Distortion Free Fingerprint Optical Scanner	Technical College of Applied Sciences in Zrenjanin
7	HEISPS	Highly Efficient Information System for Parking Support	State University of Novi Pazar
8	HPC	Heat Pump Control	University of Kragujevac - Faculty of Mechanical and Civil Engineering in Kraljevo
9	SensORing	Molecular sensor for malignancy screening	University of Belgrade - Institute of Molecular Genetics and Genetic Engineering
10	TorqSens	Torque Sensor based on Magneto-mechanical Effect in Commercial Steel	University of Kragujevac, Faculty of Technical Sciences

The realization of PoC projects started in June 2018 through the implementation of two study visits to the University of Maribor and Instituto Superior Technico in Lisbon, where four research teams participated. Development and validation of prototypes for six PoC projects is ongoing, and for two PoC projects IP evaluation and search of patent bases are underway. Support to the development of the Commercialization Strategy will be given to research teams for whose projects and technologies have the potential for commercial exploitation and commercialization.

As foreseen by the Operational Manual, the research teams whose PoC projects are approved for support and partial financing within the IF4TM project are required to submit bi-monthly Progress reports to organizing partner institution, showing the status of the project implementation and the action plan for the next two-month period of implementation of the project. In this way, project monitoring and proactive support for their successful implementation is enabled.

At the end of the pilot phase and lessons learned on the pilot implementation of the PoC program in Serbia, an upgraded version of the Operational Manual for the PoC Program will be proposed by IF4TM Consortium in order to sustain it in the coming years as a national program financed by the responsible Ministry. The Operational Guide also allows universities to launch their own Proof of Concept Fund and to implement the PoC program for their researchers, thus enhancing innovative and research capacities and cooperation with the industry.

6. CONCLUSION

Proof of Concept programs and their financing are being introduced in recent years in various modalities, depending on whether they are implemented by states as national funding programs and support for the development of technologies and innovations, or implemented by universities from their own resources to support their researchers and innovative processes internally. Practice has shown that PoC program implemented by university have a better impact because it encourages the development of an entrepreneurial university as socially responsible organisation that helps the development of a knowledge-based economy and society. In addition, the return on investment is evident in shorter period

as validated technologies are easier to commercialize with mutual benefits for researchers and university.

There are numerous support activities offered in the PoC programs in the world, but several of them are most represented: Technical feasibility studies, Prototyping, Specialist testing and / or demonstration testing, Market research, Market research and competition analysis, Intellectual property protection, Intellectual property position assessment, Investigation of production and assembly options.

The Impact of PoC program can be quantitatively and qualitatively measured by positioning technology and its development status using industry-recognized Technology Readiness Level (TRLs) or Manufacturing Readiness Level (MRLs), before and after the PoC support.

The paper presents the results of the development of PoC program in Serbia within the IF4TM project, the basic elements of the Operational Manual for its implementation, as well as some results in the ongoing pilot implementation. The goal is to improve the PoC program after the pilot phase and as such realize at the national level, financed by the ministry, or by research-driven universities in Serbia, which recognize the importance of innovation and strengthening the third mission of the university.

REFERENCE LITERATURE

[1] European Commission Decision C (2014)4995 of 22 July 2014, HORIZON 2020 – WORK PROGRAMME 2014-2015, General Annexes, G. Technology readiness levels (TRL)

[2] Institutional framework for development of the third mission of universities in Serbia, 561655-EPP-1-2015-1-RS-EPPKA2-CBHE-SP - ERASMUS+ CBHE, www.if4tm.kg.ac.rs

[3] Operational manual for Proof of Concept Programme, D3.5, IF4TM Consortium, 2017, http://www.if4tm.kg.ac.rs/pub/download/15341689132854_D3.5.pdf

[4] Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016 – 2020, Belgrade, 2016

[5] Guidelines for the development of technology transfer and innovations dimension of the university third mission, IF4TM Consortium, 2017.

[6] E.Eggington, R.Osborn, Review of UK proof of concept support, Innovate UK, the UK's innovation agency, 2015.

[7] Samantha R. Bradley Christopher S. HayterAlbert N. Link, Proof of Concept Centers in the United States: an exploratory look, The Journal of Technology Transfer, 2013, Vol. 38, Issue 4, pp 349–381.

[8] Baydali Sergey A., Budnickiy Alexandr D., Terehov Sergey A., Proof of Concept Center — A Promising Tool for Innovative Development at Entrepreneurial Universities, Procedia - Social and Behavioral Sciences 166 (2015) 240 – 245.

[9] Renate Krelle, How to set up a proof of concept fund: The dos and don'ts, Technology Transfer Tactics, September 2012.

[10] European Commission C(2018) 5200, ERC Work Programme 2019, http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/erc/h2020-wp19-erc_en.pdf

ANALYSIS OF POTENTIAL ENTREPRENEURIAL CHARACTERISTICS OF YOUNG PEOPLE

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Abstract: *The aim of this paper is to present the importance of entrepreneurship for the economy of any country, to show the most important entrepreneurial characteristics, and then, based on the conducted research, to present the results revealing the degree of presence of the observed characteristics in young people. Creativity, self-confidence, and stress were analyzed through the results of the research, after which the measures were listed which could support the development of these features among young potential entrepreneurs, as it is the group of respondents that could potentially be a part of the development of Serbian economy.*

KEY WORDS: ENTREPRENEURSHIP, ENTREPRENEURIAL CHARACTERISTICS, ENTREPRENEURSHIP OF YOUNG PEOPLE, ENTREPRENEURIAL VENTURE, SELF-CONFIDENCE, CREATIVITY, STRESS, INNOVATION

JEL CLASSIFICATION: I2 Education and Research Institutions.

1. INTRODUCTION

In the 15th and 16th centuries economy lacked any autonomy in relation to other spheres of social life. The medieval world was static, and bloody political and religious wars were neither conditioned by the economic logic, nor by the logic of capital flows, but were caused by primitive needs for looting and plundering, as well as specific religious motives, which made various religious groups involved in conflicts and open confrontations. In the Middle Ages, entrepreneurship in today's sense played no role in gaining political and economic power (Carter, Jones, Dylan, et al. 2006).

Changes are at the core of the entrepreneurial process, and the means for realizing the changes are certainly innovations. It is supposed that an entrepreneur has to be creative in order to succeed in dealing with increasing changes adequately, through innovations as the basic instrument. Innovations are the result of creativity that provides perspective to different business opportunities. Entrepreneurial orientation and innovativeness are not important only for the emergence of new business ventures, which result in the creation of new enterprises, but also for existing enterprises. Therefore, an important attribute of successful internal or corporate entrepreneurship is certainly innovation, or creativity, as the starting point (Đuričin, Janošević, Kaličanin, et al. 2013).

We live in a highly dynamic environment that poses significant challenges for all business subjects. Organizations are emerging, making changes and disappearing from the market scene in a much more dynamic way than it was the case a few years ago. Entrepreneurs are under constant pressure to introduce changes, while increasingly confronting the competitors. They are constantly facing changes and challenges coming from the environment. In this context, entrepreneurship is more and more seen as a very important lever for restructuring economy, its creative and most dynamic developmental resource, and entrepreneurs are seen as initiators and bearers of innovative change (OECD Fostering Entrepreneurship, et al. 1998).

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In many discussions entrepreneurship is treated as something very mysterious, as a talent, inspiration, ingenuity and an artistic form. Very often, we talk about *a great and brilliant personality* with innate affinities and abilities for entrepreneurial behavior. Entrepreneurs are people who can present a particular idea or concept interestingly and provocatively, responding instinctively to the given opportunity, with the ability to understand the moment and problem.

In modern approaches to entrepreneurship the most creative elements of entrepreneurial behavior are put into the foreground, and therefore entrepreneurship is treated as a very rare and therefore very expensive resource, difficult to copy and without a real substitute in the process of creating a stable and sustainable competitive advantage in the market. Entrepreneurs are a managerial subset, the most creative subset, which has the ability to recognize business opportunities, which hovers in the chaos of the market, where many see something completely useless and negligible (Brigde, O Neill, Cromie, et al. 2009). Entrepreneurship is a business philosophy oriented to future which is full of business challenges and business opportunities, and it is precisely the business challenges and opportunities which are the basis and key to technical and technological, economic and social growth and development.

Schumpeter argues that the basic task of an entrepreneur is creative destruction, and the core category of entrepreneurship is innovation in the broadest sense. Entrepreneurs constantly challenge the *status quo*, seek changes and use them as potential business opportunities. Changes embodied in specific innovations do not have to be material in nature. As Peter Drucker has shown, innovations can be both of economic and social character. He believes that innovation is a specific tool of entrepreneurs, a means by which they use changes as opportunities to perform various production or service activities. It can be presented as a scientific discipline, that can be learned and that can be practiced. Entrepreneurs need to explore, in a meaningful way, possible sources of innovation, as well as changes and their symptoms that indicate opportunities and realization of successful innovations (Drucker, et al. 1996).

Thus, as a rule of thumb, entrepreneurs introduce innovations. They are a specific tool of entrepreneurship. Innovation is an action that provides resources with new capacities to create wealth. In fact, innovation is the creator of resources. Resource is actually a non-existing thing until a person finds the use value of something in nature and endows it with economic value.

Instead of waiting for the "kiss of the muse" which would grant them a clean idea, successful entrepreneurs take actions. They are in fact not looking for great innovations, innovations that will revolutionize economy, create businesses worth billions of dollars, or those that will make someone rich overnight. Entrepreneurs who start from the idea that they need to accomplish something great and are in a hurry to realize that can be seen as doomed to failure. They are almost fatefully condemned to do the wrong thing. One innovation, which at first glance can be very expensive, can ultimately prove to be nothing more than technical improvement. On the other hand, innovations with modest intellectual pretensions can turn into gigantic, highly profitable economic activities.

2. ENTREPRENEURIAL CHARACTERISTICS

As noted in the introduction, an entrepreneur is a person who expresses creativity in all phases of business. He/she is innovative and believes that every challenge carries a potential chance for success. The entrepreneur is responsible and capable of making decisions. He/she is brave enough to take risks and able to manage the risks. He/she believes in his/her ideas and his/her qualities. He/she is persistent and patient because he/she knows that success does not come overnight. He/she is aware of the importance of being informed and always looks for a chance to achieve success.

An entrepreneur should possess a high level of self-confidence, be sociable and have excellent communication skills. A successful entrepreneur is also distinguished by organizational skills. Good entrepreneurs are self-critical; they recognize their own faults and organize their work in a way that people from the environment will compensate their deficiencies using their abilities. Self-realization, self-confidence, autonomy, risk acceptance, creativity, innovation, personal initiative, the ability to integrate resources, and managerial skills are all that can be seen as essential characteristics of an entrepreneur's personality (Pokrajac, Tomic, et al. 2006).

An entrepreneur is a person with particular abilities, either innate or learned. In addition to the necessary knowledge and determination, it can be said that entrepreneurs are also characterized by internal restlessness, curiosity and the need to realize their own idea, where optimism is very important, that is, the belief of entrepreneurs in the success of their ideas, without fearing the risk of failure. Entrepreneurs are doing this because of a justified desire to achieve material rewards, or profit, but also to achieve other goals, such as self-expression, social reputation, power and domination. Accepting the claim that there is a certain set of characteristics that distinguishes successful entrepreneurs would mean that the supply of potential entrepreneurs in any society is limited, since there is a definite number of individuals who possess the innate characteristics necessary to become a successful entrepreneur. Furthermore, such a conclusion has its implications for economic policy, because this raises the question of effectiveness of measures of economic policy aimed at encouraging entrepreneurship. A realistic approach to this question would recognize the undoubtedly great importance of the entrepreneurs' personal characteristics for their success, but would not exclude the influence of measures of economic policy that create an incentive business environment for the establishment of companies and the growth and development of existing enterprises, which certainly contribute to this success. Given that entrepreneurs are coming from different social strata, they are of different education, different family background, and have different work experience and the like, one cannot talk about an appropriate or typical entrepreneur profile. Nevertheless, most researchers who believe that entrepreneurs pose a certain set of traits agree that successful entrepreneurs have certain common features that distinguish them from other people. These characteristics usually include willingness to accept calculated risks, emphasized need for success, desire to control their lives and destiny, creativity, self-confidence and tolerance for failure that can be viewed through the dimension of stress.

Creativity allows entrepreneurs to identify a market gap, as well as the way to fill it. For entrepreneurs who are creative it is said that they are sensitive to the problem, defects, knowledge gaps, missing elements, disharmony, and are capable of identifying difficulties, looking for solutions, anticipating or forming hypotheses about difficulties, testing them and finally communicating the results (Aardt, Bezuidenhout, et al. 2002). The success of entrepreneurs often depends on their ability to think outside the box and to arrive to a certain solution in a creative way. Creativity is certainly the most important dimension for determining innovativeness, where innovativeness refers to the ability to introduce novelties that initiate and enable the above mentioned changes. Innovations introduced by entrepreneurs relate to new products, technological processes, raw materials or opening new markets. Innovation is the main source of high profits. The source of the business idea is very important, but the role of creative thinking is vital in developing, elaborating and translating an idea into action, and then in all stages of its commercial life. Therefore, innovation should be permanent. Entrepreneurs with the ability to innovate, i.e. the initiators of creative destruction are very important catalysts of economic development.

Self-confidence is often highlighted as an outstanding feature of successful entrepreneurs. This feature is expressed as a belief that entrepreneurs have the ability to motivate other people, mobilize resources, initiate and implement changes, and the like. Similar to other characteristics, self-confidence is a feature of successful and brave people, regardless of the area in which they operate. Studies confirm that there is a link between the sense of self-confidence and the results achieved by some entrepreneurs.

In the initial stage of the entrepreneurial venture, the person who starts the business is, as a rule, also the founder, owner, planner, organizer, financier, manager, or commercialist, accountant, controller and the like. The entrepreneur often works alone or mainly with a small number of direct team associates. This requires a lot of renunciation, time, and strength and inevitably causes stress, which is a condition of long-lasting tension, which results in physiological, psychosomatic reactions, resulting in deterioration of the state of health, sense of frustration, mental and physical exhaustion. Stress occurs when a specific situation requires an individual or an entrepreneur to do something that is beyond his usual way of customization or routine procedures. Then usually a number of symptoms occur – rapid heart rate, high blood pressure, physical tension, depression, lack of appetite or excessive food intake, and the like. The most common sources of stress are loneliness, absorption by work, interpersonal relationships, as well as result-orientation. Stress control is crucial to a successful career. Some studies have shown that in addition to self-discipline, ability and systematic work, success also requires

controlling negative feelings, such as fear and tension. Psychologists argue that it would be desirable for potential entrepreneurs to take into account their ability to control stress as well.

The above mentioned common characteristics of entrepreneurs are the result of the approach by which entrepreneurs have some common features that distinguish them from other people. This approach is based on the assumption that entrepreneurs are a homogeneous group. This assumption is not always realistic, since it should be taken into account that entrepreneurs differ from each other in terms of their motives for starting a job, tendency to develop their work, perceiving the work, and the like.

3. ENTREPRENEURSHIP OF YOUNG PEOPLE IN SERBIA

Like their peers around the world, young people in Serbia face a number of challenges when entering the labor market. Thus, possessing innate or acquired qualities and skills that are of great importance for starting an entrepreneurial venture is not crucial for their survival on the market.

Starting a private business is one of the solutions for those who have the affiliation towards entrepreneurship. In addition to the lack of experience and risk inherent to entrepreneurship, young people are largely deterred by the business environment that does not provide them with great support. The fact is that young people lack experience, capital and proven earlier success, which are key elements for starting and conducting a profitable business. All this makes young people vulnerable and less able to adapt. The key missing elements are alternative or non-financial mechanisms, which would increase the chances of being funded from existing sources. These mechanisms could include the provision of mentorship and support for young entrepreneurs, thus alleviating the risky nature of newly-emerging businesses. While securing a start-up capital is one of the biggest obstacles for young people when starting a business, once when the business is launched, traits, skills and experience are essential for success. Young people in Serbia lack basic knowledge and practical skills that are necessary for entrepreneurship. The reason for this is partly in the lack of experience resulting from their age, and partly that the formal education system does not prepare them for entrepreneurship in general.

The government and business environment are unable to keep pace with highly educated young people who are the subject of research that will be presented in the following part of the paper. While highly educated young people are making a run at their goals, public institutions and certain legal solutions continually raise obstacles that slow them down. Under the term "highly educated young people" we mean innovative, smart, young people, whose business models show rapid growth and are globally oriented. Their activities may relate to a product or service, whether it is an IT or an innovative manufacturing company. In innovative industries where global orientation, high quality and flexibility are the main determinants of competitive advantage, a rigid and outdated business environment seriously impedes the growth and development of such enterprises. A large number of rigid laws has been introduced in the past in order to guarantee stability and security of legal and monetary system, but this system is not adapted to the modern environment. Fortunately, highly educated young people almost never give up their entrepreneurial intentions and thrive, despite the obstacles created by the system (Bobić, et al. 2017).

4. RESEARCH

The research was carried out at the Faculty of Technical Sciences, University of Novi Sad. It was conducted in writing; the participants were required to fill in three questionnaires (Penezić, et al. 2003) – a questionnaire that provides results regarding their creativity, a questionnaire that provides results regarding the stress present in their "business" environment, and a questionnaire that provides results regarding their self-confidence.

The research involved 65 students attending the third year of undergraduate academic studies.

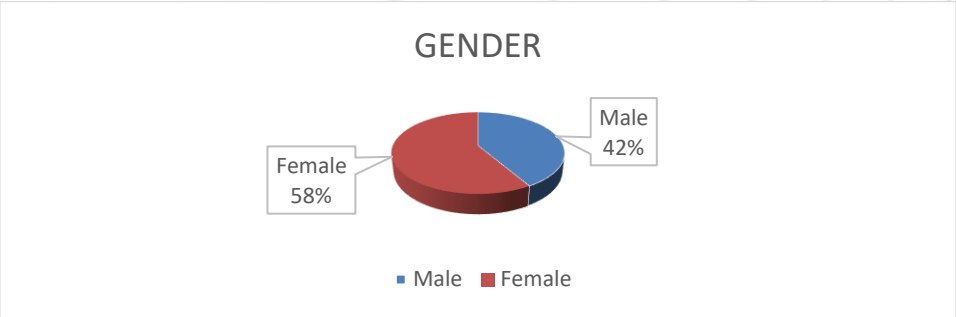

Figure 1: Chart showing the gender distribution of respondents

The respondent population consisted of 42% male and 58% female examinees.

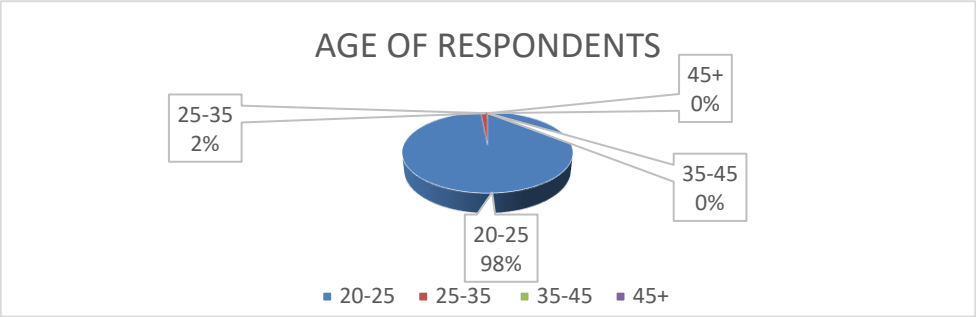

Figure 2: Chart showing the age distribution of respondents

The age distribution was as follows: 98% of respondents were 20-25 years old, 2% were 25-30 years old, while there were no respondents aged 35-45, or over 45.

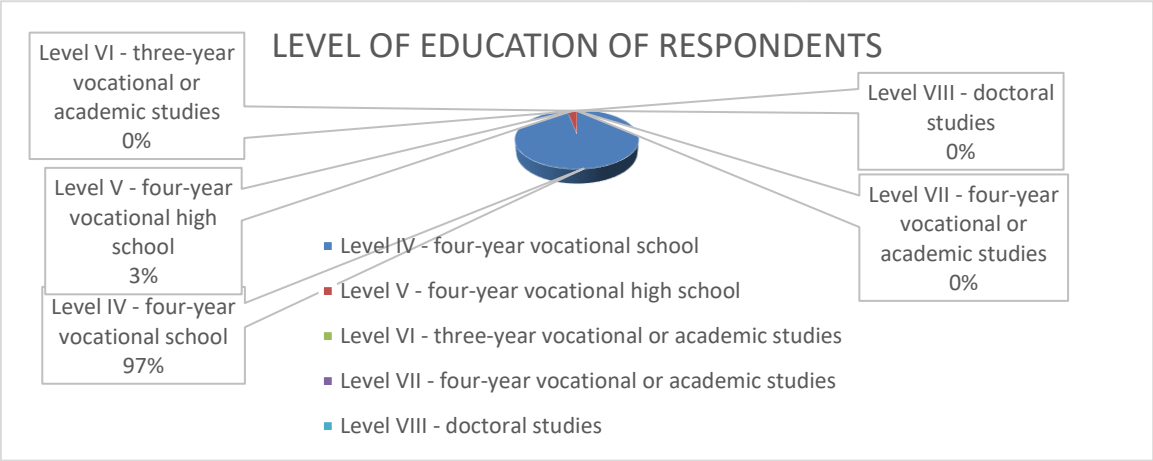

Figure 3: Chart showing the level of education of respondents

Given that the survey was conducted at the Faculty of Technical Sciences, where the respondents are students of the third year of academic studies, they are supposed to have completed the level IV secondary school.

The IV level, or the four-year vocational high school, was completed by 97% of respondents. 3% of respondents have completed the V level, i.e. the four-year vocational high school. None of the respondents have completed the VI level (three-year vocational high or academic studies), the VII level (four-year vocational high or academic studies) and the VIII level (doctoral studies).

4.1. Creativity

The results of the questionnaire showing the level of creativity among students will be analyzed first.

The questionnaire was rated in such a way that respondents were answering questions with "yes" and "no", where the answer "yes" counted as 1 point, while the answer "no" counted as 0 points. Then the number of points was summed up and based on these results, the following results were obtained for the 65 respondents:

0 - 5 points = 3 respondents
6 - 10 points = 24 respondents
11 - 15 points = 34 respondents
16 - 20 points = 4 respondents

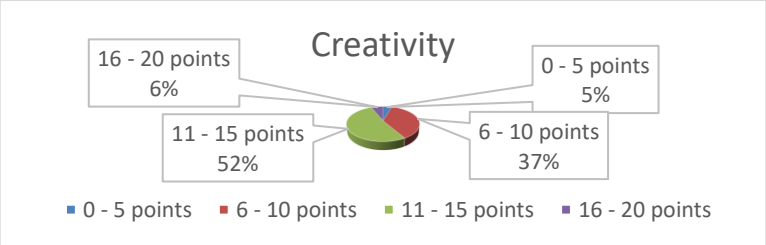

Figure 1: Chart showing the level of creativity among the respondents

0-5 points on the questionnaire were achieved by 5% of respondents.

Considering the fact that this category of respondents will be in the labor market in a few years, if they decide to start their own business, this will definitely be very good for their competition, but not for them. For this category of respondents, based on the questionnaire, it can be concluded that their level of creativity is extremely low. This category includes people who are unlikely to make innovations that will attract potential customers or users and companies will probably be short lived under their management.

6 - 10 points on the questionnaire were achieved by 37% of respondents.

This category of respondents views their future work environment as very boring. Respondents in this category neither strive to be creative, nor encourage creativity in themselves and in people in their surroundings. What is very important for this category is that they should be directed to think less about potential risks, because if they decide to embark on an entrepreneurial venture in future, their willingness to take risks will be of great importance, as entrepreneurs should quickly respond to the changes in their environment, and it is completely uncertain what the outcome of these changes will be. Also, it is very important for them to develop a positive attitude towards the job. It is recommended that they develop communication skills, which would enable them in future to be more effective in negotiating with their potential associates and thus raise creativity to a higher level because introducing more creativity in work will increase the effects and positively change the image of their company.

11 - 15 points on the questionnaire were achieved by 52% of respondents.

In this category of respondents, the results show that these respondents are not completely uncreative, unlike the previous category, but what is similar to the previous category is the fact that they are too careful to embark on ideas that seem risky, which certainly cannot positively influence the launch of an entrepreneurial venture.

16-20 points on the questionnaire were achieved by 6% of respondents.

For this category of respondents, it can be concluded that they are very creative people, who are constantly looking for new ideas and new approaches, and that in the future they will certainly encourage people in their surroundings to face challenges, but they are also ready to help them if they encounter difficulties. They regard their potential work environment as a very exciting place and this category of respondents actually represents potential entrepreneurs.

4.2. Stress

In this questionnaire, respondents answered questions with "yes" and "no", where the answer "yes" counted as 1 point, while the answer "no" counted as 0 points. Then the number of points was summed up and the following results were obtained.

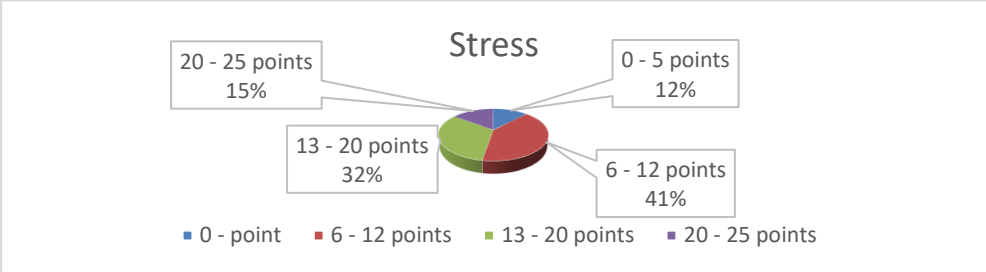

Figure 2: Chart showing the level of stress present in respondents

20 - 25 points were achieved by 15% of respondents.

According to the survey conducted and on the basis of the questionnaire, for this category of respondents it can be concluded that their health is in great danger because they are extremely prone and exposed to stress.

13 - 20 points were achieved by 32% of respondents.

When it comes to this category of respondents, it is quite safe to conclude that they are under a lot of pressure and stress and are advised to seriously analyze themselves and change their attitude towards future work. They are also recommended to talk about their problems with people close to them because it is considered that the level of stress in individuals can be reduced in this way.

6 - 12 points were achieved by 41% of respondents.

For this category of respondents it can be said that they are prone to stressful situations on average, which can be a cause for concern, but it should certainly be one of their primary topics for reflection.

20 - 25 points were achieved by 15% of respondents.

Based on the questionnaire, this group is considered stress-resistant. Like all other individuals, people in this group also have their bad days, but they have learned to cope with the storms that life occasionally brings. As long as they look forward, as long as they view their situations optimistically, this category of respondents will be happy and satisfied both with their chosen work and private life.

4.3. Self-confidence

Unlike the previous two questionnaires that were analyzed, the results in this questionnaire were obtained using the Likert scale, which was interpreted as follows:

0 – strongly disagree

1 – in most cases disagree

2 – neither agree nor disagree
3 – in most cases agree
4 – strongly agree

After the respondents answered the questions by writing one number from 0 to 4 depending on their answers, the values were calculated, and the results of each questionnaire were obtained.

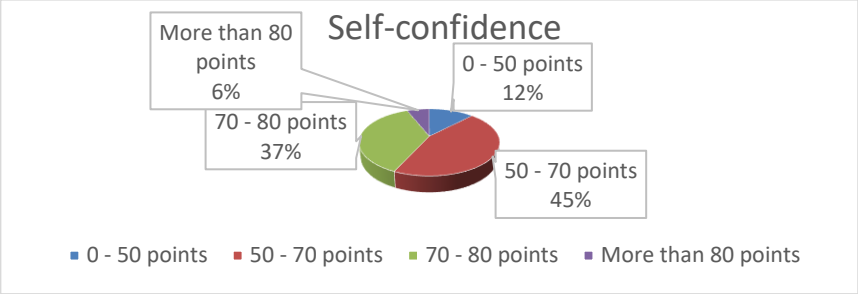

Figure 3: Chart showing the level of self-confidence among the respondents

0 - 50 points were achieved by 12% of respondents.

Based on the questionnaire, this group of respondents is advised to seek urgent intervention. This group consists of very pessimistic people; they perceive everything around them in an extremely dark way, including their environment and potential workplace. Every situation in which they find themselves they regard from the worst perspective, perceiving business opportunities as unimportant and meaningless. It is believed that the individuals from this group of respondents will not become successful entrepreneurs, as entrepreneurs, by their very nature, should be very optimistic and believe in their ideas.

50 - 70 points were achieved by 45% of respondents.

For this group of respondents it can be concluded that they have a very serious problem. They simply observe their environment as a place where any bad thing that can happen will surely happen to them.

70 - 80 points were achieved by 37% of respondents.

This group of subjects has a problem with self-confidence, but certainly cannot be characterized as a group of pessimists. When people have a problem with self-confidence, they are advised to work on their public appearance, because this is the activity through which they will have to work on their verbal and non-verbal communication, and it will definitely increase their confidence which helps them consider their situation in a rather optimistic way.

More than 80 points were achieved by 6% of respondents.

This category of respondents consists of future, potentially very successful entrepreneurs. In the questionnaire this group showed an extremely high level of optimism. Entrepreneurs are optimistic by their nature. When they start their entrepreneurial venture, they expect to succeed in it. However, optimism by itself is certainly not sufficient. If a potential entrepreneur does nothing else but just sits idle, optimistically expecting success, the only thing that is sure is that he/she will fail. Entrepreneurs have to set a goal, believe that they will succeed and do everything to make it happen. The main characteristic of optimistic people, which is of great importance for entrepreneurs, is to set goals that they want to achieve and direct their thoughts to what they are currently doing.

4.4. Discussion of results

Creativity

Analyzing the results from the questionnaire on creativity, it can be concluded that as many as 89% of respondents view their future work environment as boring, or even if not completely boring, they do not show predispositions for risk taking, although risk taking is very important for entrepreneurs. Based on these results, it can be concluded that the number of respondents willing to undertake an entrepreneurial venture in the future is very small, and this will definitely have a very bad influence on the development of the country's economy in future, since young people, particularly those oriented towards entrepreneurship, are the main promoters of economy.

Only 6% of respondents belong to the category of highly creative individuals. They are young people who are willing to overcome difficulties that will be awaiting them in the path of their potential entrepreneurial venture. It can be said that this category of respondents is actually real "treasure" for the economy of Serbia. It is precisely because of the creativity they possess, that their education in entrepreneurship is very important. The education curriculum should definitely provide them with at least the basic knowledge on entrepreneurship, but certainly also on their further development and improvement of traits and skills they possess. Apart from the fact that these young people could be further directed towards launching entrepreneurial ventures, it is likely that this category of respondents may actually achieve that, provided that they realize the unlimited benefits this field can offer them.

Stress

Results of the stress-related survey show that as many as 47% of participants are under a very high level of stress, and a certain percentage of respondents are at high risk and it is even recommended that they seek professional help. When we look at the labor market that they should face in future, these results are actually not surprising.

Considering that the research is based on the analysis of the most important characteristics for a potential launch of an entrepreneurial business in the future, the presence of stress among young people is quite justified. Starting from the fact that there is no specific institutional or legislative problem that relates exclusively to young people, which would not affect others, a certain set of conditions presents a significantly greater obstacle for young people. Although young people have much more favorable educational preconditions than adults and have a higher degree of interest in entrepreneurial activity, the proportion of those among the young who actually start business is smaller than that among adults (Schott, et al. 2015). A recent Global Entrepreneurship Monitor (GEM) study on youth entrepreneurship has shown that “Young people, as a group, exhibit a significantly higher level of entrepreneurial intention than adults (1.6 times higher). In the category of adult people, this intention is translated into a relatively high level of actual entrepreneurial activity, while young people show significant discrepancy between entrepreneurial intention and entrepreneurial activity. In addition, certain obstacles are higher than the ones the adults face”. This confirms the assumption that young people are confronted with bigger obstacles that impede them in realizing their intention to start business. The Government’s support to youth entrepreneurship is still patchy − they do not understand the specific needs of young people and do not create customized measures to support young entrepreneurs in particular (Marjanović, et al. 2016). Solutions offered by strategies that seek to address the issue of access to funds and knowledge in terms of youth entrepreneurship (the above mentioned Strategy of supporting the development of SME, entrepreneurship and competitiveness for the period from 2015 to 2020 and the National Youth Strategy for the period from 2015 to 2025) are often only partial and not applicable throughout Serbia. In addition, a number of projects aimed at supporting the entrepreneurship of young people through various funds and educational programs are not properly coordinated.

Self-confidence

Regarding the results of research in self-confidence, it is found that examinees can be much better in terms of potential launch of entrepreneurial venture. As much as 57% of respondents have shown that they have serious self-confidence problems. Being self-confident when it comes to future ideas is crucial for entrepreneurs. The education system may certainly have an important role in acquiring and building confidence in young people, potential entrepreneurs. By developing their communication skills, both

verbal and non-verbal, and their public appearance, young people can build confidence to a certain extent. This segment is very important because entrepreneurs are optimistic in their nature, and they believe that they will succeed in starting businesses. Young people should be motivated to set goals for themselves, they should believe that they will reach them and do everything they can to make it happen, and be focused entirely on the core of their future business.

5. CONCLUSION

The aim of this paper was to show the degree to which the most important entrepreneurial characteristics of young people have been developed and the extent to which they can potentially influence the development of Serbian economy.

Certainly, there is a part of the analyzed category of respondents that shows tendency towards undertaking an entrepreneurial venture in the future, and it is precisely this category in which entrepreneurial qualities should be improved, primarily through education, followed by the government measures with adequate support programs.

6. REFERENCES

Aardt, V., Bezuidenhout, S. (2002), "*Entrepreneurship and New Management*", 2nd ed., Oxford Univercity, UK

Bobić, D. (2017), "*Preduzetništvo mladih u Srbiji – Mapiranje prepreka za preduzetništvo mladih*", CEVES – Centar za visoko ekonomske studije, Beograd, strana 30

Brigde, S., O Neill, K., Cromies, S. (2009), "*Understanding eterprice, enterpreneurship and small business*", MacMillan Business, Londom, page 112

Carter, S., Jones, E., Dylan, E. (2006), "*Enterprise and Small Business – Principles, Practice and Policy*" Pearson Education Limited, Harlow, UK, page 267

Drucker, P. (1996), "*Inovacije i preduzetništvo*", Grmeč, Beograd, strana 35

Đuričin, D., Janošević, S., Kaličanin, Đ. (2013), "*Menadžment strategija*" (osmo, prerađeno i dopunjeno izdanje), Ekonomski fakultet u Beogradu, Beograd, strana 226

Marjanović, D. (2016), *„The transition of young women and men in the labor market od the Republic of Serbia"*, International Labour Organization inGeneva, Work4Young publication series, No. 36

Navedeno prema: OECD Fosterin enterpreneurship, Paris, (1998), European Commision: "*Improving and simplifying the business enviroment for business start-up"*, EU: Action plan for promote entrepreneurship and competitiveness

Penezić, N. (2003), *„Kako postati preduzetnik"*, drugo dopunjeno izdanje, Republička agencija za razvoj malih i srednjih preduzeća i preduzetništva, Beograd, strana 105

Pokrajac, S., Tomić, D. (2006), Naučno-stručni časopis "*Preduzetnici kao ključni činioci stvaranja preduzetničkog duha*", Novi Sad

Schøtt, T., Kew, P., Chereghi, M., (2015), "*Future potential*", GEM perspective on youth entrepreneurship

DEVELOPMENT OF CREATIVE CAPACITY OF STUDENTS THROUGH PRACTICAL WORK

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Abstract: *Engineering is a creative profession, so one of the most important qualities which should be developed in future engineers is creative and innovative thinking. The aim of the present paper is to show the results of mechanical engineering students' creative work at the Technical College in Zrenjanin. It includes technical solutions realized during practical sessions within two courses: Automation of Processes and Mechatronics. They were also presented in student's term papers or graduation papers. The models of technical solutions presented in this paper are all exhibited in the Automation Laboratory at the Technical College in Zrenjanin and are used for demonstrations.*

KEY WORDS: CREATIVE AND INNOVATIVE THINKING, STUDENTS, TECHNICAL SOLUTIONS.

JEL CLASSIFICATION: O Economic Development, Innovation, Technological Change, and Growth

1. INTRODUCTION

Creativity is defined by the experts as ability to create products which are new, original and unexpected, but at the same time appropriate so that they could adequately respond to demands and restrictions of a given task (Kaufman & Baer, 2004: 2). Beside characteristics of a person, process and product, when considering creativity it is also important to take into account the effects of the environment (Mooney, 1963) which may underpin or hinder creative potential of individuals. The environment plays an important role in evaluation of a creative product as well (Csikzentmihalyi, 1999; Feldman, 1999).

Enhancing creativity and innovation as well as entrepreneurship, at all levels of education and training is one of the Europe 2020 strategy aims which the European Union recommends to national education systems (Strategic framework for European cooperation in education and training „ET 2020", 2010).

Talented and creative pupils and students are one of the most important national resources, a potential that provides basis not only of economic progress, but the progress and development of the whole society as well. In order to support them, the society and the state should offer them appropriate conditions for their work and personal and professional development.

The first institutions responsible not only for the development of creativity of pupils and students, but also for recognizing the creative and innovative potential in them are schools and universities.

[1] Institution/Affiliation: Technical College of Applied Sciences in Zrenjanin

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2. RESOURCES OF THE TECHNICAL COLLEGE OF APPLIED SCIENCES IN ZRENJANIN AND THEIR ROLE IN STIMULATING STUDENTS' CREATIVITY

Having in mind the fact that engineering is a creative profession the Technical College of Applied Sciences in Zrenjanin has been working on creation of an environment which stimulates creative thinking. To achieve this goal a special attention has been given to creation of stimulating curricula and modern laboratories as work settings which involve equipment, student-teacher interaction and group work where students apply the theoretical knowledge in practical work on the one hand, while on the other hand teachers strive to use effective teaching methods and strategies to foster students' creative skills.

The contents of programs of study are regularly updated having in mind the aim of vocational studies where the stress is on practical knowledge. They provide the theoretical background and underpinning to the practical sessions. Since creativity is an essential component in engineering design, most courses are project based and provide different opportunities for students to develop their creativity. Students are assigned design projects to encourage them to explore their creative potential while working individually or in a group with other students during practical sessions where students solve different problems through individual or cooperative project-based learning using laboratory resources to put their ideas into practice. The results of their work are presented in term papers, projects and graduation papers.

Apart from attempts to create well-designed curriculum and program of study and well-equipped laboratories, the role of teachers as probably the most important condition required to provide favourable environment for creative work is changing. They should use their skills, build attitudes, show willingness and be aware of students' needs. Therefore, teachers are required to permanently update their knowledge not only about the contents of courses they teach, but their professional development must also include learning about different strategies that can be used in the classroom while teaching and assessing students' work. The teaching methods are student-centred with flexible lesson structure and classroom interaction and the role of teachers is to recognize, encourage, help and support the realization of students' ideas.

Keeping in mind that the Technical College of Applied Sciences in Zrenjanin is a college of vocational studies, a special attention is given to finding solutions of real-life problem, which is in line with the fact that a certain number of students are employed or self-employed and they face different situations and problems in everyday work.

This fact offers the teachers an opportunity to assist the students in their attempts to find solutions to those problems. In this regards, the students can use either the college laboratories where they have available the equipment as well as the professional assistance, or they can show their skills in companies where they have to complete mandatory internship and where their work is monitored, instructed and assisted by teachers-mentors. This also gives the students opportunity to apply the theoretical knowledge in a specific production environment.

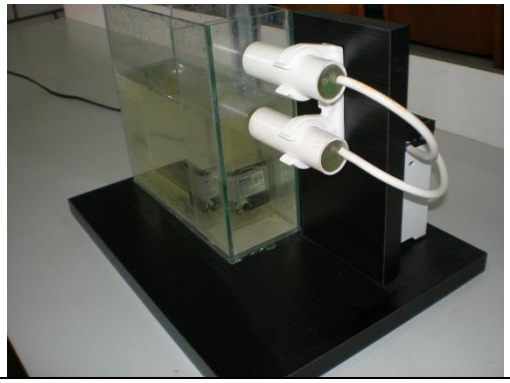
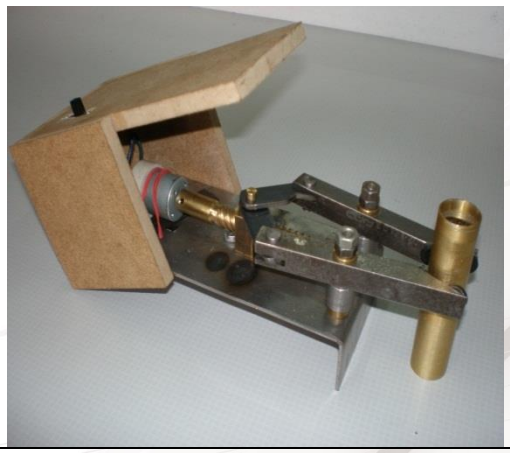
In order to keep their professional knowledge and development continuing, the college regularly organizes visits to professional fairs and exhibitions where the results of students' practical solutions are so they become visible to wider public, which also gives the students opportunity to meet their possible future employers. These solutions are also shown at the college on important dates.

Moreover, there are different incentives offered through the signed agreements on cooperation with local and regional companies which, among other things, include involvement of students and their ideas in the manufacturing processes and their advances.

3. THE EXAMPLES OF REALIZED STUDENTS IDEAS

This part of the paper shows the table of selected students' ideas realized through individual work during practical sessions within two courses: Automation of Processes and Mechatronics. The shown models and descriptions of their development and operation were all presented either as term papers or graduation papers.

Table 1. Selection of realized students' ideas

	3.1 A system for automatic maintenance of liquid and temperature levels in a tank The picture shows a solution to the problem of automatic control of liquid and temperature levels in a tank. The tank contains two sensors which control the maximum and minimum liquid level. The sensor for temperature level control is fitted inside the tank. Electromagnetic valves for the fluid inflow and outflow as well as the electric heater for liquid heating are the actuators. The Whole process is automatically controlled by PLC with previously set parameters.
	3.2 Capacitive sensors and their use A student has designed and made two contactless capacitive sensors. They are installed on the outer side of the tank with the aim of controlling the maximum and minimum liquid level. Hydraulic pump switches on when the minimum level is reached and switches off when the set maximum level is reached. A finite-state machine, which is also a part of the student's project, controls the process.
	3.3 Grippers in industrial robotic manipulators and robots Design of grippers in industrial robotic manipulators and robots depends on required shape, dimensions and weight of a particular object. The present mechanical gripper consists of electric motor, screwed spindle, nut and grippers in the shape of double lever. The mechanism converts the circular motion of the electric motor into turning of the gripper fingers and grasping of an object.

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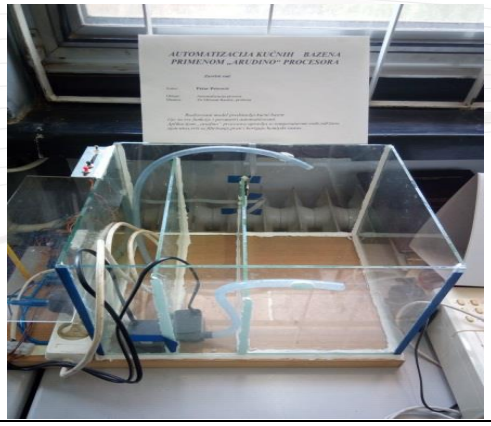
	3.4 Automated sorting of green and white bottles A conveyor belt which carries green and white bottles passes through a detection unit with a fitted sensor which detects the green bottles. The sensor signal starts a mechanism consisting of an electromagnet and a barrier installed on the conveyor belt. The barrier turns and the green bottles are removed from the conveyor belt. An automatic counter which counts the separated bottles is also installed.
	3.5 Testing the functionality of contactless sensors The present device offers a solution to testing functionality of contactless sensors in mass production. When activated, the signal lamp indicates the functionality of the sensor.
	3.6 Windscreen wipers with the rain sensors The designed sensor detects the presence of rain and the electric signal starts the electric motor which activates the wiper blades. An electronic timer controls the time interval of wipers operation.
	3.7 Parking sensors The shown model car is equipped with the sensors which alert drivers of obstacles while parking. The display shows the distance from the bumper to the obstacle in the range of 0.4 - 0.7 meters. If a distance is smaller than 0.4 m, an automatic audio alarm and a light signal are switched on.

	3.8 Automation of home pools The automation of all functions of home pools has been solved using Arduino processor. The applications of the processors may be used to control the water temperature, water level, water filtration and the chemical composition of the water.
	3.9 Car alarm and central locking The car protection system including alarm and central locking consists of components linked in a system and put into function.
	3.10 Roller shutters with remote control Window roller shutters and garage roll-up doors are simply activated using the remote control. The built-in electric motor and the mechanism for lifting and lowering are used to wrap the shutter curtain around the roller barrel. The electric motor is switched on and off using a remote control thus lifting and lowering the shutter curtain.

4 CONCLUSION

Creativity and innovations have been globally recognized as the main driving forces of technological and consequently economic development. The process of fostering creative and innovative thinking should begin in early childhood and continue throughout all stages of education. Higher education institutions play a particularly important role in this process since they prepare young people for their future carriers and because they are expected to give their contribution to development of the society.

Colleges of engineering have become aware of their crucial role in this process and have introduced changes in their work with the aim of preparing future engineers for challenges in a fast-changing technologies and markets.

Technical College of Applied Sciences in Zrenjanin has recognized its role and has defined the goals in its mission statement which include participating in local, regional and national technological development.

In order to achieve these goals it is necessary to create conditions such as professional development of teachers so they could select creative students, form creative teams, offer them high-quality professional knowledge on the one hand, and provide encouraging environment to boost students' creativity and foster their entrepreneurial spirit.

REFERENCE LITERATURE

Craft, A. (1998). "Educator Perspectives on Creativity: An English Study" *Journal of Creative Behaviour*, Vol. 32, No. 4, 244-257.

Csikszentmihalyi, M. (1999). "Implications of a Systems Perspective for the Study of Creativity" In R. Sternberg (Ed.), *Handbook of Creativity* (pp. 313-335). Cambridge: Cambridge University Press.

Mooney, R. L. (1963) "A Conceptual Model for Integrating four Approaches to the Identification of Creative Talent" In C. W. Taylor & F. Barron (Eds.), *Scientific Creativity* (pp. 331-340). New York: Wiley

Richards L.G. (1998) "STIMULATING CREATIVITY : teaching engineers to be innovators" FIE '98. 28th Annual Frontiers in Education Conference. Moving from 'Teacher-Centered' to 'Learner-Centered' Education. Conference Proceedings (Cat. No.98CH36214)Craft, A. (1998). "Educator Perspectives on Creativity: An English Study" *Journal of Creative Behaviour*, Vol. 32, No. 4, 244-257.

http:ec//ec.europa.eu/education *Strategic Framework for European Cooperation in Education and Training „ET 2020*" (2010). Retrieved April 21, 2010 from the World Wide Web [Accessed 01/11/18]

CROWDFUNDING FOR INNOVATION

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Abstract: *The paper describes crowdfunding as one of the mechanisms for financing development of innovations in Serbia. Different critical factors are analyzed and some recommendations for successful crowdfunding implementation are given.*

KEY WORDS: INNOVATIONS, FINANCING OF INNOVATIONS, CROWDFUNDING OF INNOVATIONS

JEL CLASSIFICATION: G24

1. INTRODUCTION

Different financial mechanisms are in use in the world to support the development of innovation, and their application is adapted to the stage of developing an innovation [2]. In this paper some guidelines for implementation of crowdfunding are given. Crowdfunding is a relatively new mechanism for financing innovative ideas and initial development of innovations, when on April 5, 2012, President Obama signed the law[3] that has encouraged the adoption of similar laws in other countries (Canada, Israel, ...) and can serve as a model for the adoption of a similar law in Serbia.

2. FINANCING OF INNOVATIONS

Financing of innovations is a very risky investment. Many startups try to develop an innovation and need financial support. Even if banks want to offer loans, for it (but it is not likely), it is difficult for entrepreneurs and innovators to accept it as the risk of failure is high. In this case, they cannot continue paying the installment and can bankrupt. Some government provide special innovation funds, such as in Serbia, giving grants to innovative companies, usually startups and SMEs. But, this cannot be the right mechanism for financing innovations. Innovations are marketable new or upgraded products, with some original, unique and creative features or solutions. Only markets can decide whether a product is good or not. If a product is supported by grants from public sources, it gets better positions in comparison with its competitors, and in to fair market competition. Grants are suitable for funding research, but not for financing of development of final, innovative products, planned to be launched on the market. They must be competitive, based on new and innovative product features. The "market survival" should no depend on any grant.

More suitable mechanisms for financing of development of innovations are:

- ***Angel investment:*** This is a dominant mechanism in first stage of development, when relatively low level financing is necessary for testing some new ideas i planning a innovative product.[4] "Angel investments are typically the earliest equity investments made in startup companies. Angel investors are almost always wealthy individuals and commonly band together in investor networks. Often these networks are based on regional, industry, or academic affiliation…. Sometimes angel investors fund startups before the company has significant number of employees, and before there is a completion of a proof of concept of the idea that they intend to commercialize. Angel investors are typically former entrepreneurs who have experienced success in their ventures, and wish to continue working with startups in a particular industry (or geographical region) even though they have exited the entrepreneurial ventures that made them wealthy."
- ***Investment of Venture Capital (VC) Funds:*** Venture capital funds are investment funds that manage the money of investors who seek private equity stakes in startup and small- to medium-sized

[1] Institution/Affiliation: Belgrade Metropolitan University/Rector
[2] Ferenčak at al. (2016)
[3] https://www.gpo.gov/fdsys/pkg/PLAW-112publ106/content-detail.html
[4] http://lexicon.ft.com/Term?term=angel-investment

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enterprises with strong growth potential. These investments are generally characterized as high-risk/high-return opportunities. In the past, venture capital investments were only accessible to professional venture capitalists, although now accredited investors have a greater ability to take part in venture capital investments[1]. Venture capital investments are considered either seed capital, early-stage capital or expansion-stage financing depending on the maturity of the business at the time of the investment. However, regardless of the investment stage, all venture capital funds operate in much the same way. From there, the venture capital fund seeks private equity investments that have the potential of generating positive returns for its investors. This normally means the fund's manager or managers review hundreds of business plans in search of potentially high-growth companies. The fund managers make investment decisions based on the prospectus and the expectations of the fund's investors. After an investment is made, the fund charges an annual management fee of around 2%, and some funds may not charge a fee. The management fees help pay for the salaries and expenses of the general partner. Sometimes, fees for large funds may only be charged on invested capital or decline after a certain number of years. Investors of a venture capital fund make returns when a portfolio company exits, either in an IPO or a merger and acquisition. If a profit is made off the exit, the fund also keeps a percentage of the profits -- typically around 20 percent -- in addition to the annual management fee. Though the expected return varies based on industry and risk profile, venture capital funds typically aim for a gross internal rate of return around 30 percent.

- ***Investment of Investment Founds:*** An investment fund is a supply of capital belonging to numerous investors used to collectively purchase securities while each investor retains ownership and control of his own shares[2] . An investment fund provides a broader selection of investment opportunities, greater management expertise and lower investment fees than investors might be able to obtain on their own. Types of investment funds include mutual funds, exchange-traded funds, money market funds and hedge funds. With investment funds, individual investors do not make decisions about how a fund's assets should be invested. They simply choose a fund based on its goals, risk, fees and other factors. A fund manager oversees the fund and decides which securities it should hold, in what quantities and when the securities should be bought and sold. An investment fund can be broad-based, such as an index fund that tracks the S&P 500, or it can be tightly focused, such as an ETF (Exchange-traded funds) that invests only in small technology stocks. The majority of investment fund assets belong to open-end mutual funds. These funds issue new shares as investors add money to the pool, and retire shares as investors redeem. These funds are typically priced just once at the end of the trading day. Closed-end funds trade more similarly to stocks than open-end funds. Closed-end funds are managed investment funds that issue a fixed number of shares, and trade on an exchange. While a net asset value (NAV) for the fund is calculated, the fund trades based on investor supply and demand. Therefore, a closed-end fund may trade at a premium or a discount to its NAV. Exchange-traded funds (ETFs) emerged as an alternative to mutual funds for traders who wanted more flexibility with their investment funds. Similar to closed-end funds, ETFs trade on exchanges, and are priced and available for trading throughout the business day.

These financial mechanisms may be implemented for financing of innovations in different stages of their life-cycles. As shown in Figure 1, angel investments, or, in facts, donations, are the most appropriate financing mechanism in early stages of development of potential innovations, when relatedly modest investments are necessary. When higher investments to innovative startups and companies are necessary (for development of prototype or first innovative products need to lounche on the market), then venture capital (VC) funds are providing necessary investments. When innovative company have success on the market with an innovative product, they need to invest to manufacturing pants, development of business and business networks. They need significant investments, and venture funds are needed, or even banks with loans. These investments are relatively high, but with low risk, a supposed with high-risk investments in initial development stages of an innovation, but with low investment needed.

As shown in Figure 1, in early stages of development of innovations, crowd funding may be a good alternative to angel investment of VC funds' investments. Figure 1 also shows investments needed

[1] https://www.investopedia.com/terms/v/vcfund.asp
[2] https://www.investopedia.com/terms/i/investment-fund.asp

for research, As opposed to innovation development, research in initial stages is highly depended on angel investments, or grants provided by different (usually) public funds.

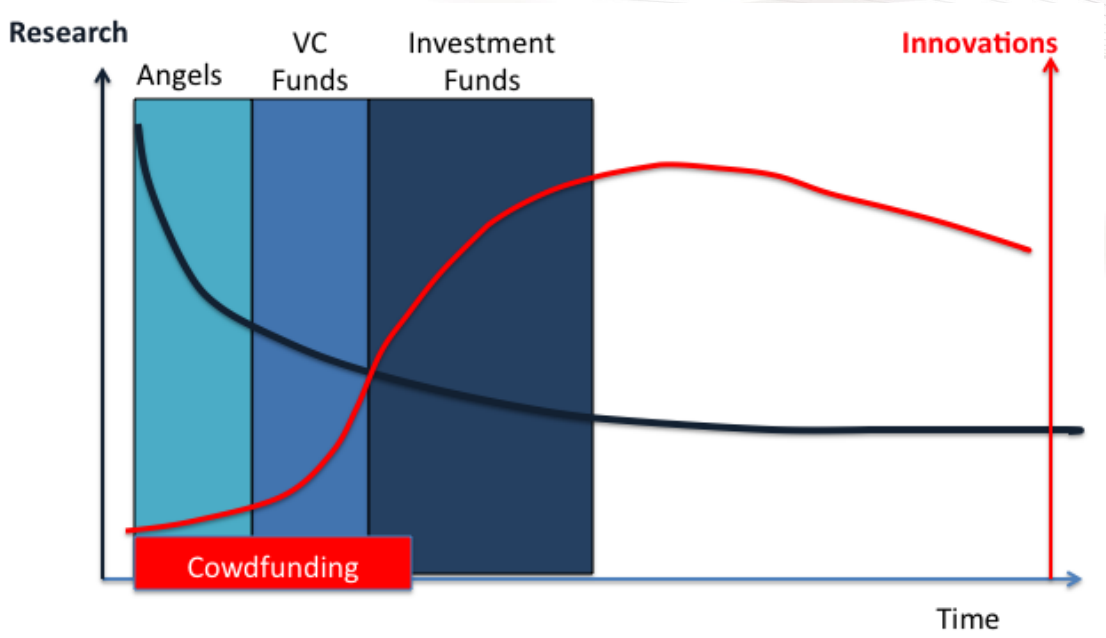

Figure 1. Investments in development of innovations in different stages of their life cycles.

3. CROWDFUNDING

What is crowdfunding

Crowdfunding[1] [2]is a financing method that involves funding a project with relatively modest contributions from a large group of individuals, rather than seeking substantial sums from a small number of investors[3]. The funding campaign and transactions are typically conducted online through dedicated crowdfunding sites, often in conjunction with social networking sites. Depending on the project, campaign contributors may be essentially making donations, investing for a potential future return on investment (ROI), or prepaying for a product or service. Crowdfunding has created the opportunity for entrepreneurs to raise hundreds of thousands or millions of dollars from anyone with money to invest. Crowdfunding provides a forum to anyone with an idea to pitch it in front of waiting investors.

In the case of crowdfunding there are the following actors:

- **Innovation (startup) company** - the issuer of securities that gathers money to finance the idea of innovation and its development;
- **Investors** who grant grants to an innovative company, based on investment or gift contracts;
- **Investment portal or broker** through whom investment funds are required for investment projects and collect the necessary funds within the prescribed deadline, i.e. performing the function of an intermediary between the buyer and the seller of securities;
- **The Securities and Exchange Commission,** which registers brokers and investment portals, and supervises the work of all stakeholders to minimize the risks of investing and fraud.

The following funding categories exist:

[1] http://crowdfunding4innovation.eu/study/about-study [accessed 6/11/18]
[2] http://eurocrowd.org/2015/09/28/crowdfunding-in-europe-state-of-the-art-in-theory-and-practice/ [accessed 6/11/18]
[3] https://whatis.techtarget.com/definition/crowdfunding [accessed 6/11/18]

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- **"Borrow"** Crowdfunding – funders' microfinance projects in return for a small interest on the amount.
- **"Click"** or social button Crowdfunding – funders pay websites, blogs, videos, etc, through a social button added to the page.
- **"Donation"** Crowdfunding – funders pledge money in return for goodies or just goodwill. E.g. Kickstarter, Indiegogo
- **"Equity"** Crowdfunding – funders are offered equity stake in the company in return for capital. E.g. GrowVC, Crowdcube

For innovation development, the most appropriate funding category is "Equity" Crowdfunding, as it will be descried later.

Figure 2. A typical crowdfunding process

Figure 2 shows a typical crowdfunding process. Typical phases of this process are:

1) **Phase 1:** Convincing of potential investors, which includes the following steps:

a) Pitch creation

b) Screening – analysis of the pith

c) Public offering of the pitch, which includes specification of the idea, funding goals, funding deadlines and returns and awards to investors

2) **Phase 2:** Public pledge money, when the investment platform collects, within a specified timeframe, funds from investors. The platform shows current state of funds collected. After the deadline, one of two decision options must made, depending of the crowdfunding model implemented by the platform:

a) *"All or nothing" model*: If the financial target has not been reached, the funds are returned to investors.

b) *"Keep it all" model:* Regardless of the amount collected, the innovation development project starts.

3) **Phase 3:** *Project development:* The startup company develops the innovative product and launches it on the market. If the goal of crowdfunding was to share the profit generated by of the product on the market, all investors get their part of it, according to the contracts they have. If the goal is selling of the startup company, investors do not share the annual profit generated fro the sell of the product.

4) **Phase 4:** *Selling of the innovative startup:* If a larger company, or an investment fund buys the innovative startup company, then, according to the contract, investors and the broker, share parts of the paid price with the owners of the startup company.

4. JOBS Act (USA)

Investment funds are offered through investment portals that are registered with the Securities Commission because they have to meet certain conditions, such as procedures that reduce the possibility of fraud, check the directors and managers of companies, and ensure that investors do not invest more than the law stipulates (and for the purpose of reducing possible damage from the wrong investment). Crowdfunding may be misused and a legal framework for its implementation is necessary. For instance, in the USA, so called JOBS Act [3] regulates relationships and responsibilities of above crowdfunding actors an specifies, for instance, the following constraints:

- The total amount sold to investors for a period of 12 months before the transitional period cannot reach $ 1,000,000

- The total amount sold to an investor should not be higher than:
  - 2.000 USD or 5% of the investor's annual income, ultimately its annual income, or its value, does not exceed US $ 100,000;
  - 10% of the annual income, where the total sum may not exceed USD 100,000 if the annual income or value of the investor is at least USD 100,000 or more; i
  - The transaction is done through a broker or investment portal that meets the set requirements.
- The issuer of securities must meet specific working conditions

Firms seeking investment capital must disclose some information about themselves, such as the legal status of the company, the names of directors and managers, information on how the funds will be used, how the value of the company is determined, the company's capital structure, and must indicate the names of shareholders with more than 20% of the ownership share, the method of determining the value of securities, as well as to indicate the risks of the buyer of securities related to minority ownership and risks related to corporate affairs.

The company - the seller of securities, must publish the amount of funds it wants to collect within a specified period, whereby these funds may not exceed the following values in the period of the last 12 months:

- 100,000 USD or less: the issuing company must be accompanied by:
  - tax return for the previous year, and
  - accurate and complete financial statement of value, which will be certified by the Chief Executive Officer;
- more than USD 100,000 but not more than USD 500,000, the company encloses a financial statement certified by a public accountant that is independent from the issuer of securities, using professional standards and procedures established by the Commission for such purposes, and
- more than US $ 500,000 (or some other value determined by the Commission) using the financial statements certified by the auditors;

The Commission registers an investment portal that applies for registration as a broker or dealer that meets the following requirements:

1. remains subject to examination, and the obligation to apply the rules of the Commission;
2. is a member of the National Securities Association
3. must satisfy the Commission's requests that it considers appropriate.

Investment portal means any legal entity acting as a mediator in a transaction that includes offers or sales of securities on behalf of others, but so that it cannot:

1. offers investment advice or recommendations;
2. require customers for purchases, sales or offers for the purchase of securities offered or displayed on the website or portal;
3. compensates employees, agents or other persons for searching for customers, the sale of securities that are displayed on the website or portal;
4. has, operates, owns or otherwise has investment funds or securities; or
5. engages in activities identified by the Commission as such.

The importance of crowdfunding for development of innovations for Serbia

Serbia does not have significant financial resources for investing in the development of innovative ideas and innovations. It does not have developed financial mechanisms to finance innovations. Crowdfunding is therefore of particular interest to Serbia, since most of the funds raised are expected to come from abroad.

It should be kept in mind that many individual innovators and entrepreneurs, have ideas for new innovations, but do not have enough funds to develop and test their innovations, and to run their startups. On the other hand, many citizens might be interested to invest few thousands euros in investment projects that someone analyzed and recommended. Investment portals to raise funds over the Internet to develop innovations could become a significant investor of innovative startup companies. However, due

to the potential for fraud and the high risk in these investments, it is necessary to legally regulate crowdfunding, primarily for two reasons:

- to prevent fraud (primarily by a broker, but also by a securities provider); and
- to limit the investments of legal entities and individuals, in order to minimize the damage if their investments are wrong.

5. A MODEL OF CROWDFUNDING IMPLEMENTATION IN THE IT SECTOR

Implementation of crowdfunding of innovative startups and SME of in the IT sector can provide visible and rewarding effects on the development of Serbian IT industry. We will briefly describe here one of possible crowdfunding models which can lead to great effects in the software and IT services industry. It is very common in the IT industry in the world that large IT companies buy small, but innovative and promising IT companies that have previously successfully launched an innovative product, technology, or service in the market. In this way, large companies avoid the risk of investing in research and development, and speed up launching of new, innovative products in the market. Instead of buying licenses for developed innovations, large companies just buy their owners. i.e. smaller companies that developed them. It is cheaper and faster solution for them.

In addition to selling of IT products, the sale of small, innovative IT firms can become a very lucrative business. There are examples in the world, when using crowdfunding through investment portals, a startup company was developed and sold for more than ten times higher price than the funds invested in its development (for example, Viber). Investors in development of these companies do not become its co-owners, as in the case of investment funds. But, if the startup company is sold, they share the profit from this sale.

A broker/investment portal (Figure 3), in addition to mediation between investors and entrepreneurs, could provide the following services:

- *Due diligence analysis* of the legal, economic and technological aspects of companies - issuers of securities;
- *Registration of potential investors* to innovation development
- *Provide help* to startup companies to prepare pitches and their requests for investments;
- *Distribution of requests for investments* of startups to registered investors, but also publishes them on the investment portal, in order to attract new, not registered investors.

If the broker/investment portal does not collect the required funds within a specified period of time, it returns the collected funds to investors. If it succeeds to collect the requested funds, or more, it makes the contract with the startup on behalf of investors. The contract specifies shares of investors, but also of the broker, of the profit generated when the innovative startup (developer of the innovative IT product) is sold. As the broker and investors have an interest in preparing a startup company for sale, as well as selling it better, the broker can provide, if necessary, not only the necessary consulting services to the startup company, but can also help in finding a suitable customer of the startup company.

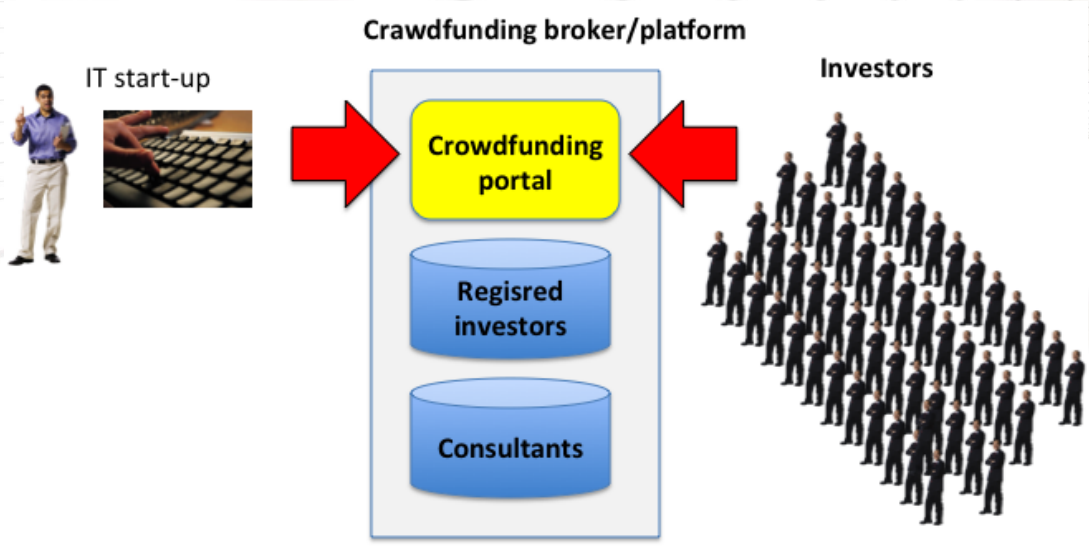

Figure 3. The crowdfunding platform for IT sector

A national crowdfunding platform could be created based on the principles of public-private partnership and founded as a joint-stoke company. The Serbia state could be one of majority shareholders (with share up to 49%), and other shareholders may by private companies, banks and individuals. For different industrial specialized crowdfunding platforms may be established before their pitches are offered to the public.

6. LEGISLATION NEEDED TO SUPPORT CROWDFUNDING IN SERBIA

In order to apply crowdfunding for innovation by implementing crowdfunding platforms in Serbia, it is necessary to make changes in the Law on Innovation Activity, as well as in the laws in area of finance regulating the work of the Commission for Securities, the tax system and the operation of investment funds. Serbia has not developed the legal framework for its security markets. It is probably the best, in addition to amending some laws, to prepare a special law on crowdfunding platforms capable to perform quality due diligence of proposed investment projects before

7. CONCLUSIONS

In our opinion, investment to shares of innovative start-up companies and implementation of crowdfunding are more appropriate mechanisms for financing innovations and innovative companies than grants or loans. Crowdfunding initiatives, besides of supporting of development of innovative products, may also support development and selling of innovative companies.

Serbia needs to create an appropriate legislative framework for implementation for crowdfunding, as it can be misused if it is not regulated and monitored. Implementation of crowdfunding to support innovations in Serbia may provide significant funds needed to innovative start-ups. Crowdfunding should be one of important elements of the Serbian innovation systems. The government could be play two roles: as the legislator and as the investors to crowdfunding platforms, organized as joint-stock companies.

REFERENCE LITERATURE

[1] The Study ***"Assessing the potential for crowdfunding and other forms of alternative finance to support research and innovation" (***Crowdfunding4Innovation), initiated by the European Commission's Directorate-General for Research & Innovation (DG RTD) in December 2015. - http://crowdfunding4innovation.eu/study/about-study

[2] *Miroslav Ferenčak, Mladen Radišić, Dušan Dobromirov, Milan Šolaja, Inovativni modeli finansiranja malih i srednjih preduzeća u sektoru informaciono-komunikacionih tehnologija. XXII Skup TRENDOVI RAZVOJA: "NOVE TEHNOLOGIJE U NASTAVI", Zlatibor, 16. - 19. 02. 2016.* www.trend.uns.ac.rs/stskup/trend_2016/radovi/T3.3/T3.3-3.pdf

[3] *Jumpstart Our Business Startups A*ct, PUBLIC LAW 112–106,—APR. 5, 2012 https://www.gpo.gov/fdsys/pkg/PLAW-112publ106/content-detail.html

[4] Lars Klöohn, Lars Hornuf, *Crowdinvesting in Deutshland*, Journal of Banking Low and Banking ZBB, Heft 4, 15 August 2012, pp.237-320

[5] Reinhard Willfort, Conny Weber, *Crowdbusiness: More Innovation - Less Risk*, ISN - Innovation Service Network GmbH

[6] Crowdfunding" kao novi izvor kapitala - Umesto traganja za velikim investitorima i kreditima do novca moguće stići putem masovnog finansiranja xrrn://www.ekanija.uom/webcire/cp/nage/1233657

[7] Balkan Venture Forum, http://www.balkanventureforum.org/ [accessed 6/11/18]

INNOVATIVE OPEN TECHNOLOGIES (IOT) FOR A DEVELOPMENT AND INNOVATION BREAKTHROUGH OF THE EASTERN SLOVENIA COHESION REGION

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Abstract: *This paper addresses a gap which has been long identified in the Slovenian research, development and innovation system, where the transfer of knowledge between universities or public research organisations (PROs) and enterprises is inefficient. It presents an idea for an Innovative Open Technologies (IOT) project, which aims to encourage faster and more effective economic development of the Eastern Slovenia Cohesion Region (ECR). IOT is designed as a regional and national development project, the primary objective of which is to form a symbiotic connection between PROs, economy, intermediary institutions and local communities through open innovations and technologies. The IOT project will connect all main stakeholders in the region and create a significant added value for improving the development potential of ECR and Slovenia as a whole.*

KEY WORDS: R&D, INNOVATION, KNOWLEDGE & TECHNOLOGY TRANSFER, SLOVENIA

JEL CLASSIFICATION: O (Economic Development, Innovation, Technological Change, and Growth)

1. CURRENT SITUATION

In 2000 the Lisbon Strategy set the goal for European Union to become the most competitive, dynamic and knowledge-based economy in the world by 2010, and proposed policies that promote cooperation between economy and science as the main mean to achieve this goal. Similar is true also for the Europe 2020 Strategy, which aims to develop an economy based on knowledge and innovations. The Republic of Slovenia is one of the smallest EU Member States, and a country in transition, which went through major changes in the past few decades in its political organisation, and normative and institutional environment, while its economy is facing a global competition. Slovenia was supposed to have been the best prepared among the new Member States in the EU enlargement in 2004, and was presented as a model of a successful transition state, however, the global economic crisis revealed the weaknesses and deficiencies of the Slovenian economic and innovation system, as they are presented below.

The main weaknesses are excessive fragmentation and insufficient cooperation among the development and innovation actors, which hamper efficient transfer and use of knowledge, an inefficient "knowledge triangle", as well as lack of targeted investment and focused research and innovation activities in areas where the country and its regions have comparative advantage. The OECD Reviews of Innovation Policy Slovenia 2012 report lists low productivity in comparison with other OECD countries, low internationalisation, reluctance of universities to introduce changes, along with their poor organisation and limited strategic capabilities in the academic sphere as the main weaknesses of the Slovenian innovation system. (Lipnik, 2016)

Slovenia experienced some positive developments and trends in research and development in the period 2005-2008, but these peaked in 2009, and since then there have been important changes in the funding of research and development. On the one hand, the public funding allocated for research and development has been reduced, while on the other hand, private funding has increased. The Science Citation Index shows a high increase in scientific publications of Slovenian researchers and their citations. Unfortunately, the number of highly cited scientific publications (top 10%) and European patent applications coming annually from Slovenia is slightly less than half of European average. Despite a rise in the number of publications and citations, the Republic of Slovenia is still witnessing a low level of cooperation between science and economy and a low share of innovative enterprises. (Likar, 2014)

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Analyses of the Slovenian innovation system state several deficiencies, among others especially the following:

- insufficient and inefficient transfer of knowledge from scientific and research sphere to enterprises,
- inadequate level of innovation, especially in small and medium-sized enterprises,
- slow progress in creating intellectual property,
- inefficient use of information and communication technologies in enterprises and the public sector, and
- slow growth of the economy's productivity, and of the share of high-tech products and knowledge-based services in export.

A significant difference in development level of development regions (measured with the development deficiency index, which includes, inter alia, GDP per capita, gross value added per employee, gross fixed capital formation in less developed regions as a share of GDP, the share of domestic expenditure for research and development in GDP, and the level of registered unemployment) can be noticed between ECR and the Western Cohesion Region (WCR), with the latter having a significant advantage (e.g. the development deficiency index of the Central Slovenia development region is 35.5, while that of the Podravje region is 123.9).

ECR lacks research and development infrastructure and the capacities to develop excellence in this field. Research equipment and data infrastructure in ECR is dispersed. There is duplication of individual equipment among institutions, in some cases even within institutions. At the same time, research equipment is in a large part depreciated, and partly also outdated.

Innovation activity, efficiency of enterprises and commercialization of research organisations' knowledge and technologies are poor in ECR because of:

- deficiencies in research departments in enterprises,
- poor cooperation between (a) knowledge institutions and the economy, (b) enterprises themselves, and (c) knowledge institutions themselves,
- fragmentation of supporting/intermediary institutions, which do not have sufficient critical mass and do not provide comprehensive support,
- focus on product development based on technological development after inertia (push factor), while not emphasizing development of products/services needed by the users/market (pull factor).

ECR is lagging far behind WCR in the scope of scientific talent (expressed as the number of employed researchers per 1000 employees). There are few medium-sized and large enterprises in ECR which would have a high added value and thus form a strong economic core. Economic activities with low added value are prevalent. As a result, the net added value lags behind the Slovenian average. Especially in times of crisis and when facing global social challenges, such as climate change, pollution, and demographic ageing, the expectations that the society poses on researchers and enterprises fly high.

2. PROBLEM DEFINITION

The state-defined legislative framework can influence (by encouraging or hampering) the mobility of researchers by providing different and more flexible forms of employment in labour legislation, directing research through public funding programmes, establishing and promoting intermediary and hybrid structures intended for knowledge transfer from the research sphere to the economy (e.g. pre-incubators, incubators, technology transfer offices, technological parks, technological platforms, centres of excellence, competence centres, etc.).

Joining the EU in 2004, Slovenia gained access to various resources, devoted to R&D, different internationalisation mechanisms, and unlimited access to the single European market. European funds in Slovenia were reflected strongly in investments in research and development. They were included in the different public agencies instruments (i.e. TIA, SPIRIT, SPS), two calls for tenders for Centres of Excellence (CE) (in 2005 and 2009), Competence Centres (CC) and Development Centres in 2010 and 2011.

The Operational programme for strengthening regional development potentials for period 2007-2013 included calls for tenders for the following instruments: Centres of Excellence, in the amount

of 84.14 million EUR (8 CEs were established, out of which all have their headquarters in WCR, while 5 of them do not even include any PROs from ECR), Competence Centres, in the amount of 45.3 million EUR (7 CCs were established, out of which only 1 has its headquarters in ECR, while 3 do not even include any PROs from ECR), and Slovenian Economy Development Centres, in the amount of 185.3 million EUR (17 centres were established, among which the Gorenjska region received the most funds in terms of project shares). The three calls for tenders were one of the largest programme investments in R&D in Slovenia, with the total amount of almost 315 million EUR.

European funds presented a large financial investment in research and development, but they also revealed certain flaws in the innovation policy, which were highlighted by the evaluations of these instruments. Inadequate cooperation between knowledge institutions and the economy, and low commercialization of knowledge and research achievements are a significant and often identified problem of Slovenia's innovation system. Commercialization of knowledge as a basic principle of Slovenia's innovation policy measures, is merely declaratory and has no concrete support. Centres of Excellence are an example of one of financially best supported innovation policy measures, which contributed importantly to building research infrastructure and connecting researchers and the economy. Problems appeared, however, in creating, protecting and commercializing intellectual property rights and interpreting commercial revenues. (Bučar et al., 2014)

The innovation system is not prioritized or recognized as the driving force of economic progress in Slovenian politics. This is reflected in the constant organisational changes of the supporting environment, and in introducing and abolishing instruments based on restrictive austerity measures, rather than on the recommendations of evaluations that were carried out to increase the efficiency of the innovation system and the funds allocated to R&D. The IOT project could take advantage of these instruments, connect them better, and properly integrate them in improving the efficiency of the innovation system in the long run.

3. SOLUTIONS

In cooperation with project partners, which are selected based on the "quadruple helix" principle (i.e. knowledge institutions, enterprises, supporting environment entities, and representatives of the state and civil society) we are preparing the IOT project application. The application defines the roles/tasks of project partners and priority areas or content intersections, in which research and development activities in the framework of the IOT project will be provided in accordance with smart specialization, and on which the supporting services of the entrepreneurship and innovation ecosystem will focus. In the framework of the IOT project, also a set of research, development and innovation projects will be determined, supporting more active integration of scientific and economic spheres and other stakeholders, and enabling economic breakthrough and sustainable development of ECR.

A modern Technology Innovation Centre[3] at the University of Maribor (INNOVUM) will be built, as well as other collocation centres in partner enterprises, organisations and local communities in

[3] Technology Innovation Centre (TIC) is an organization focused on utilizing and supporting new technologies through infrastructure which spans across a wide spectrum of activities from research to commercialization of technologies. Most TICs are built from public funds, and later financially supported by public funds to cover investment costs associated with starting and developing new activities or to assist with obtaining and implementing funded R&D projects.
Like science parks, TICs are normally built near leading universities and provide equipment and services to businesses based on new knowledge and technologies. Their objective is to develop their own know-how and ability to cooperate with universities and other TICs. Similarly to universities, TICs work on R&D projects as part of innovative programmes financed from public funds, they provide access to technological infrastructure and customized research services. Additionally, they help businesses by allowing them to share R&D costs, access to facilities and expertise in order to reduce their risks, shorten the time from lab to market and utilize synergies in the know-how throughout the value chain.
Typical activities and outputs of TICs include expansion of manufacturing processes and production of technology and application demonstrators. They help businesses to get beyond their abilities and what they could achieve with their own resources by providing a range of support services while carrying the risk associated with inventions in

the framework of the IOT project, which will aim for integration in their operation and follow the principle of complementarity with INNOVUM. They will enable research organisations, enterprises and other stakeholders to use research equipment and capacities for research and development activities on new, advanced and key enabling technologies, based on the "open access" principle.

Entry points will be established at collocation centres in the framework of the IOT project. They will be organised as "one-stop shops" and will direct enterprises and other stakeholders to appropriate service providers and help them find solutions and partners.

In cooperation with banks and venture capital funds we will establish an investment fund, which will enable all stakeholders (i.e. researchers, students and economic operators) to acquire seed and early-stage capital to establish start-ups and spin-off companies, and financial means for (co)financing further development and testing of research results utilisation, making prototypes, carrying out market research, testing innovative concepts, technologies or prototypes, and protecting intellectual property rights.

Experts will be trained to provide services at entry points and to manage and maintain research infrastructure in collocation centres of the IOT project, to manage the investment fund, to manage innovations and industries/economic clusters, to develop new products and services, and to support users in using the equipment and interpreting the results.

Industries/economic clusters or technology platforms will be established in priority technological areas of the IOT project. They will be organised as stakeholder forums (led by the economy), which will create and promote opportunities for (international) R&D cooperation and integration with networks and technology platforms, and encourage open innovation.

4. OBJECTIVES

Realising the IOT project will achieve a general reorientation of investments in ECR to research and innovations for sustainable growth; supporting small and medium-sized enterprises for high added value jobs; quality education and training; inclusive labour market which encourages sustainable employment and social cohesion; ensuring productivity and added value growth; and integration of climate change objectives and transition to low-carbon economy through efficient use of resources, in all areas of region's development specialization, thus reducing the development gap between ECR and EU's developed regions or cohesion and development regions in Slovenia.

REFERENCES

Brighton, D., Zajko, M. and Pezoldt, K. (2015), *Successful Innovations? Efficient Knowledge and Technology Transfer and International Collaboration*, Universitatsverlag Ilmenau, Ilmenau.

Bučar, M., Stare, M. and Udovič, B. (2014), *Centri odličnosti in kompetenčni centri - Evalvacija instrumentov*, Centre of International Relations, Faculty of Social Sciences, Ljubljana.

Likar, B. (2014), *O inovativnosti slovenske predelovalne in izbranih storitvenih dejavnosti*, University of Primorska, Faculty of Management, Koper.

Lipnik, A. (2016), *Politike vzpodbujanja sodelovanja javnih raziskovalnih institucij, gospodarstva in države*, Faculty of Mechanical Engineering, National and University Library of Slovenia, Ljubljana.

the early stage of their development. TICs act as catalysts to build new markets, innovative industries, clusters and networks. An important aspect of a successful TIC is the weight and priority the public and private sectors assign to innovation in their country. (Brighton et al., 2015)

CREATIVITY AND INNOVATION CHANGE IN EDUCATION

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Abstract: *The transfer of an innovation conceptual model is a complex process. It requires many changes in attitudes, behaviours and values of the participants. This paper summarizes the initial observations and reflections of the University of Brighton team who have been involved in both a Centre of Excellence for Creativity project in the UK and the IF4TM project in Serbia. This summary includes the analysis of an exploratory survey of some of the Serbian based universities that are our partners.*

The survey reveals some interesting initial perceptions of innovation and how to apply it. Several qualitative outcomes are made that point towards relevant issues in which to engage for embedding innovation in the Serbian University sector.

KEY WORDS: CREATIVITY, INNOVATION, CHANGE, TECHNOLOGY, EXPECTATIONS.

JEL CLASSIFICATION: O33

1. INTRODUCTION

Changing Education

The traditional view of University teaching has in the past been a tiered auditorium with a distinguished professor at the front delivering a lecture; the so called 'sage on the stage' approach. That didactic method has however for some years been a declining pedagogic model increasingly replaced by more dialectic, open and experiential approaches to learning. Since the 1960's, developments in teaching and learning have included areas such as modularity and choice, student-centred learning, problem- and project-based learning, blended learning and, increasingly, on line learning.

Background

Brighton Creativity Centre

In 1992 the University of Brighton (Brighton), along with all other Polytechnics in the United Kingdom, became designated University Institutions under the Further and Higher Education Act (1992). In due course the university would become a four-campus institution of around 20,000 to 25,000 students. In broad terms, these 'new universities' were traditionally vocational, problem solving and practically orientated in comparison to the traditional universities with a more research and theoretical orientation.

In 2005 the University of Brighton, in partnership with the University of Sussex, was deemed by the Higher Education Funding Council for England (HEFCE) to be a Centre of Excellence in Teaching and Learning (CETL) for Creativity. The award provided an opportunity for the universities to extend research into the theory and pedagogy behind creativity (Morris 2010), and to develop Creativity Centres to aid in both this process and in creative practice itself. At the close of the project in 2010, the Brighton project team had hosted 653 events at its Creativity Centre with 11,179 participants, established 11 creativity fellows, funded 20 creative outreach projects and facilitated several other creative events (Martin 2010).

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IF4TM

The Republic of Serbia (Serbia) numbers around seven million residents but has suffered through recent wars, sanctions and underinvestment. Serbian Higher Education has a strong record in maths and computer sciences, but the traditional pedagogy still favours a more didactic approach than might be seen in Great Britain and other parts of Europe. It also has a long-term problem with students emigrating overseas after graduation forming a part of the 'Serbian Diaspora' problem.

In 2016 an EU funded Erasmus project was agreed that included the aim of developing less didactic approaches to teaching and learning in Serbian Higher Education and an indigenous culture of innovation and enterprise. The Institutional Framework for the Development of Third Mission of Universities in Serbia (IF4TM) includes seven Serbian higher education institutions and five European partners including the University of Brighton team behind the Brighton Creativity Centre. This has included Mr Mark Milne, Mr Richard Morris, Mr Steven Kilgallon and Dr Tim Katz. The team between them has also been involved in teaching creativity and innovation in engineering (Walesh, 2018) and product design for over 60 man years.

Brighton's remit was to oversee developing programmes of:

- Social Engagement,
- Institutional Creativity Centers
- Creativity based workshops,
- Student Volunteers,
- Effective utilisation of resources and
- an Innovation-based campaign.

2. EXPLORING CREATIVITY IN SERBIA

Action Research

The Brighton team has been able to monitor the development of IF4TM as part of a research investigation, in addition to undertaking active participation. Active research therefore forms a strong part of the research methodology.

Anthropometric analysis

The knowledge gained from our experiences of the CETL project in Brighton included perspectives of agency, constraints and were captured in several papers, videos and books. These experiences have formed the grounded base for our investigation and reflection into the IF4TM project where we have made direct and analogous comparisons. This is from the perspective of a team new to EU funded projects. Our relevant CETL experiences are summarised as:

- The team were unsure of how our colleagues would perceive creativity training, as mirrored by the survey. When outcomes were better established (creative, entrepreneurial), the value was recognised by our peers, but it was necessary to publish research data to ensure credibility in an engineering context.
- Many academic and bureaucratic domains within Brighton wanted to use the facilities just as a nice meeting room. However, over the years the concept of having nice rooms for meetings has disseminated so that the creativity Centre is now mostly left for creative and interactive activities.
- There was much IT input to the CETL, but much of it was more of a barrier than a help. Some very user-friendly aspects remain, but sophisticated visual and sensorial systems have mostly atrophied. The survey shows some expectations of the machinery itself being able to generate creativity.
- It has been the attitudinal and interactive nature that has promoted most of the benefits, many of which are not expensive. The use of group-based creativity workshops has been most effective in both training students and facilitating staff engagement.

- Students' subsequent sketch modelling and prototyping is severely influenced by the available technology: if laser cutters are available everything comes out box-like; with RP machines most things end up constrained by their CAD systems and ability.

Investigative analysis

The second research strand is through an exploratory survey sent to all Serbian partners, as part of an investigatory Action Research methodology (Walsham, G. 2018). The results of this study (https://admin.onlinesurveys.ac.uk/account/brighton/analyse/383797 - *Creativity Questionnaire-IF4TM, 2018*) were used to frame relevant questions for our future visits, observations and focus groups due to the limited response and hence the statistical robustness.

3. RESULTS

The results at this stage are summarised through the two investigative methods:

Our team observations

These can be assigned to two categories: Experience of the EU as "newbies"; and our perceptions of the project context itself.

EU projects

In terms of commercial projects, education and research we have previously experienced, the EU compares strikingly in that:

- The procedures can be very onerous and inflexible, with many obligations and requirements;
- These are rationalised by the need to account for public money
- Many of these requirements make no positive contribution to the project outcome
- Many of the requirements are quite esoteric and hard to understand by those unused to them
- Any project partner needs the overhead of a financial facilitator (not gate-keeper) that has EU financial experience
- The onerous bureaucratic overheads can have significant demotivating effects on academic staff unused to this mode of operation

Serbia and the IF4TM

Authors' perceptions here are through diverse meetings and Trello activities, as well as group sessions to reflect on the project's position and UoB place in it. We have noted that:

- The culture is historically authoritative, or top-down;
- This is reflected in the view of innovative development in Universities (professors have good research ideas, and then need to think of ways to exploit them);
- Development seems more focussed on hardware and processes, rather than developing creative and innovative practice;
- There seems to be a procedural and rules-based innovation model, rather than an attitudinal and cultural change requirement;
- There can be a resistance in accepting some suggestions as feasible within the socio-political context of the Republic of Serbia and its University system;
- The relative inflexibility of the project has not been conducive to the utilisation of experiences from partner institutions;
- Achieving a successful end to the project seems of greater importance than its long-term efficacy.

Questionnaire summary

There have been limited responses to the survey trawl, so statistically valid conclusions were inappropriate. Specific anecdotal results would be misleading and are therefore not quoted, although the direct analysis of the results is available on line (https://admin.onlinesurveys.ac.uk/account/brighton/analyse/383797 - *Creativity Questionnaire-IF4TM, 2018*). However, an integrating cursory analysis may help to focus the action research in its next phase. Of interest was that:

- They have an eclectic view on creativity;
- Serbian University staff are very optimistic about the centres;
- There are opportunities to be creative;
- They prefer independent creative working;
- They are concerned about the (time) resource needed to change teaching methods;
- They are also concerned about their peer's perception of the creativity agenda within the University curriculum and system, which has a large cultural inertia;
- Although they see creativity as "trainable" they would not use on year-one students;
- The recipients were nervous of the students' attitudes to new methods;
- Success criteria are perceived as very much quantitative, rather than qualitative.

4. CONCLUSION

The outcomes here are purely preliminary, and the outcomes for the further investigation are similarly preliminary at this stage. As with the initial exploration and analysis, these cannot exclude our previous experiences. The response of the conference attendees for this work will however be used to add another, third triangulating input to the more detailed investigation to follow.

Suggestions for further investigations

Some issues seem to be coming up through both these exploratory methods as well as from the authors' own experiences of embedding creativity and innovation within their institution. We would like the reader to consider:

- There are many participants who are conversant and motivated in developing creativity education and innovation enhancement within the Serbian partners. However, they are concerned as to how easily it will be possible to implement the changes needed within the Serbian University system. This seems to be migrating into a "change management" scenario, rather than one of creativity technology implementation.
- What are the overall expectations of INNO and creativity spaces? There seems to be a feeling that the technology enhancement will be very beneficial on its own. Is this how it will happen?
- How will the spaces be supported after the project, and from where will the resources to support change come?
- Creativity does not necessarily mean good innovation or entrepreneurship. How is the creativity suite to be optimally used for innovation?
- The need to identify and specify which change management methodologies would have greatest chance of success in this scenario.

It is felt that consideration of these types of questions is essential to the long-term embedding of a creative and innovative ethos within the Serbian university domain.

REFERENCES

Martin, P. et.al. (2010), "Appendix A Dissemination Outputs", *InQbate CETL in Creativity Self Evaluation Report*; University of Brighton.

Morris, R.D. (2010), *Making Space for Creativity*. Ebook ISBN 978-1-905593-12-5 and DVD ISBN 978-1-505593-43-9.

Walesh, S.G. (2017) *Introduction to Creativity and Innovation for Engineers*, Pearsons, Global Edition, ISBN 9780133587074

Walsham, G (2003), "Research Methods for Information systems in the Development Context: A Tutorial", in Krishna et al. (ed.) (2018) The Digital Challenge: IT in the Development Context, Routledge (Chapter 5).

https://admin.onlinesurveys.ac.uk/account/brighton/analyse/383797 - *Creativity Questionnaire-IF4TM* [Accessed 10/10/2018]

SESSION 2:
CONTINUING EDUCATION

THE ROLE AND CONTRIBUTION OF LIFELONG LEARNING STYLE ON MILLENNIALS' GENERATION

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Abstract: *The transformational leader of 21st century, who is, at the same time, the leader in permanent learning and creation, is different in understanding of the need to change his or her own manner and style of communication with employees, who, under the impact and by accepting the change, themselves become creators of added value in the company. The knowledge era is shifting towards the era of design thinking, entrepreneurship and innovation. Some recent research show that collaboration, communication, creativity and critical thinking are the four skills acting as indispensable wheels on the exciting 21st century' journey. The Y generation and digital natives are different in their learning style and the way in which they expect to be trained, and coached. By 2020, the share of Serbian Y generation among working population will be more than 50%, according to the estimates of the Republic Statistical Office. The paper would represent results of the research conducted among Serbian millennials regarding their style of learning and behavior, and attitudes toward collaborative and interactive learning.*

KEY WORDS: TRANSFORMATIONAL LEADER, INNOVATIVENESS, LIFELONG LEARNING, PERSONAL DEVELOPMENT, DESIGN THINKING, COLLABORATION, COMMUNICATION, CREATIVITY, CRITICAL THINKING

1. INTRODUCTION

The intensity of changes, caused by digitalization and globalization, opens up space for new manners of thinking aimed at sustainable company business-making for a longer period of time. The planet is faced with several massive changes: while resources are obviously limited, human ambitions and desires make them unlimited. Visibility of processes, transactions, and relations, enabled by the Internet and social networks, calls for even greater responsibility so as to make communication, business solutions, and cooperation as quality as possible. Survival of every human being, each organization, and even nations, depends on the possibility to keep in permanent contact with progress and changes in all spheres.

The way we communicate determines how we value employees, and thus the level of employee loyalty to the company. In the current phase of economic life, business will be built on a model of thinking rather than the model of creating products and services. (Mamula, Kužet, 2015) 21st century leaders learn in order to create. They enjoy personal development. Lifelong learning is their determination, and they approach learning with a passion and desire to gain new knowledge which will be applied in practice.

2. THE ROLE OF LIFELONG LEARNING IN 21ST CENTURY LEADERSHIP

In an information-intensive age, education is mandated to respond to demands in two directions: on the one hand, it has to transmit an increasing amount of constantly evolving knowledge and know-how adapted to a knowledge-driven civilization; on the other hand, it has to enable learners not to be overwhelmed by the flows of information, while keeping personal and social development as its end in view. Therefore, education must simultaneously provide maps of a complex world in constant turmoil and the compass that will enable people to find their way. (Nanzhao & Yunxiao, 2001)

Informal educational approach promotes and develops the "8 Key Competences for Lifelong Learning" recommended by the European parliament and Council as necessary skills for the 21st century. Long-term objective is the development of attitude towards an "economy for the common good"

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IF4TM Institutional framework for development of the third mission of universities in Serbia

Co-funded by the Erasmus+ Programme of the European Union

which will bring a better social cohesion, focus on solving local problems, better use of existing resources and motivation of the youth to become agents of change (UNESCO, 2002). Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.

In order to release the potential of individual creativity and manner of thinking in the new millennium, companies increasingly invest in intellectual property, rely on intense knowledge of their employees, and use their proposals and proactivity leading to innovation. Lifelong learning is an obligation of everyone who wishes to become and remain a serious player at the market. The job position of a leader in the networking and collaborative economy era calls for a different manner of management based on the important role of the leader who stimulates exchange of knowledge through a network of stakeholders as well as the process of transfer of a part of his or her competences to co-workers within the team. (Mamula&Ćoso, 2015)

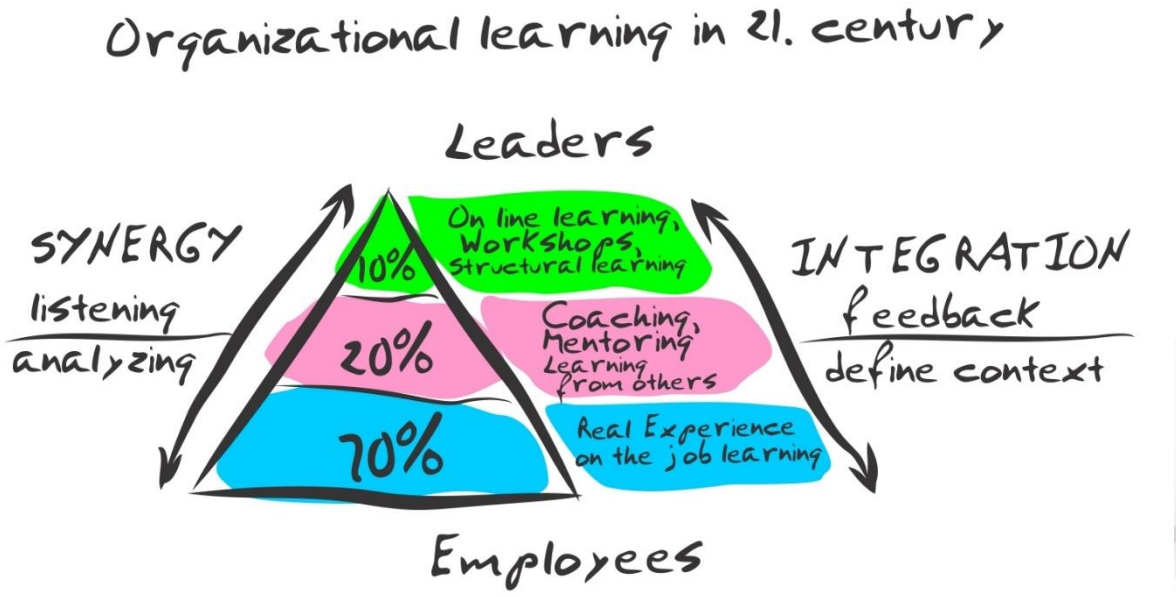

Figure 1. - 21st century learning model

Source: 70:20:10 Model for Learning and Development (Gaša featuring Pixpired)

In the book "The inventive manager in 100 lessons", Velimir Srića distinguishes between two types of learning:

a) Learning for survival – is the ability of the manager or organization to adapt to the environment, i.e. world and the market in answer to issues and challenges.

b) Learning for creation – is the ability of the manager or organization to actively change their environment, recognize new opportunities, and find sources of creative ideas, to develop by perceiving and forecasting, or even creating new development trends. (Srića, 2004)

Goleman and Boyatzis (2001, 2008) believe that companies interested in development of leadership need to assess willingness on part of their employees to change and include them in their development programs, applying tools which diagnose their strengths and weaknesses, strengthen their communication skills, and release the potential for perceiving a broader picture and a step ahead, all aimed at promoting company achievements. Leaders need to "shape" the new manner of thinking by adopting non-directive coaching style to replace directive styles such as mentoring, advising, and training. Many people use the terms mentoring, training, and coaching in almost the same meaning. "Coaching is partnership with a client in the contemplative-provoking and creative process which inspires them to maximally develop their personal and professional potentials." (ICF definition of

coaching) Coaching is a process which helps people to actively shift from the point where they currently are (either in business or private terms) to where they want to be. In most cases, not everyone has a defined idea where they would like to be; thus, coaching with its competences helps them find this out on their own. Transformation of the manner of thinking is not simple, as it is not easy to change deep-rooted opinions, beliefs, and perceptions of people. By asking carefully tailored questions, the coach provokes thinking and reflection of experiences, thus developing potential and creativity. Coaching is the most efficient form of work which enables use of the method of learning through experience (learning by doing).

3. NEW GENERATIONS' EXPECTATIONS AND TEACHERS' ABILITY TO RESPOND ON LEARNING ISSUES

Schools from all over the world are innovating learning designs and the manner of learning in the digital era that students would need for 21st century success. New generations' lifelong engagement is based on digital platforms which present their systems aimed at ensuring their satisfaction, meeting their expectations, and corresponding to their values and behaviors. According to research (Tapscott, 2009), some of the characteristics differentiating Y generation from their parents are: freedom to choose what they find right and express their personal views and individual identity, customization and personalization, the ability to change things to suit their own needs better, integrity and openness in their interaction with others, entertainment and play integrated into their work, learning and social life, collaboration and relationships as a vital part of all they do, speed of communications, obtaining of information and responses to questions and messages, innovation in products, services, employers, and schools, as well as in their own lives. It takes new ways of making learning interactive, personalized, collaborative, creative, and innovative to engage and keep new generations actively learning in schools everywhere. (Oblinger & Oblinger, 2005)

Faced with high costs of education and employers' requests, students also insist that their education should result in measurable skills and abilities. Modern educational institutions already have incorporated "on the job" practice programmes for their students; thus, students have a greater possibility of choice of employment. This actually makes the difference in the definition of a modern university, because, before enrolling in university studies, the first thing students will look for when choosing a faculty is the type of practice offered, and companies in which it is offered by universities in the course of education. (Mamula & Ćoso, 2015) Even in Serbia, approach to the learning and teaching is changing, starting as far as primary school. Teachers nowadays have not only the means but also the obligation to learn how to approach teaching, from gender-sensitive topics to teaching methods. (Nećak et al., 2016:75-76) Teachers adjusting their teaching methods to the demands of the innovative learning and to new generations.

Collaborative learning is an instructional method whereby a group of learners work together to achieve common objectives and goals. (Chen & Chang, 2014) Active and collaborative learning practices have a more significant impact on student performance than any other variable, including student background and prior achievement. Students are most successful when they are taught *how* to learn as well as *what* to learn. Innovative behaviour of e-Learning are refreshed with development of technology. Some of successful learning strategies which turned out to be effective among the millennial generation are gamification, story-based learning, interactive videos, and others. (Mamula & Ćoso, 2015) E-Learning courses are supposed to be easy to navigate and ready for implementation via exercises, case studies, knowledge checks, scenarios, storytellings, simulations and interactive games. E-Learner likes to have the opportunity to be interactive by choosing different documents, videos, links, and web pages as additional web resources. Games in E-Learning put an e-Learner in the position to learn faster and more easily, make them engaged, and introduce thought-provoking questions. Millennials like to be coached. To keep them focused, an educator can add humor. E-learner-centric courses include challenge, control, collaboration, personalization, engagement, relevance, and feedbacks. In order to have truly engaged e-Learners, their curiousity must be stimulated and sustained along the entire course. (Mamula & Ćoso, 2015)

In the 21st century infrastructure teachers also learn to play the role of a facilitator and coach providing knowledge and assistance. In the 21st century, teachers ought to manage the innovative style

of classroom activities, supporting teams of students in terms of exploring and gaining new skills which will prepare them for the future life. They need to be well-coordinated with current changes in curricula, assessments and other key performance indicators. The coaching style of the educator relates not only to the subject being taught, but also to the purpose and broader picture. What is important for the student? What are his or her values? Teacher coaches can help students learn how to set goals, define measurable action steps, and assess themselves. Their role is to facilitate brainstorming, ignite creativity and integrate different strategies and tools in the learning process. Thus, students are supported during the challenging studying time. Leadership coaching can prepare learners to take on future career more seriously and confidently. (Mamula & Kužet, 2015)

Teachers will have to communicate and collaborate with students and other teachers and experts, working in teams to create and share the most engaging and challenging projects. Thorough and continuous investments in professional development of teachers will be of utmost importance in the future transformation of educational systems world-wide. (Mamula et al., 2016) By asking carefully tailored questions, the teacher as a coach provokes thinking and reflection of experiences, thus developing ability and creativity. Coaching is the most efficient form of work which enables use of the method of learning through experience. Such form of work implies responsibility of the very person who is being developed, and his or her active participation in empowerment of their capacities and skills. A new manner of thinking and communication of the teacher - leader with his or her students - employees is needed so that results of synergetic action could be efficient and effective, thus making faculties - companies successful in the 21st century business-making. (Mamula & Kužet, 2015)

4. WHY LEARNERS NEED A NEW WAY OF THINKING

We are witnesses to the fact that without an understanding of who Millenials are and why they think and act in a way that is different from the older generation employers can disadvantaged when it comes to communication, delegation of activities to teams or individuals, training and building relationships with representatives of the new generation. Therefore, for them, it is not unknown how to use these communication channels, both in teaching and in work process, because it offers interactive lectures and authentic experience in the process of learning and work. (Barron & Darling-Hammond, 2008). Today, Millenials are mentees learning from older generation colleagues. At the same time, they are mentors, transferring their knowledge and sharing it with the same colleagues they learn from (reverse mentoring).

Figure 2. - Millenials and educators – learning in the digital age

Source: Mamula & Ćoso, 2015

Owners/managers of SMEs in Serbia with strong marketing orientation, in a constant changing environment, should be more agile and open for novelties. Since their system of organization is more flexible they could reorganise their employees in a better performing units. This type of organization

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allows managers to stimulate and motivate employees to be more creative in a process of finding solutions for their customers' needs applying constant dialogue. It seems that today it is not possible to have a good marketing performance without an equally good innovation performance and vice versa. This is because strategic marketing planning and strategic innovation management are interrelated in many aspects. Strategic innovation concerns an organization strategy which draws continuous competitive advantages, while the core of marketing efforts on part of companies is focused on being faster than their competition at the market. Innovation is widely recognized as a means for companies to become more competitive and successful. (Mamula & Popovic, 2015)

Technological advances brought about huge changes in consumers, market, and marketing over the past century. The technology allows individuals to express themselves and collaborate with others. According to Kotler (Kotler & al., 2010), the rise of three major forces shaped the business landscape toward Marketing 3.0: the age of digitalization, the age of participation, and the age of creative society. Understanding this transformation will lead to a better understanding of Marketing 3.0 as a nexus of collaborative, cultural, and spiritual marketing. In 21st century marketing, or 3.0. marketing implies consumer participation and co-creation in brand development, while from the standpoint of development of corporate company culture, coaching has an important role in integrating employees through values communicated by the company (involvement of their mind, body, heart, and soul). (Kotler et al, 2010)

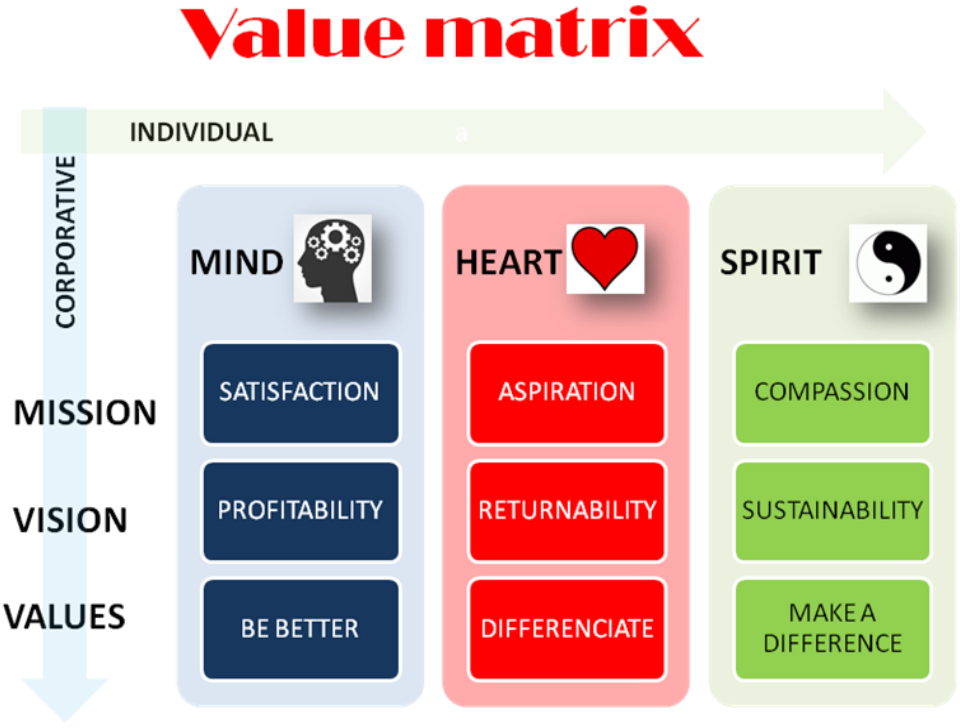

Figure 3. - Value based matrix

Source: Kotler et al, 2010

5. THE ROLE OF INNOVATIVE MILLENNIAL' LEADER IN CREATING ADDED VALUES

We have to be aware that by 2020, the share of Serbian Y generation among working population will be more than 50%, according to the estimates of the Republic Statistical Office from 2016. In addition to the Y generation, generations of Baby Boomers as well as the X and soon Z generation are also working. The development of IT leads to faster development of generations, and each generation represents the specifics of their period. The way how to Y generation buy products and services differs that older generation.

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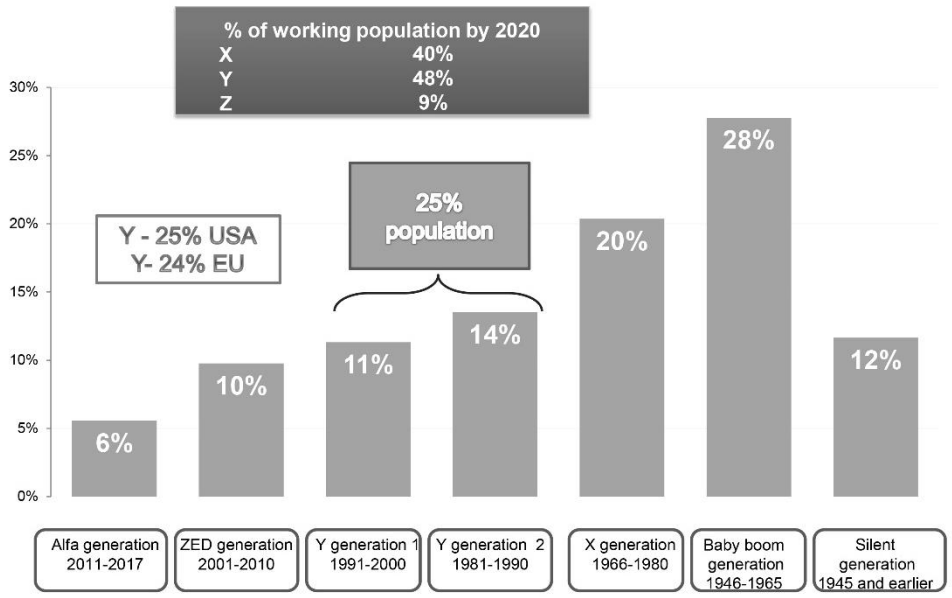

Figure 4. - Serbian generations in the working age population of Serbia

Source: Data are from the last Census 2011.

When they find themselves in the role of managers, members of generation Y are very different from managers who belong to previous generations. They prefer informal feedback and a more casual work environment. The very title 'manager', as in the case of millennials' leaders, is not so important to them. What they find important is to have more autonomy, free time or get recognition for their work. Growing up in a world where nothing has been promised not guaranteed, taught that their skills they must acquire themselves, but also that they themselves seek ways to do so, They are very aware of the problems facing the world in which they live, but also very optimistic in their wish to make changes and make a better, more loyal to themselves, but also the team, and not to the structure of the organization because young leaders are the ones who will lead the world in the future. While experts invest a lot of energy and time to understand how to manage the generation Y, they actually do not realize that this generation learned to lead itself. (Forbes, 2014/5/14) Successful young leaders should know how to inspire employees. To enable mutual collaboration to all, they should have an understanding of individual strengths and weaknesses of a generation and find the point where their opinions diverge and define action steps so as to understand the differences.

The fact that they have excellent knowledge and use technology enables them to work much faster and more productively than older colleagues. They also have a better approach to problems, practical solutions, and clearly defined goals. Self-management is one of the key strenghts of the Millenial' leaders. Since the Y generation is a leader in the labor market all the more visible are changes in the world of business and work environment.

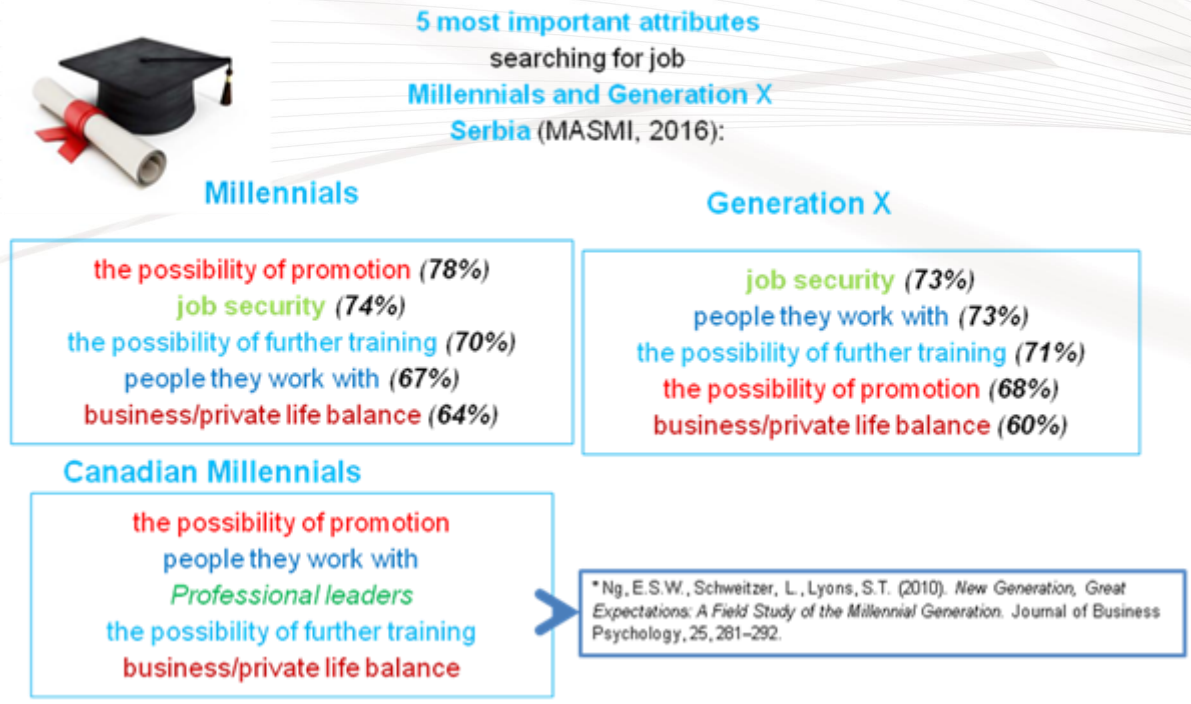

Figure 5. - Most important attributes when considering employment after graduation

Source: Research on Millennials and X generation, 2016

According to survey results conducted in March 2016, Millenials are a generation open to new technologies, it offers space for the implementation of various forms of interactive materials using digital channels.

6. RESULT OF RESEARCH - SERBIAN MILLENIALS IN A WORKPLACE CONTEXT

An especially important topic in the story of Millenials and how they differ from American to Japanese, and Japanese from Serbian Millenials. Research was conducted on a representative sample of 1,000 Serbian Millenials (aged 18 to 36), in order to get insights on different types Millenials and what are the similarities and differences. Looking at the demographics, most of Serbian Millenials are in a middle-lower material status, they just have enough to meet basic needs. Half of them live with their parents, which is understandable given the fact that they are between 18 and 36 years of age and taking into account the practice in our environment that they "fly away from the nest" later than is the case in the West. Regarding education, about a third of them graduates from high school and do not continue their education, one third have a university degree, and every fourth is a student.

6.1. Answers on the question what motivates me (would motivate me) and discourages (would discourage me) in the workplace?

Although it is cited that important motivators are good relationships and the possibility of personal development and training, less than a third of Serbian Millenials would leave the company in which they currently work due to poor interpersonal relationships or lack of possibility for personal development and training. If we compare the motivators for work in a company with demotivating conditions it can lead to the abandonment of the workplace - we can conclude that good human relations and the possibility of personal development and training more impact on satisfaction than dissatisfaction of employees. Thus, two of the three Serbian Millenials would leave the company in which they currently work for better job opportunities.

6.2. Answers on the question what is valued among employers today?

Serbian Millenials believe that some of the most sought-after skills in employees are commitment to the job (69%), work efficiency (52%), literacy (46%), problem solving skills (44%) and teamwork (40%). Dedication and responsibility, as well as emotional and social intelligence are the

skills that women see more than men as the most wanted in the 21st century, while men think its professional integrity. More than half believe that companies most value employees who are involved and highly productive workers, indicating a perception of demanding performance parameters and professional investment by employers to their employees. In addition, four out of ten Serbian Millennials recognize that the skills needed for teamwork is a requirement of employers.

The motivators that are highly rated by the Serbian Millenials that have an influence on their work are: a high salary, the possibility of training and improvement, lifelong learning, interpersonal relationships, job security, a good balance of work and private life. If some of the motivators are not met, people will look for a better business opportunity. As necessary skills for the effective performance at work are: dedication, computer literacy, teamwork, loyalty to the employer, academic knowledge of the profession. Most respondents considered that they possess all the skills necessary for job efficiently. Part of the young people, faced with increasing competition in the labor market, realize that personal development is extremely important as a kind of lifelong learning. They turn to informal forms of training, visiting various seminars and trainings when they get an opportunity, use the programs for professional training and volunteering, even when there is no financial gain. They realize that this, other forms of profit are actually much more important, because it sets them apart from the rest of the labor market and prepares them for the uncertain future. As generation Y are increasingly given managerial positions, not only will the "team values" come to light, but will also impact on the community priorities for organizations to become visible.

7. CONCLUSION

A new manner of thinking and communication of the leader with his or her employees is needed so that results of synergetic action could be efficient and effective, thus making companies successful in the 21st century business-making. In order to be competitive, the most important role of a leader todays is to efficiently allocate employees so as to make them as creative and innovative as possible. The role of coaching-style of the leader is in understanding employees by asking good questions, support in defining and achieving goals, either professional or private, as well as integration and visionary perception of future activities.

The role of the leader Y generation in comparison to other generations in the workplace is very important, how to share and transfer their knowledge and skills, and the constant feedback, the feedback necessary for complex projects and situations. Keeping everything in mind, we can say that this is a generation that shares most of the values of previous generations, but unlike them, are prepared to express their needs and wishes stronger and louder. The challenges in a multi-generational workplace are not seen as insurmountable differences rather challenges whose goal is to harmonize generation and be aware of the advantages of each generation can contribute to improving teamwork and business results, applying collaboration and lifelong education. Using influence, relationships, and strategic behaviour, leaders may inspire, support, streamline, and evaluate creativity of their employees, which results in competitiveness of the organisation in modern business environment.

REFERENCE LITERATURE

Barron, B., & Darling-Hammond, L. (2008). Powerful learning: Studies show deep understanding derives from collaborative methods.

Chen, S.Y., L.P. Chang, 2014. The influences of cognitive styles on individual learning and collaborative learning: Innovations in Education and Teaching International, 1-14.

Coaching definition ICF: International Coach Federation, http://www.coachfederation.org/ [Accessed 01/11/18]

Drawings by Gaša featuring Pixpired http://pixpired.com/ [Accessed 02/11/18]

Education for Sustainability, From Rio to Johannesburg: Lessons learnt from a decade of commitment. (2002) The report has been prepared by UNESCO in its role as Task Manager for Chapter 36 of Agenda 21 and the International Work Programme on Education, Public Awareness and Sustainability of the United Nations Commission on Sustainable Development.

Goleman D. & Boyatzis R. (2008) Social Intelligence and the Biology of Leadership, Harvard Business Review, September 2008

Goleman D., Boyatzis R. & McKnee A. (2001) Primal Leadership: The Hidden Driver of Great Performance, Harvard Business Review, December 2001

http://ec.europa.eu/education [Accessed 02/11/18]

http://scindeks.ceon.rs/article.aspx?query=ISSID%26and%2612646&page=2&sort=8&stype=0&backurl=%2fissue.aspx%3fissue%3d12646 [Accessed 02/11/18]

http://www.forbes.com/sites/lbsbusinessstrategyreview/2014/05/14/generation-y-loyalty-and-leadership/ [Accessed 02/11/18]

http://www.masmi.rs/od-skole-uspeha-milenijalci-generacija-x/ [Accessed 03/11/18]

http://www.masmi.rs/wp-content/uploads/2016/08/Milenijasi-u-Srbiji_Preview_MASMI.pdf [Accessed 02/11/18]

https://en.wikipedia.org/wiki/70/20/10_Model_(Learning_and_Development) [Accessed 02/11/18]

https://www.ibe.unesco.org/cops/Competencies/PillarsLearningZhou.pdf [Accessed 03/11/18]

Kotler P, Kartajaya H, and Setiawan I. (2010) Marketing 3.0., John Wiley & Sons, Inc., Hoboken, New Jersey

Mamula T, Ćoso D. (2015). Millennials' way of e-learning and communication in the digital era, The Sixth international Conference on e-Learning (eLearning-2015), 22-23 September 2015, Belgrade, Serbia http://econference.metropolitan.ac.rs/files/pdf/2015/06-Tatjana-Mamula-Dragomir-Coso-%D0%9Cillennials-way-of-e-learning-and-communication-in-the-digital-era.pdf [Accessed 01/11/18]

Mamula T., Kužet N. (2015). The role and contribution of coaching style of the 21st century' leader, 2nd HR Conference, pp. 394-400. UdEkoM. Belgrade

Mamula T., Popovic S. (2015) Relationship between Innovativeness and Strategic Planning - empirical research, Original scientific paper, JEL: L100 DOI: 10.5937/industrija43-8718 UDC: 005.342:005.51.

Mamula T., Radojević I., Sljepčević M., (2016) Innovative approaches in university and lifelong style of learning designed for new generations, Innovation Competitiveness and Sustanaible Development Conference, ICSD May 2016, Beograd

Nanzhao Z., Yunxiao S. (2001). Toward Learning Society: Building Four Pillars of Learning. Beijing: Beijing Press

Nećak et al. (2016), "Family and school as actors in the process of education" in Milutinović Bojanić S., Ćeriman J. (ed) (2016), Gender upbringing and education: (im)possible dialogue, Center for Law, Ethics and Applied Philosophy (CELAP) and Institute for Philosophy and Social Theory, University of Belgrade (IFDT), Belgrade, pp 65-95

Oblinger, G.D. & Oblinger J.L., editors (2005) Educating the Net Generation, EDUCAUSE www.educause.edu/educatingthenetgen/ [Accessed 03/11/18]

Research on Millennials and X generation, conducted by MASMI, 2016

Srića V. (2004) Inventivni menadžer u 100 lekcija, str 18., Znanje d.d. Zagreb

Tapscott, D. (2009). Grown up digital: How the net generation is changing your world, New York: McGraw-Hill

INCLUSION OF ENTREPRENEURSHIP AND INTELLECTUAL PROPERTY IN UNIVERSITIES' CURRICULA

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Abstract: *The importance of acquiring basic knowledge of entrepreneurship and intellectual property during the academic studies, no matter in what professional environment in the future students will be, is of importance for the improvement of their professional competencies in the field in which they are involved. The ultimate effect is also the better economic indicators of business entities in which they are employed or a more significant and measurable transfer of knowledge in the economy if they remain dedicated to scientific research. Entrepreneurship is also a skill that is useful in both personal and social aspects of everyday life.*

Knowledge based economy promote innovations and background of the majority of innovations lies in numerous researches, prototyping and investment, so use of IP system can be critical in helping new ventures transform their innovation potential and creativity into market value and competitiveness. The term "intellectual property" encompasses a wide range of intangible assets – including patents, industrial designs, copyrights, trademarks and trade secrets. It is important to young people to be familiar with intellectual property, understand its potential to generate income and growth.

KEY WORDS: UNIVERSITY, ENTREPRENEURSHIP, EDUCATION, INTELLECTUAL PROPERTY, KNOWLEDGE TRANSFER

1. ENTREPRENEURSHIP IN EDUCATION

Entrepreneurship is recognized as a key factor for economic growth, employment and personal fulfilment. In order to address the entrepreneurial challenges of adults for entering into the self-employment activities, innovative ventures or other business related activities in their professional life, education should develop awareness on entrepreneurship from an early age. Entrepreneurship is also a skill that is useful in both personal and social aspects of everyday life. It is also the part of recommendation of European Commission for implementing the Lisbon Strategy for fostering entrepreneurial mindsets through education and learning[2]. While recommendations to the public authorities are related to the taking the initiative to promote the basics of entrepreneurship to primary and secondary education, heads of schools and teachers, at higher education's levels recommendations are related to the inclusions of entrepreneurship as an important part of curriculum across different subjects. Combining entrepreneurial mindsets and competence with excellence in scientific and technical studies should enable students and researchers to convert their ideas into the products with the commercial value in the market.

In accordance with the high number of research papers on entrepreneurship from the beginning of 21st century[3] that showed correlation of the cultural value and entrepreneurial mindset, there were recognized several "entrepreneurial cultures". In the countries and environment with the high entrepreneurial orientation, organized entrepreneurial education is widely integrated into all level of education. The lack of entrepreneurial education leads to the low level of intention for entrepreneurial engagement in the student's population[4]. Transformation of Serbia in the last few decades produced economic and social changes that significantly influenced country's educational system. The role of the universities as an engine of economic growth and in development of entrepreneurship's environment and climate can have positive impact on students' entrepreneurial activities.[5] The role of universities is to develop personal competences of students that leads toward behavior of entrepreneur such as creative and innovative thinking, risk taking, initiative, planning, analysis, management, team work, autonomy,

[1] Institution/Affiliation: Intellectual Property Office of the Republic of Serbia, Belgrade
[2](COM 2006, 33)
[3] (Hayton, Cacciotti 2014:3)
[4] (Frank, Luthje, 2004)
[5] (Subotic et al. 2017)

motivation, experiential learning, financial and economic literacy, ethical and sustainable thinking, etc.[1] Entrepreneurial competences as a need of modern society have been recognized as one of eight group of key competences for long-life learning. [2]

Even though the role of universities in developing entrepreneurial skills is irreplaceable, it cannot be seen independently from other institutional and financial infrastructure at national level that should support fostering entrepreneurship. It has been recognized in Serbia and 2016 year was dedicated by the government as a year of entrepreneurship. Also, developing the entrepreneurial mindset through nurturing its potential is the long term goal that could be achieved through all educational levels, from primary to high education. At the high level education, it is important that education on entrepreneurship should be spread not only through the fields social sciences like economy, management, finance, business, but also in engineering and natural science's fields raising the competences of students for converting the innovations and the research results into different business models. In that manner, cooperation of universities with the private sector for experiential learning should be more constructive.

2. INTELLECTUAL PROPERTY AND UNIVERSITIES

Having in mind that knowledge based economy promote innovations and background of the majority of innovations lies in numerous researches, prototyping and investment, IP system can be critical in helping new ventures transform their innovation potential and creativity into market value and competitiveness. Intellectual Property rights (IPR) allow innovative entrepreneurs to protect their inventions.[3] This is particularly the case for new enterprises, as these rely heavily on exploiting intellectual capital in their business models. Protecting an invention is only one of the many roles that IPR may play in innovative firms. Other functions that companies fulfill with IPR are[4]: positioning in global markets; signaling value to investors, competitors and partners; accessing knowledge markets and networks; defending themselves from patent infringement suits; blocking rivals from patenting related inventions; using patents in negotiations over technology rights. The role of IPR in accessing external finance is particularly important and IPR could serve as collateral for bank's or other loans. Shane (2011) also stresses that an effective IPR system allows entrepreneurs to have more time to grow their businesses before their ideas are imitated. For a new firm, time is crucial in order to collect funding, develop the supply chain and reach the market – all aspects in which big companies have a competitive advantage. Effective patent protection may allow a new firm to compete on the basis of differentiation rather than on the basis of costs. This is another a crucial asset for new ventures, since big firms generally have a strong comparative advantage in producing at a lower cost. For knowledge based intensive start-ups, patents are often the only asset entitlement they can use to raise funding. [5]

On the other hand, universities and public research institutes contribute to innovation in various aspects. A traditional way of exhibiting new results is through scientific publication and the knowledge embodied in technological innovations and inventions that are later taken up by innovative firms or had been done in collaboration with the firms. Over the last few decades, commercialization of the knowledge that universities generate through spin-off companies or through licensing out its protected intellectual property had been imposed and later accepted at national level (EU) as a recommendation of European Commission for its member states through Code of Practice for HEIs as a way of generating the income from the generated knowledge [6]. It was accepted as a justification of public investment in research for socio-economic benefit and economic growth.

Active engagement of universities in IP management and knowledge transfer need not conflict with their education and research missions. A proactive IP policy may generate additional revenues for the university, but this definitely is not the sole objective. It can support their mission of generating socio-economic benefits for society, and can become a key element to attract students, scientists and

[1] (Bacigalupo et al. 2016).
[2] (Zlatić, Stamatović, 2018)
[3] https://www.innovationpolicyplatform.org/content/intellectual-property-rights-innovative-entrepreneurship
[4] (OECD, 2011; Cohen, Nelson and Walsh, 2000)
[5] (Hall and Harhoff, 2012)
[6] http://ec.europa.eu/invest-in-research/pdf/download_en/ip_recommendation.pdf

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further research funding, in particular from the private sector and at international level. (Code of Practice, EC 2008).

Despite the incredible importance of intellectual property to the overall economy IP education largely remains the province of law schools. Although the idea of teaching IP-related subjects at the undergraduate level has grown more popular in recent years, there is still more work to be done towards introducing IP into course curriculum.[1] The term "intellectual property" encompasses a wide range of intangible assets – including patents, industrial designs, copyrights, trademarks and trade secrets. It is important to young people: to learn to be familiar with intellectual property, understand its potential to generate income and growth and to respect other people's intellectual property rights.

IP rights and related themes, beside in the Law schools, usually are introduced through IP-related education areas that could serve as the entry points to introduce explicit mentions of IP: entrepreneurship education, arts education, information and communications technology (ICT) education, Science, Technology, Engineering and Maths (STEM) education[2].

3. IF4TM ANALYSIS

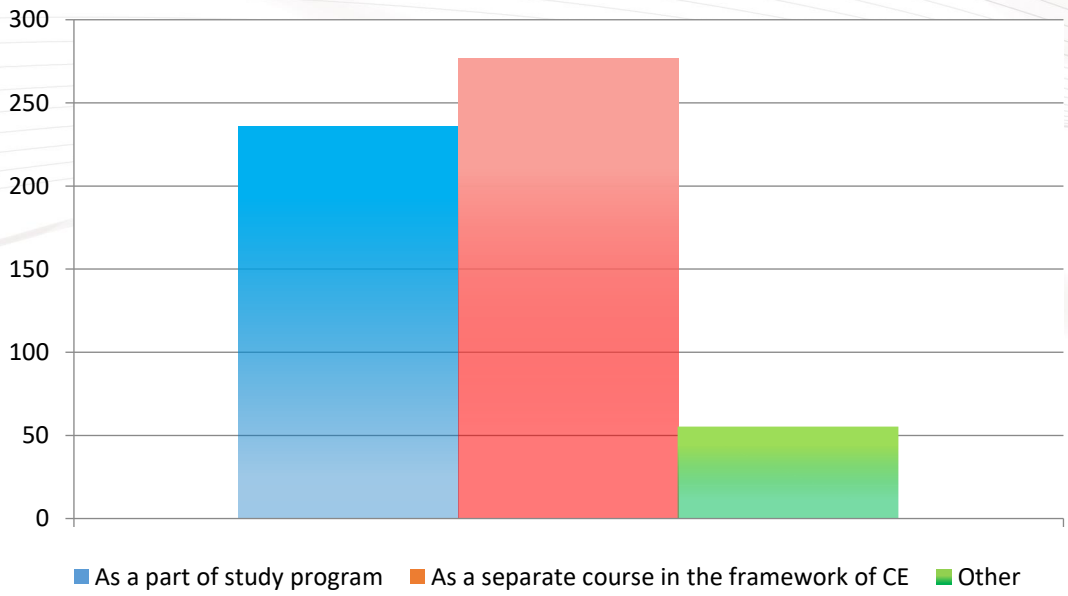
Within the IF4TM project[3] one of the activities within the work package 4 - Continuing education dimension was mapping of activities in continuing education and lifelong learning for activity 4.1 *Defining integrative university approach in continuing education dimension.* Parts of the two questionnaires were dedicated to the inclusion of entrepreneurial and IP topics in formal or CE curricula of 7 Serbian HEIs that are the partners in the project. Universities included in survey within the first half of 2017 were: University of Belgrade, University of Kragujevac, University of Niš, University of Novi Sad, University of Novi Pazar, Technical College of Applied Sciences Zrenjanin as state funded HEIs and Belgrade Metropolitan University as the private one. Even though not all the faculties at partner's universities answered the questionnaires, there were 35 questionnaires 1 answered by the management of faculties and 705 questionnaires 2 answered by researchers and teachers. On the basis of answers some conclusions and recommendations could be brought.

3.1 Entrepreneurship

At almost two thirds half of the faculties (21 out of 35) that responded the survey there is entrepreneurship included in some study programs. Depending on the faculty's field, entrepreneurship teaching varies from dedicated subject to the topic to inclusion of the entrepreneurship into the curricula of other subjects. Separate subjects on entrepreneurship already exist at the faculties of economy and at some of them as a separate study program, in the study programs for management at technical faculties or within the subjects that includes management of innovations in the particular scientific field of the faculty (Entrepreneurship and innovation, Entrepreneurial management, Entrepreneurship in ICT, Engineering management of innovation, etc.). There are also subjects at the art schools that include entrepreneurship.

75% individual respondents have a positive attitude on inclusion of entrepreneurship in education curricula at their HEI, but answers on the ways of inclusion vary as it is shown on the Graph 1.

[1] (Soetendorp, 2005)
[2] (OAMI, 2013)
[3] http://www.if4tm.kg.ac.rs



Graph 1: Answers on the ways how entrepreneurship should be included in education at HEI

Opinions are almost equally split among introduction of entrepreneurship as a separate subject in formal study programs and as a separate course within Continuing education.

Teachers who deliver the lectures on entrepreneurship acquired competence in this field mostly through formal education (economy and management study programs at HEIs), some of them declared that they combined formal and continuing education and the smallest number of teachers declared that the competence for entrepreneurship education they acquired only through CE. Even though there are some programs where teachers can acquire necessary competence for entrepreneurship, there is a need for designing special program for each of faculties' field in cooperation with the teacher of business economy as well as to motivate the teachers to upgrade their capacities for inclusion the entrepreneurship fields wider in their curricula.

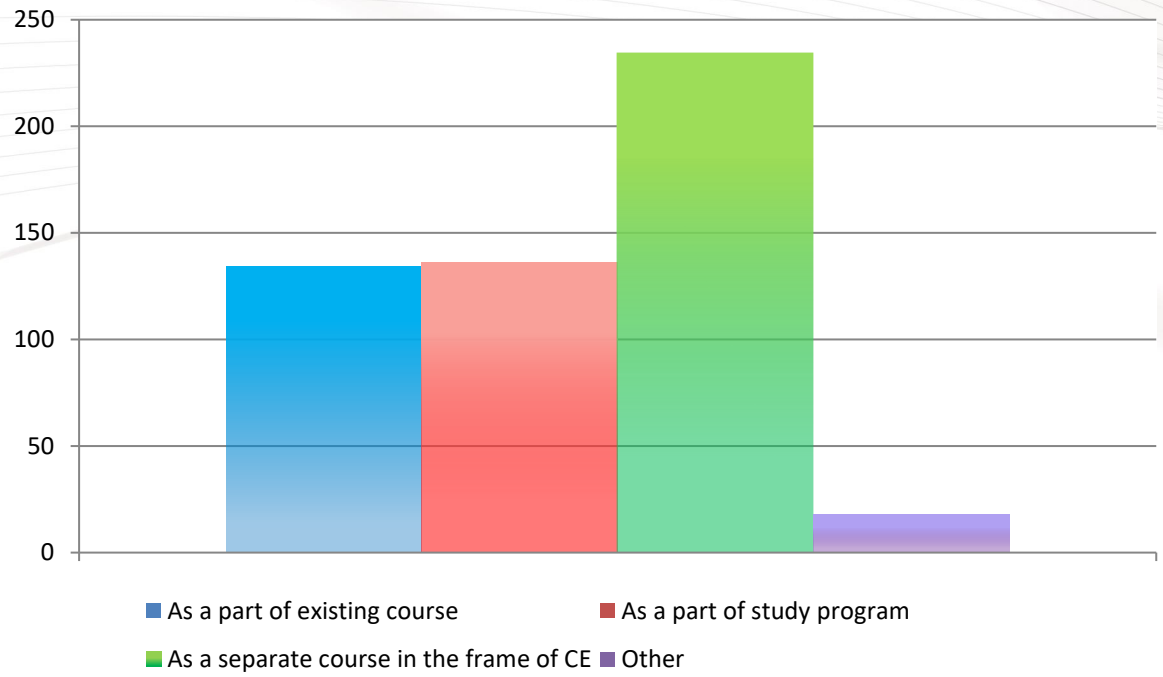
Significant contribution to entrepreneurship development at universities are provided by business incubators and science and technological parks as well as more often new hubs establishment.

One of key missing link is connecting the students and researchers from different faculties for developing new ideas in cooperation. Establishment of creativity centers within the IF4TM could address that challenge which would be the place for linking the experts with the different expertise.

3.2 Intellectual property

At 4 out of 7 HEIs that participate in IF4TM project there are some forms of regulation of IP generated at universities, mostly as a Rulebook on IP management. At the level of members of universities that legal act had been trans ponded at 9 out of 25 respondents at faculty's level. The number of faculties that responded the survey cannot represent the general application of that legal act since some universities were not represented with majority of its members (eg. UBG). The real application of the rules for IP management at the level of faculties has not clear defined yet. During the project UKG brought the Rulebook on IP at university level.

In regard to the inclusion teaching on IP, at 11 out of 25 faculties that responded to questionnaires about IP there are IP topics included in some subject, as separate one or within the existing subject. The question of relevance of data depends on number of respondents. On the other hand, the majority of individual respondents with the high percent (68%) showed willingness to introduce IP as a part of study programs. Half of respondents would like to introduce IP as a separate course within CE while one quarter would like to introduce IP as a part of study program and one quarter as a part of existing course.



Graph 2: Respondent's answers on the ways how they would like to introduce IP in education

58% respondents expressed the need for additional teaching material for raising the competences of teachers in IP topics. Mapping analysis had been conducted prior to the workshops on IP management that were conducted later on within the activity 4.2 of the project by the Intellectual Property Office and its Education and Information Center. Intellectual Property Office of the Republic of Serbia as a partner in the project prepared additional material that could be used for teaching on IP. Part of material had been prepared by European Patent Office and translated in Serbian as Patent teaching kit but also updated with the IP basic and IP Management topic. Also, with curricula for workshops, additional sources of material for reading were obtained as well as a list of teaching books and tutorial for creation of curricula for different fields (STEM fields, socio-humanistic fields, arts, etc.). The teaching material created is intended mostly for non-law schools which has in their study programs separate subjects related to specific industrial property rights, copyrights and other IP related issues.

One of the main goal of IP Strategy in previous period 2011-2015 as well as continuation in part in new, recently adopted one for 2018-2022[1] is education and capacity building for knowledge transfer in the function of the improvement of intellectual property application in the business environment. Measures for reaching the goal are: the introduction of intellectual property teaching at universities through accredited study programs, stand-alone courses or other subjects adapted to educational profiles, as well as through continuing education courses; formal introduction of third mission of universities in the Law on higher education; raising the level of IP management in R&D organizations; adoption of national recommendations for universities and institutes in IP management in knowledge transfer; other measures for implementation of IP system in innovation activities of SMEs and infrastructure support for innovative projects that includes commercialization of IPR. Measures are in line with the framework of IF4TM project, so previous topics of inclusion or enlargement of entrepreneurship and IP education at universities would contribute to the fulfilment of goals set in the IP Strategy.

3.2. Introduced new subjects into universities' curricula

During the IF4TM project 15 new subjects were introduced at 7 HEIs that encompass in curricula topics of entrepreneurship and intellectual property. Entrepreneurship have been included in 10 subjects at partner's HEIs. Majority of subjects as a subject of studying have management and entrepreneurship in business, business development planning, introduction of product to the market and

[1] http://www.zis.gov.rs/upload/documents/pdf_sr/pdf/Strategija%20razvoja%20IS%202018.%20do%202022.%20god.pdf

similar and some of them are closely related to management and entrepreneurship in specific scientific field. Majority of subjects are introduced at technical faculties.

IP topics have been introduced during the project IF4TM within the seven subjects. Four subjects are dedicated to teaching only intellectual property at two law schools and at two technical faculties, while one subject includes intellectual property within the management of innovations and two subjects combine intellectual property with entrepreneurship topics.

Even though the subject of work package was not the analysis of existing study programs that include above mentioned fields, in the *Integrated report on improving faculties study programs with entrepreneurship and intellectual property*, part of report is the table with the existing subjects at partner's institutions based on submitted information and research through available syllabus at HEI's websites. (Activity 4.5 of IF4TM). The table cannot be considered as the final one but informative one. In the table there are 35 subjects that include entrepreneurship and 35 subject that include IP in syllabus. Five subjects have the common denominator both fields, entrepreneurship and intellectual property.

4. CONCLUSIONS

In order to achieve the long-term effect of creating an entrepreneurial spirit of young people, regardless of the choice of scientific fields, it is necessary to reach consensus and raise awareness about the importance of this topic for the professional development of students and researchers, but first of all to clearly define the position of faculties to dedicate the part of education and research in that direction. Presence of entrepreneurship education is notable at Serbian universities but it should be included into the subjects of almost all faculties' study programs with customization to specific scientific\teaching fields. Also, recommendation based on individual mapping analysis at HEIs is to make additional efforts at all faculties for inclusion of intellectual property in as many curricula as possible, either through the introduction into general acts or through facilitation and additional training for teaching staff which are willing to include this field in their subjects.

Whether it's about one or another area, raising awareness about the necessity of change and the introduction of new topics that address challenges of society (intellectual property, entrepreneurship, etc.) in education is something to be looked at in the long run, and what should be methodically done in the upcoming period.

REFFERENCE LITERATURE

Bacigalupo, M., Kampylis, P., Punie, Y. and G. Van den Brande (2016). *EntreComp: The Entreprenuership Competence Framework*, Luxembourg: Publication Office of the European Union. Retrived Noveber 1, 2018 from the World Wide Web http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101581/lfna27939enn.pdf

Hayton, J. C. and G. Cacciotii (2014). Is there an entreprenual culture? A review of the empirical research, *ERC Research Paper*, No.16. Retrieved November 1, 2018 from World Wide Web http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101581/lfna27939enn.pdfhttps://www.enterpriseresearch.ac.uk/wp-content/uploads/2014/02/RP-16-Hayton-Full-Paper.pdf

Hall, B. H. and D. Harhoff (2012). RECENT RESEARCH ON THE ECONOMICS OF PATENTS, National Bureau of Economic Research, Cambridge, January 2012. Working Paper 17773. Retrieved November 3, 2018 from World Wide Web https://www.nber.org/papers/w17773.pdf

Cohen, W.M., R.R. Nelson, and J.P. Walsh (2000), "Protecting their intellectual assets: Appropriability conditions and why U.S. manufacturing firms patent (or not)", NBER Working Paper No. 7552. (OECD cited at https://www.innovationpolicyplatform.org/printpdf/12419)

Lüthje, C. and Franke, Nikolaus (2004) Entrepreneurial Intentions of Business Students: *A Benchmarking Study*. International Journal of Innovation and Technology Management, 1 (3). pp. 269-288. Retrieved November 1, 2018 from World Wide Web http://epub.wu.ac.at/3097/

Soetendorp, R. (2005). Intellectual Property education – In the Law School and Beyond. Centre for Intellectual Property Policy and Management . Retrieved on November 2, 2018 http://eprints.bournemouth.ac.uk/3195/1/478.pdf

Subotić, M., Mitrović, S., Grubić-Nešić, L. and D. Stefanović (2017). Uloga univerziteta u razvoju preduzetništva, XXIII Skup Trendovi razvoja: Položaj visokog obrazovanja i nauke u Srbiji, Zlatibor, February 2017. Paper No. T3.3-9, pp. 1-4. Retrieved November 1, 2018 from World Wide Web http://www.trend.uns.ac.rs/stskup/trend_2017/radovi/T3.3/T3.3-9.pdf

Zlatić, L. and J. Stamatović (2018). Entreprenuership Education at Faculties of Education. Conference „Innovative Learning and Teaching“, September, 2018., Slovenia

Communication from the Commission to the Council, the European Parliament, the European Economic and Social committee and the Committee of the Regions - Implementing the Community Lisbon Programme: Fostering entrepreneurial mindsets through education and learning /* COM/2006/0033 final */ https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52006DC0033&from=EN

European Intellectual Property Office, European Citizens and Intellectual Property: Perceptions, Awareness and Behaviour (2013). https://oami.europa.eu/ohimportal/documents/11370/80606/IP+perception+study

Intellectual Property for Innovative Entreprenuership, https://www.innovationpolicyplatform.org/content/intellectual-property-rights-innovative-entrepreneurship

Intellectual Property Office of the Republic of Serbia, IP strategy for 2018-2022. http://www.zis.gov.rs/upload/documents/pdf_sr/pdf/Strategija%20razvoja%20IS%202018.%20do%202022.%20god.pdf

IF4TM Erasmus+ project, http://www.if4tm.kg.ac.rs

NEW TENDENCIES IN ENGINEERING EDUCATION AT UNIVERSITY OF NIŠ

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Abstract: *In this paper, new tendencies in engineering education at Faculties of Electronic and Mechanical Engineering as parts of University of Niš will be considered. These tendencies are caused by immense ongoing changes in modern industry and labour market. Modern engineering curriculum can no longer emphasize narrow specialization in their field of expertise but has to strongly promote practical learning and development of digital and entrepreneurial competences among the students. Various national and international projects can provide substantial help in reaching that goal.*

KEY WORDS: ENGINEERING EDUCATION, CURRICULUM MODERNIZATION, ENTREPRENEURIAL COMPETENCES, IF4TM PROJECT

1. INTRODUCTION

Ongoing changes in world economy and industrial production, caused by the rapid development of information technologies and technological innovations, dictate continuous modernization in the education process. Engineers of today cannot be trained in the same way they were trained before. Modern engineering curriculum should not be based only on new teaching methods and regular introduction of new lecture topics, but also on the strong practical part of learning and development of digital and, especially, entrepreneurial competences among the students. Acquiring basic knowledge on intellectual property and entrepreneurship during academic studies, no matter which professional direction will later be chosen by students, is of great importance for the advancement in their future professional lives as well as for better economic indicators of the companies in which they will be employed.

This paper describes attempts of professors at two faculties of University of Niš (Faculty of Mechanical Engineering and Faculty of Electronic Engineering) to cope with modern challenges in engineering education related to the development of entrepreneurial competences among the students in the sense of encouraging their active participation in society, future job search and launching start-ups. These efforts are in the line with proclaimed goals of the Serbian Ministry of Education, Science and Technological Development to help development of new and innovation of existing study programs that support the labour market needs, improve entrepreneurial skills of students and cooperation between higher-education institutions on one side and companies and other interested actors in local communities on the other side.

In order to fulfil set goals regarding realization of entrepreneurial ideas and innovations, professors, assistants and students of these two faculties besides usual facilities (classrooms, laboratories) also have at their disposal help of recently established university's Innovation and Creativity Center. These centres were founded on the basis of the Erasmus+ project IF4TM (Institutional framework for development of the third mission of universities in Serbia). Project supports development of a third mission (technology transfer and innovation, continuing education and social engagement) at

[1] Institution/Affiliation: University of Niš, Faculty of Electronic Engineering
[2] Institution/Affiliation: University of Niš, Faculty of Mechanical Engineering

higher education institutions in the Republic of Serbia. The role of the Creativity Center of the University of Niš is to foster the creativity and innovation of young people in the academic population, to teach them on intellectual property topics and thus contribute to creating an environment in which they can realize their entrepreneurial and research potential. Creativity Center also organizes the competition for best ideas of students whose goal is to help students to develop their business ideas and manage their innovations.

2. NEW EDUCATION MODEL AT THE FACULTY OF MECHANICAL ENGINEERING

2.1. Motivation

Modern mechanical engineers have to be able to follow entire life cycle of a product, from idea to its concretization through manufacturing, distribution and recycling. Their job is to develop new or improve existing products and, in that way, to fulfil demand-driven market needs through creativity, innovation and technology. The implementation of the product idea goes through advanced design methods and technologies like 3D graphics systems, simulation software and virtual and physical prototypes. Ever-changing market dictates a fast and accurate development of ideas and their realization. This leads to parallel and complex processes in product development and production which requires a methodical approach in solving problems, where teamwork is increasingly important. New sales potential is recognized through continuous innovation in interaction with the market where important part is the business plan which describes the cycle of strategic planning and supports selection of the optimal production concepts considering cost and revenue as well as needed resources.

2.2. Modernization of curriculum

In order to achieve above mentioned goals, the new education model in the field of product development was defined at Faculty of Mechanical Engineering, University of Niš (Miltenović et al, 2013). Implementation of new education model was performed through several subjects already existing in the curriculum, but also through newly accredited study programs like master program Engineering Management. In this model, theoretical education is contributed with practical experience and this knowledge is implemented through seminars and praxis with real examples from industry. The modernized courses integrate theoretical and methodological knowledge and they are designed to promote the development of creativity by combining the lecture with independent development work of the students.

During the lectures, students are introduced to product development of industrial enterprises with particular reference to the requirements of small and medium sized companies. Based on practical experiences and examples from industry, the theory of planning, design, cost control and management of the development and innovation process is discussed. Problem solving processes, system analysis, team leading, product lifecycle and development strategies are presented, as well. Students are taught how to define profile of the product and product concept from ideas and how to efficiently evaluate different concepts and solutions. Lectures are accompanied by practical workshops where the knowledge is actively built up and developed with the first real application experiences. This is achieved through direct and practical translation of the learnt methods directed to the industrial product development process and simulation of team work during solving of practical problems.

2.3. Study program Engineering Management

The professors of the Faculty of Mechanical Engineering recognized the need for separate master study program that would deal with all the modern industry production demands and developed study program Engineering Management[1] with the goal to broaden the academic knowledge and skills acquired at the undergraduate level of studies, within the chosen specialized field. The study program of master academic studies in Engineering Management is conducted within five modules: Energy Management, Industrial Management, Management in Transport and Logistics, International Project Management and Entrepreneurship, Innovation and Product Development Management. The last two modules are particularly interesting from the entrepreneurship side because they consist of the courses like: Methods and techniques of project management, Technology-based entrepreneurship,

[1] http://www.masfak.ni.ac.rs/index.php/en/studies/master-academic-studies/engineering-management

Entrepreneurship and creative industries, International marketing of products and services, Public relations and corporate entrepreneurship, Human resource management in an entrepreneurial environment, Integrated product development, Tools and technologies in product development, Success factors in product development, Protection of intellectual property, Innovation management, Basics of product development validation. Many of these courses are electoral, tailored for personal interests and preferences of students.

2.4. Student projects

Important part of the teaching process are student projects whose aim is the development of realistic industrial product from product profile up to the virtual prototype (3D-CADModel) or from the idea up to the validation of manufactured prototype by independent student teams. Provider of the development task is always an industrial company which defines either the development area or an idea. Students work in the simulated environment of the midsized enterprise in which the virtual management is composed of course professor, assistants, project sponsor representatives and guest professors. Management role is to ensure all recourses needed for successful work on project as students are actually employed in midsized enterprise. Student teams are located into separated virtual offices in which they dispose with all hardware and software tools necessary for project development.

3. NEW EDUCATION MODEL AT THE FACULTY OF ELECTRONIC ENGINEERING

3.1. Motivation

The third industrial revolution (digital revolution), that took place in the late twentieth century, meant the introduction of computers and automation in the production process. Today, four decades later, we are entering the fourth industrial revolution (Industry 4.0), which is based on the use of information technologies in creating "smart" services and production. In order to respond to the new demands in the field of industrial production and to train students in the basic concepts and applications of Industry 4.0, a group of teachers at the Department of Control Systems at the faculty of Electronic Engineering, University of Niš, introduced and innovated several courses related to the artificial intelligence and intelligent control.

Public call for projects "Development of Higher Education" by Serbian Ministry of Education, Science and Technological Development was a good opportunity to make a concept of modernization of curriculum for study module Control Systems[1]. Ministry had program objectives to improve the competencies of teachers and associates for teaching process, to develop new and to innovate existing study programs that support the labour market needs, to develop entrepreneurial skills of students and to improve the cooperation between higher-education institutions and companies as well as other interested actors in local communities, to increase the usage of information technologies in teaching and learning process and to directly support the realization of the government action plan to improve IT sector in Serbia.

3.2. Modernization of curriculum

Study module Control Systems is very attractive for students, because it enables acquiring knowledge from several scientific fields and represents one of the most perspective IT areas of the future. During the school years, students gain knowledge of computer and information technologies, electronics, automation systems, robotics, measurement, electric power engineering and telecommunications. Today, traditional automation and process control techniques are being intensively replaced by new types of intelligent control. Benefits of using intelligent structures are multiple, from energy and resources savings to more efficient and accurate control, prediction of desired parameters, greater system resilience to external disturbances and more reliable work.

In the scope of the proposed project "Implementation of Modern Intelligent Control Methods within the Study Module Control Systems", a plan for innovation and introduction of several courses was made: Artificial Intelligence Methods, Entrepreneurship for Engineers (basic academic studies), Modern Control of Industrial Processes (master academic studies) and Intelligent Control (doctoral academic studies). Emphasize was not only on modernization of lecture topics and teaching methods

[1] http://www.elfak.ni.ac.rs/en/courses/master-academic-studies/656-control-systems

but also on strengthening practical part of learning as well as developing digital and entrepreneurial competences among the students.

Main goals of modernization were: adapting the curriculum to the needs of the IT industry and the rest of the labour market, innovation of teaching methods with increased number of practical teaching units, curriculum harmonized with successful related study programs at faculties abroad, increase in the number of professional student practices in successful IT companies, improved creativity and entrepreneurial skills of students, contribution to dual education through cooperation with selected companies and directing students toward start-ups.

Essential part of modernization was cooperation with business partners in various forms: arranging professional practices for students, identifying the necessary IT competencies that the Control Systems engineer should possess after completing studies in the domain of artificial intelligence, consultative help in the development of the curriculum, defining project assignments for students, identifying the topics of lectures that will be held by industry experts to students, designing student ideas to be realized in the university creativity center.

The lack of basic knowledge among graduated students about entrepreneurship and the commercialization of their ideas, which are essential today for the development of any successful business, proved the necessity of existence of separate course on the module (beside new lectures as part of existing engineering courses) which would deal with entrepreneurship for engineers. Some of the topics that are particularly useful within this course are: development and validation of the business model, the start-up concept, market strategy, planning costs, financing methods, business presentation, and protection of intellectual property.

3.3. Student projects

Important part of innovated courses are practical individual and team projects where students are able to develop teamwork competencies, learn through experience, take initiative and plan and manage a project task - implementation of the intelligent control system, from the idea to the practical solution. During these activities, teachers draw students' attention to errors, evaluate their work continuously, and form final grade that represent a sum of theoretical and practical knowledge as well as quality of teamwork within project teams. These projects are tailored in such a manner that they can also help in the development of digital (Carretero et al., 2017) and entrepreneurial competences (Bacigalupo et al., 2016) among the students in the sense of active participation in society, future job search and launching start-ups. After completing projects, students possess necessary theoretical and practical knowledge needed to solve complex problems of modern control and to successfully propose new ideas, technical solutions and innovations in the field of intelligent automation.

4. IF4TM PROJECT CONTRIBUTIONS TO THE DEVELOPMENT OF NEW EDUCATION MODEL AT UNIVERSITY OF NIŠ

4.1. IF4TM project

The Erasmus+ project "Institutional Framework for the Development of the Third Mission of Universities in Serbia" (IF4TM)[1] aims to contribute to the development of a third mission (in addition to education and research) at higher education institutions in the Republic of Serbia. The third mission (Foss and Gibson, 2017) encompasses a wide range of activities involving the generation, use, application and exploitation of knowledge and other university capabilities outside academic environments. Those activities are divided into three dimensions: 1) Technology transfer and innovation; 2) Continual education; 3) Social engagement.

One of the most important goals of the project is promotion of modernization of curricula at Serbian universities with the goal to achieve the long-term effect of creating entrepreneurial spirit of youth through introducing new lecture topics and courses in the area of technology transfer and innovation, intellectual property and entrepreneurship. Faculties of Mechanical and Electrical Engineering seized that opportunity to use various forms of help from IF4TM project results, like use

[1] http://www.if4tm.kg.ac.rs/

of university creativity center, established under the influence of the project, or participation of students in project competition for best entrepreneurial idea.

4.2. University centers promoting entrepreneurial competences

University of Niš has several centers, established partially under influence of IF4TM project, which can be helpful in development of new education model at technical faculties. University of Niš on 18.04.2016. founded the Innovation Center[1] as the organizational unit of the University in which, in an organized and systematic manner, university employees work on the application of their own and scientific results of others as well as modern technological processes in order to create innovations, develop prototypes, new products, processes and services or to improve existing ones, and at the same time to transfer the knowledge and technologies in production and services of other economic entities. The Innovation Center organizes scientific research, develops innovations, provides consulting services to companies, public services and entrepreneurs, helps in the establishment of innovative and high-tech companies, provides assistance in establishing incubators and technology parks, and educates and trains staff.

In the scope of IF4TM project, University of Niš decided to also establish Creativity Center on 13.09.2017. as a separate organizational unit, which includes a collaborative multidisciplinary space where students can develop creative thinking, entrepreneurial spirit and innovation in a relaxed and friendly atmosphere. The newly established Creativity Center will play an active role in modernizing the University from educational and scientific research into a socially active and responsible institution through the development of ideas, teamwork, volunteer activities and establishing contacts with important structures within and beyond the academic community. Through the development of creativity and entrepreneurial skills, center should open up new opportunities for students and researchers to start their own business through the establishment of a start-up or spin-off companies. Location of the center at the Faculty of Mechanical Engineering, which is, again, located next to the Faculty of Electronic Engineering, is very fortunate for development of new education model at these two faculties. One of important tasks of the center is also organization of competition for best idea of students.

4.3. Competition for best ideas of students

One of the ideas of IF4TM project is the use of established creativity centers for the organization of the competition for best ideas of students. In order to support the development of ideas and innovations, computer platforms for innovation management were developed. Using these platforms, students can govern and develop their business ideas and innovations. Competition for the best student idea has the following goals: promoting entrepreneurial culture in the student population, encouraging the development of student creativity and support to develop their own business ideas, facilitating the transfer of innovative ideas into products or services on the market, thereby improving the socio-economic environment. Competition should also help students with providing the necessary knowledge and skills to start their own businesses (enterprises), thanks to carefully designed training courses. With these goals, competition for best ideas proved to be compatible with proclaimed goals of modernization in engineering education, so students are encouraged to enter the competition and use the competition resources and activities to improve their entrepreneurial skills.

5. CONCLUSION

Continuous changes in world economy and industrial production dictate modernization in the engineering education process. Engineers of today must be trained with the strong practical part of learning with emphasize on development of entrepreneurial competences. Acquiring basic knowledge on development and validation of the business model, start-up concept, market strategy, planning costs, financing methods, business presentation, and protection of intellectual property, is of great importance for the advancement of students in their future professions as well as improving local and national economy.

This paper presented efforts of professors at Faculty of Mechanical Engineering and Faculty of Electronic Engineering, University of Niš to deal with described new tendencies in engineering

[1] http://www.icun.ni.ac.rs/index.php/sr

education. These efforts are directed toward introducing new entrepreneurial topics into existing courses as well as introducing whole entrepreneurial courses and study modules, accompanied by cooperation with business partners in form of arranging professional practices for students and defining practical project assignments. Different national and international projects also proved to be very helpful in described modernization of engineering studies.

REFERENCE LITERATURE

Bacigalupo, M. et al. (2016), "EntreComp: The Entrepreneurship Competence Framework" *Publications Office of the European Union*

Carretero, S. et al. (2017), "The Digital Competence Framework for Citizens" *Publications Office of the European Union*

Foss, L. and Gibson, D. (2017), *The Entrepreneurial University: Context and Institutional Change*, Routledge.

Miltenović, V. et al. (2013), "The New Engineering Education Model on University of Niš" *Power Transmissions*, pp 729-741

DEFINING TRAINING NEED FOR ACADEMIC STAFF BASED ON THE SUPPORT PROVIDED IN DEVELOPMENT STUDENT INNOVATIVE IDEAS

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Abstract: *During competition for best student ideas, student teams had support from different departments of the State University of Novi Pazar. Research showed that most teams requested support from the field outside of their department. Based on analysis of their needs we proposed course for the teachers which is essential for supporting students to promote entrepreneurial skills. Also, research showed need for constant involvement of the academic staff in continuing education process.*

KEY WORDS: INNOVATION, CURRICULUM DEVELOPMENT, CONTINUING EDUCATION, MULTIDISCIPLINARY APPROACH

1. INTRODUCTION

Idea of multidisciplinary scientific approach is idea of interconnection and providing missing elements and implementing different approaches between different sciences to increase level of knowledge in desired fields of science. Implementation of this concept especially in modern society raised new questions, like do all fields of science yield to become one joint scientific endeavor or maybe as specific field of science.

Since all sciences have different fields of research, and there is evident problem if we try to use terms or research from one field of science in other we can raise sound question were multidiscipinarity actually can take place. Classical research cannot provide tools for multidisciplinary, but fast and sound development of the technology provide main inputs which ultimately lead to multidisciplinary approach. This development was clear in early stages of development of physics in early 20th century, where many important discoveries like X-ray discovery were implemented in medicine. This fact required all new set of skills and employment opportunities in medical institutions based on knowledge of physics. But that was not enough since new ways of diagnostics at same time produced new and until then unknown health issues.

This new development established new challenges in front of education system. Curriculums should be prepared in line with new requirements and new developments. Education system especially on tertiary level is strictly divided into specialized fields of education and implementation of new paradigm showed as big challenge.

Emergence and adopting of ICT technologies, by wide community made this approach easier and academia started to adopt and implement new technologies. Market is in growing demand of trained experts, if educational institutions want to provide knowledge they must be in lead of technological advance. This paper will provide overview of approaches which provide chances for multidisciplinary approach to teaching, challenges for teachers and need for their life long learning effort, and practical implementation of joint courses and exchange of ideas. We will analyze case study for need of application of importance of learning multidisciplinary approach based on the analysis of the need of student team who applied for a student competition of best student idea.

[1] Institution/Affiliation: State University of Novi Pazar

2. MULTIDISCIPLINARY APPROACH IN SCIENCE

Historical development of the science showed that diversification of scientific knowledge was important tool for scientific disciplines to develop proper tool. Development of complex machines requires joint effort of highly specialized skill and professionals. Joint solution for different sciences was hard endeavor, until technology applied. Multidisciplinary approach to solving problems is successfully used in researches concerning global warming where inputs from physics, meteorology, temperature measuring, computer simulations can be used to achieve proper conclusions.

Development of technology created paradigm for new approach. When we speak about any scientific discipline, like astrophysics or high energy physics we can conclude that these scientific disciplines could not exist without technological base. Technology application in these sciences became norm and we cannot divide endeavor of the engineers, and technological staff and pure theoretical discoveries. Sciences of this type are multidisciplinary by norm since technological approach is deeply involved in those sciences. Areas of those sciences are very wide, and some sets of those sciences and their multidisciplinary approach is self evident like in molecular biology, neurosciences, nanotechnology.

3. ANALYSIS OF THE STUDENT NEEDS BASED ON BEST STUDENT COMPETITION PROPOSALS

In order to establish need for lifelong learning of academic staff we will analyze student ideas proposed during two rounds of competitions, and expected support from academic staff during competition.

During invitation period 54 students applied from 11 different study programmes and 19 potential innovative ideas (Table 1). Teachers from all corresponding departments and study programmes agreed to provide support to project team in the field of their expertise. In the beginning of the project idea development we established two research question for team members

"For completing of Your idea knowledge gained from teachers on Your study programme is sufficient?"

"Do You think that additional resources should be used to support development of Your Idea?"

Overall majority 18 (86%) teams out of 21 answered that they think that support only from their teachers is enough and that additional support will not be needed.

According to methodology of competition and provided guidelines for competition all team completed similar phases in preparation of project idea. First part of methodology were theoretical trainings on innovation, invention and market capitalization of idea. Students learned about methodological approach how to manage innovation and innovation cycle. Result of training were innovative ideas defined as clearly as possible and problems to tackle were identified.

In the second phase students were bringing together to trainings share and propose ideas and problems which they plan to solve. In communication with other students they elaborated basic idea and adopted comments and solutions from their peers in order to evolve idea further.

After that students were presented with the concept of entrepreneurship, innovation, Start-up Company. They became familiar with those concepts in order to properly determine business model which can commercialize their idea. Business model describes the rationale of how an organization creates, delivers and captures value.

After this initial learning students were introduced with the concept of business model validation. Environment chart, Business model chart as well as Value chart were conceptually specified. Emphasis was put on the concepts of Customer profile and Value map. Profile (of the segment) of buyers describes a certain segment of one business model in a detailed and structural manner. Buyers are observed from the aspect of: problems/needs they have, wishes and jobs they need to be done. The chart of estimated value describes the characteristics, specific predicted values business model should deliver. The value is presented through: products and service, elements solving the problem (necessity) (eliminates buyers' pain) and elements meeting buyers' needs.

Last part of this segment was dedicated to financial aspects of a business idea and students were thoroughly introduced to the concept, structure and types of expenses, income models, sources of start-up company financing, balance sheet and profit and loss account. Emphasis was put on preparing reports on monetary course, as a difference between cash inflow and cash outflow.

After completion of this part student developed business model in close cooperation with professors and assistants from department of economy in line with theoretical CANVAS model.

Finally, trainings was dedicated to the presentation of a business idea. Students were introduced to the "formula" of pitch presentation, i.e. to the content and order of topics in a presentation. It alludes students should first present a concrete business problem, as well as offering an answer to the question how their start-up company solves the problem. In addition, they were to give an answer to the question on the size of a market, business model, competition, investment, as well as the board members. Students also prepared short promo videos for their ideas and were motivated to put video on YouTube channel and reaching as much their fellow colleagues. Aim was to prove reach of marketing promotion by collecting number of verified likes on Youtube channel.

Since all these problems were connected to economical aspect for management aspect of project student teams unfamiliar with those concepts decided to try to find appropriate support with teacher of other study programme and most of them resourced to teacher from department of economics. Also 13 teams required support from the teachers on department of IT technologies. Only one team received all needed support from the teachers on the study programme they attend.

Table 1. Overview of student ideas, study programs and delivered support by the field of work

Student idea	Number of students in team	Study program	Field of provided support
Development of the greenhouse watering system	2	Agronomy Information technologies	Agro business Basics of Management
Innovation of smart elements in textile production in Novi Pazar area	4	Economy Information technologies Audio-video technologies	Entrepreneurship Basics of Management Basics of Management
Home aquarium based on hydroponic systems	2	Architecture Information technologies	Management in Architecture Basics of Management Agro business
Shakes and refreshing drinks	3	Economy Agronomy Information technologies	Entrepreneurship Agro business Basics of Management Food production
Bioluminescent plants for buildings	4	Biology Architecture	Management in Education Management in Architecture
Development of the online system with educational games for elementary school teachers	2	Information technologies Mathematics	Basics of Management Management in education
Software for the smart house systems	4	Software engineering	Basics of Management Construction and architecture
Bricks based on traditional building techniques with solar panel implementing technologies	4	Construction engineering Architecture	Management in Engineering Management in Architecture
Smart wallet systems	4	Audio-video technologies	Basics of Management
Security system for the children	2	Economy	Entrepreneurship Information technologies
Online system for reading power consumption	4	Information technologies	Basics of Management Power management
Ecological and decomposing packages	4	Biology Chemistry	Management in education Management in education
Ecological park desks	3	Construction engineering	Management in Education Entrepreneurship
Smart system for reading and translation	4	Information technologies	Language
Educational software	2	Mathematical sciences	Management in Education Entrepreneurship
Bee wallet	4	Audio-video technologies	Management in Education

Educational robotic systems	3	Software engineering	Basics of Management Entrepreneurship
Green revolution	3	Construction engineering Architecture	Basics of Management Entrepreneurship
Beach safety	2	Economy	Basics of Management Entrepreneurship

Up to the final of local competition only five out seven teams completed and finalized their ideas. On semi structured interview we asked them what is the main reason for leaving process competition even with full support from teaching staff in their study programmes. We summarized their answers if the frequency of repeating was higher than 3. And joint reason was that on the beginning of the project they were not aware about wide knowledges they need to implement in order to produce their ideas and present it on proper way.

4. PROPOSAL FOR MULTIDISCIPLINARY COURSES FOR ACADEMIC STAFF BASED ON ECONOMICS AND ENGINEERING COURSES

Experience in the preparation of the best student idea showed that if teachers want to support development of the students they must have at least basic knowledge in more than one discipline. During development of the student ideas they had trainings in the fields of economic disciplines, IP management issues and innovation. Sole those trainings were not enough to completely prepare student idea. Every idea had some other specialized field of interest and specific challenges for implementation. Since majority of the ideas had some aspect of engineering involved joint consultation were held between teachers from different departments in order to provide support to development. From the engineering field they were not only interested in hard core implementation but more on the soft side of engineering, like defining, type and characteristics of the project requests, documentation, validation and verification of requests, preparation of design, defining approach and strategy for completing project, documenting and validation of final design.

After completion these students could enter in phase of implementation and construction of constructing working prototype of their idea, after implementation of solution testing phase can be introduced with overview of errors, failures, unit testing, integrated solution testing, functional, performance accepting and installation testing. Final stage will be evaluation of the product, process and resources.

5. INTERCONNECTION BETWEEN UNIVERSITY, ECONOMY AND NEED FOR CONTINUAL EDUCATION AND DEVELOPMENT

Competition for best student idea give insight on interconnection of the theoretical aspects of teaching and skills and necessary for introduction of product or service on the market. This practice in highly industrialized countries gave foundation for establishing dual system of education. This system was developed from the need of easy adaptation and constant change of market circumstances and knowledge base students receive on universities. European high education institutions started to adapt and change their offer of the American type of market-oriented university. Final stage would be erasing boundaries between academic knowledge and working practice and achieving higher level of social responsibility of university. Universities can finally fulfill role of the engine for economic development of society on one side, and on other side institutions will have new source of revenues and will become independent from state funding.

Change of attitude toward education must be changed and preparation of new innovative entrepreneurship programs must be established if high education institutions plan to keep leading position in society. Lifelong learning is essential in this approach since teachers at the universities must be aware of the skills which is requested on the market skill from their students, and they must have trainings which will increase their competences to deliver this type of courses.

6. CONCLUSION

Multidisciplinary approach and implementation of new technologies in scientific disciplines already affected need for continuing education at all level from students up to academic staff. This research showed that if we want to provide students support to develop innovative and creative ideas, to increase their entrepreneurial skills and deliver to market trained individuals, teachers must invest more time in activities of continuing education if they want to meet and fulfill requested support. ` new courses for academic staff will be important step for further development of attractive, modern and market applicable curriculums. Offer of those curriculums will establish universities as integral part of economic development which will impossible without permanent effort of the academic staff on developing new skills in continuing education processes.

7. REFRENCES

David Alvarogonsales (2011), "'Multidisiplinarity, Inter disciplinarity, Transdiciplinarity and the Sciences", International Studies in the Philosophy Science Vol.25. No.4, pp 387-403

Dowlling, I., and S. Hark. (2000) "She who speaks shadow speaks truth: Transdisciplinarity in women'sand gender studies". Signs 25, pp 1195–1198

Gero, A. (2017) "Students' attitudes towards interdisciplinary education: A course on interdisciplinary aspects of science and engineering education" European Journal of Engineering Education, 42(3), pp 260-270.

Hunks, Felix J. (1998): "Innovation, creativity and success." Small Business Economics 10, no. 3, pp 263-272.

Patton, M. Q. (1990). "Qualitative evaluation and research methods" SAGE Publications, inc.

Youngblood, Dawn. (2007): "Multidisciplinarity, interdisciplinarity, and bridging disciplines: A matter of process." Journal of Research Practice 3, no. 2 M18.

STATE OF THE ART ABOUT THIRD MISSION POLICIES AT UNIVERSITY OF BARI LEVELS

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Abstract: *In Italy, the public awareness of the importance of the so-called third mission has grown over time. Third mission has been included among the institutional activities and its assessment is included into the periodical Evaluation Report to be transmitted to the Ministry of University and Research no later than July 31st of every year. Continuing education and social engagement alongside technology transfer & innovation are therefore envisaged to play a growing role in reducing the gap between education and employment, to relate "science and society", by encouraging dialogue between the parties, through territorial valorisation and consolidation of the "network" of subjects operating in that area. In this paper we define integrative university approach in continuing education dimension, institutional policies to promote university third mission dimensions and activities, illustrating the good practices activated by the University of Bari, focusing in particular on continuing education.*

KEY WORDS: THIRD MISSION, POLICIES, UNIVERSITY, EDUCATION, BEST PRACTICES

1. INTRODUCTION

The modern context within which university is called to serve its functions has profoundly changed comparing to the past. The market and its needs, the autonomy given to university, the process of globalization and the consequential need to internationalization, the necessity to constantly rethink oneself, also in the light of the territory concerns and of the stakeholders, push to rethink and to make changes and profound, focused, and sustainable reforms. Universities have, furthermore, the responsibility to promote and carry out the betterment of productive and industrial models. It can't ignore the need to construct solid and long-lasting alliances with the territory, in a way to plan and work together for the construction of smart cities and territories. On the basis of these premises the university is part of a territorial system needs to make effort into supplying instruments and to contribute to the transfer of the competencies to significantly influence the development of the territory in which it insists on activating its unexpressed powers. The university with his partners rises up to establish intense synergies and interactions with the local, regional, national and international entrepreneurial systems promoting environmental technological innovation, with the objective of significantly growing the competitiveness of the productive system on site and in a territory. All of this in coherence with the European program Europa 2020[4]: a strategy for intelligent, sustainable and inclusive growth. This creates additional value and helps an enterprise to acquire competitive advantage on the market. One of most challenging processes in this respect is how to manage the intellectual capital. Managing intellectual capital includes managing human capital and managing innovation. Human capital consists of various skills and knowledge possessed by employees for the sustainable development of the enterprise, but also the entire economy and society. Strengthening human capital and encouraging innovation then positively relates to the creation of sustainable and inclusive society. The role of universities' third mission is the ability to provide the societies, in its various forms, with the results of

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[4] http://ec.europa.eu/europe2020/index_it.htm

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their research and specific service activities. Unlike the economic exploitation of research that, according to its nature, also provides forms of appropriation necessary to trigger innovation processes by businesses, these activities mainly produce public goods. The areas covered by the first application are the following ones: production and management of cultural heritage, clinical trials, research infrastructure and medical training, continuing education, public engagement[1]. Is necessary to analize the international perspectives and concept of universities third mission and the third mission dimension, instruments and tools, indicators for monitoring, Eu policies and legal frameworks for establishing the third mission of university, strategies and law supporting the development of the third mission. It be good to define the integrative university approaches in keeping its educational dimension and defining institutional policies to promote university third mission dimensions and activities.

2. THE ROLE OF UNIVERSITY EDUCATION IN THE NEW MILLENNIUM

So what is the role of university education in the new millennium? Probably to make this happen universities should sign an institutional commitment, showing in each of them and the academic world in general, a real commitment t to support the transfer of technologies in order to create educational and training proposals with the ability to promote the transfer of innovative and virtuous technologies and of advanced management methods. The university[2] has risen to the challenge of establishing intense synergies and interactions with local institutions, regional, national and international entrepreneurial systems promoting technological innovation, with the objective of significantly growing the competitiveness of the productive system on site and in the territory. With such logic our university is going to be a skilled centre of promotion and development of initiatives for innovative entrepreneurship resulting from the economic valuation of the results of industrial research and experimental development. A core element of the so-called third missions[3] is continuing education. At this regard, it is important to consider the wider scenario concerning the labour market reform[4] process aimed at reducing the high unemployment rate and, in particular, the youth unemployment rate, through a structural revision of public employment services and a simplification of the types of labour contracts. A growing formal role is acknowledged also to universities in the field education and employment[5], in line with occupability demands of both students and adult learners and employers. The descriptive approach adopted by the system will allow progressive extensions (vocational training, the education system, university degrees, vocational qualifications and apprenticeship profiles), as well as dynamic updates. Lifelong learning policies are decided at national level following institutionalised consultations among the Regions, the State, the local governments and the social partners. Policies are implemented by locally integrated systems, coordinating public and private stakeholders – such as universities – operating in the field. In this perspective, the national and regional support to the third mission represents a new approach to reduce the gap between education and employment, to relate “science and society”, by encouraging dialogue between the parties, through territorial valorization and consolidation of the “network” of subjects operating in that area[6]. The university initiated a search and collection of ideas, initiatives and skills and business skills, which would be able to generate value for the company, demonstrating a positive impact on the region and financial sustainability. The specific objective is to give the participants the best conditions to transform their ideas into businesses and build a portfolio of quality projects to be presented to business angels and prospective investors interested in their feasibility and market uptake.

[1] Ljubownikow (2012)
[2] Etzkowitz,Leydesdorff (1997)
[3] Scamuzzi, De Bortoli (2014)
[4] Etzkowitz, Dzisah (2012)
[5] Etzkowitz (1998)
[6] Connor (2009)

3. THE THIRD MISSION IN ITALY

In Italy, the public awareness of the importance of the so-called third mission has grown over time. Within the research assessment exercise 2004-2010, the National agency for the evaluation of the university and research system, introduced eight indicators aimed at assessing third mission activities of three types of institutions, including universities: the third parties indicator (itms1, weight 0.2), measured by adding the amounts of research/consultancy contracts with external clients acquired in the 7-years period 2004-2010;the patents indicator (itms2, weight 0.2), measured by the number of patents of structure's ownership/co-ownership granted during the 7-years period 2004-2010;the spin-off indicator (itms3, weight 0.1), measured by the number of spin-offs accredited to the structure in accordance with their internal rules during the 7-years period 2004-2010;the incubators indicator (itms4, weight 0.1), measured by the presence or absence of business incubators shared by the structure; the consortia indicator (itms5, weight 0.1), measured by the number of consortia and associations shared by the structure, which have among their objectives the technology transfer; the archaeological sites indicator (itms6, weight 0.1), measured by the number of archaeological excavations activated by the structure during the 7-years period; the museum centers indicator (itms7, weight 0.1), measured by the presence or not of museum centers managed by the structure; the third mission's other activities indicator (itm8, weight 0.1), measured according to the list of other activities provided by the structures. More recently, the agency published a handbook for the evaluation of universities' third mission, which includes a wider set of activities and indicators[1]. As a fact, and each university is called to define its own set of strategies and plans in this field. Continuing education and social engagement alongside technology transfer & innovation are therefore envisaged to play a growing role in reducing the gap between education and employment, to relate "science and society", by encouraging dialogue between the parties, through territorial valorisation and consolidation of the "network" of subjects operating in that area. In December 2010, a comprehensive reform (law 240/2010, or "Gelmini reform")[2] changed the institutional governance and internal organization of Italian state. The law proclaims autonomy and accountability as its basic principles (article 1) and provides for changes in three key areas of university administration: governing bodies; recruitment; funding and salaries. Such changes are deeply concerned with the widespread demand for a (new) legal framework regulating partnerships between academia and industry or – better say – society as a whole. As a fact, starting from the change approach proposed by the Lisbon strategy, by the Bologna process[3] and by the European universities charter on lifelong learning, the modernisation and innovation in the Italian university system depends on the response that can be given to social, economic and cultural challenges. This assumption generated the need to identify a third innovative mission for universities, besides the two traditional missions of research and higher education. As a fact, and each university is called to define its own set of strategies and plans in this field. To this end, Legislative Decree No. 104/2013 has introduced new instruments to strengthen career guidance in secondary schools and a pilot programme (through apprenticeship contracts) for students in the last two years of secondary school. More importantly here, Legislative Decree no. 13/2013, (which follows Law no. 92/2012 titled "A growth-oriented reform of the labour market")[4] aims at guaranteeing the fundamental and universal right to lifelong learning, putting the basis for a more systematic and strategic approach to lifelong and lifewide learning opportunities and needs, in accordance with the European directives on the recognition of non-formal and informal learning and on non-formal education network systems. Universities are challenged to play a relevant role in implementing legislative decree n. 13 of 2013, which provides for the general outline of the National System for the Certification of Skills. The cornerstone of the system is the establishment of the National Framework of Regional Qualifications, which serves to organize, aggregate and accord nationwide recognition to over 2,600 regional vocational qualifications. This system is based on the expansion of statistical classifications (economic activity and job classifications) involving a mapping of the labour market and of occupations[5]. The descriptive approach adopted by the system will allow progressive extensions (vocational training, the education system, university degrees, vocational qualifications and

[1] http://www.anvur.it/attachments/article/880/Manuale%20di%20valutazione%20TM~.pdf
[2] http://www.anvur.org/anvur/attachments/article/26/1.%20Legge%20240_2010.pdf
[3] http://www.processodibologna.it/
[4] http://www.gazzettaufficiale.it/eli/id/2012/07/03/012G0115/sg
[5] Etzkowitz (2003)

apprenticeship profiles), as well as dynamic updates. Lifelong learning policies are decided at national level[1] following institutionalised consultations among the Regions, the State, the local governments and the social partners. Policies are implemented by locally integrated systems, coordinating public and private stakeholders – such as universities – operating in the field. In this perspective, the third mission represents a new approach to reduce the gap between education and employment, to relate "science and society", by encouraging dialogue between the parties, through territorial valorization and consolidation of the "network" of subjects operating in that area[2]. Third mission has been included among the institutional activities and its assessment is included into the periodical evaluation report to be transmitted to the Ministry of University and Research no later than July 31st of every year.

4. UNIVERSITY OF BARI BEST PRACTICES ON THIRD MISSION

1. Realization of the FUTURE LAB in collaboration with the Politecnico di Bari, for the Regional call "La Rete ILO per la Smart Puglia". The FUTURE LAB is a place to promote and support processes of knowledge "contamination" in order to impact on entrepreneurship and innovation culture, favoring the diffusion of new learning models. The Future Lab is a place where the creativity of young people is promoted, diffused and enhanced; the birth and development of new ideas are supported; new employment opportunities with high technical and professional quality are created; the young startuppers are sustained in the boot path to the creation of company; the opportunities and places for discussion and promotion of different experiences are provided in order to stimulate collaboration and construction of formal and informal links between the young people and to enhance the quality of human capital[3].

2. Call4UNIBA: The Square of Ideas in collaboration with the Norba Group and the ItaliaCamp Association. Its goal was to promote a call for ideas to implement innovative business ideas, generated from knowledge and skills developed in the academic world, in collaboration with the companies of the regional and national territory. The university activated a partnership with the Provencies of Provincia di Barletta - Andria - Trani, the Territorial Pact North Barese Ofantino, Confcommercio Bari and BAT and the Credito Cooperativo Bank of Andria, with reference to a project called CreAttività, presented answering to the ministerial invitation for "Action Province Youth" in the 2011, to promote the culture of entrepreneurship among the youngsters and to sustain the development of innovative entrepreneurial ideas within the local territory. In collaboration with the CRUI (Italian Conference of the Rectors), it has been realized in Bari, within university contexts, within the project DEF – an event to promote entrepreneurial culture and services offered by the university in this field.

3. The University of Bari ILO mission is represented by the economical valorisation of the research results. Such valorisation is not meant as simply earning from the organization doing the research, but rather as valorisation of the whole productive section of the research group and a valorisation of the territory. In particular, this department offers support in putting in practice the so called "third mission" of the university: sensitization of the protection of intellectual rights steaming out from research; support in achieving patents; support for the negotiation activity and for the cessation or patents and technology; support in forming and developing academic Spin-off; support in forming clauses about the intellectual property regime concerning various types of events focused on research; support the university participation to productive districts, technology centres, centres of excellence; support in participation to festivals, expositions, meetings for presentations of lines and results of researches developed by the departments; promotion of professional figures and competencies within companies so to contrast the scares attitude toward innovation. The ILO office – the technological transfer – interacts systematically with: internal departments and research structures; projects area; carrier guidance; area for training opportunities. The area for technological transfer works in close connection with the Patents and Spin-off commissions. They use the investigations of the ILO Office, that are in charge of the preliminary contacts with researchers and other subjects involved. The

[1] https://www.crui.it/component/k2/item/2681-giubileo-delle-universita-world-conference-of-university-rectors.html
[2] Formica (2016).
[3] Tuunainen (2015)

technology transfer Area has systematic contacts with professors and researchers afferent to the research and services structure (departments, interdisciplinary research centres, laboratories). The ILO office – the technological transfer - interacts systematically with: internal departments and research structures; projects area; carrier guidance; area for training opportunities. The area for technological transfer works in close connection with the Patents and Spin-off commissions. They use the investigations of the ILO Office, that are in charge of the preliminary contacts with researchers and other subjects involved. The technology transfer Area has systematic contacts with professors and researchers afferent to the research and services structure (departments, interdisciplinary research centres, laboratories).

Furthermore, singles out the applicative fields for the research results, potentially interesting for companies and for valorisation and/or development paths. This may also help researchers in founding Spin-off and in understanding the path for getting a patent and the following "dressing" needed to offer the patent and/or technology to the market.

4. Collaboration with ENEA through the several meetings with spin-off and research group aimed at offering services to the companies about internationalization, technology innovation, technology transfer, and R&ST. To this aim, meetings have been organized during which the companies presented to the Enterprise Europe Network experts their needs of internationalization, technology innovation, valorisation of the results steaming from researches and activities. Technological and industrial partners have been sought, among the Enterprise Europe Network, to establish large space for collaboration and for joint projects.

5. Cycles of seminars for university students and for a larger audience have been organized about innovation, business creation, creativity.

6. Organization and participation to business competition such as "Start up week end", Start Cup, Festival of Innovation and other events on entrepreneurship and exploitation of research results, where le spin off and start up of the university gathered great results.

7. Meetings for first audit with companies have been organized to tap the demands, multiply the contacts, establish strong relationships and build capillary network.

8. Participation to events of technological brokerage such as the stock market research and the stock market for innovation and high technology.

9. Organizing visits of representatives of Mediterranean countries to share innovation paths and to build a network for agrifood incubators interested on food

10. The Tecnopolis Scientific and Tecnological Park S.c.r.l. company, of which UNIBA is the only partner, is focused on management in Italy and abroad of supporting activities in creating companies and spin-off, the coaching and support to public administrations at all levels in the formulation and implementation of information programs, modernization and innovation of its services, and the promotion and management of science and technology park, also in synergy with the competence centers, the technology clusters and associative organizations participated by universities.

11. Financing a project by the Ministry of Economic Development in response to the "Proclamation for the financing of projects for the expansion and capacity building of the Technology Transfer Office (TTO) of Italian Universities and public research bodies" – LINE 1 - Strengthening UTT of providing greater focus on the protection of the UTT and transfer of industrial property rights related to specific industrial sectors Thanks to this funding, the Office of Technology Transfer UNIBA will be enhanced through the recruitment of two figures of "Knowledge Transfer Manager" with knowledge and expertise in complementary fields, such as the scientific-technological and economic-legal. The two figures of "Knowledge Transfer Manager" will implement a series of actions aimed at:

- The management of intellectual property;
- Scouting inside and outside;
- Business creation;
- The research-industry relations;
- Engagement and communication.

Development of projects in collaboration with other THREE - NETWORK ILO PUGLIA - The Municipality of Plan 2014 and Alliances Network for Innovation in Puglia.

By signing the "Memorandum of Understanding for the Network of Puglia" ILO has brought to completion the process of professionalization and integration of structures dedicated to the exploitation of the public Puglia search results, through the notice "Alliances for Innovation" which marked a sharp break with past practice by strengthening the relations between ILO, intermediaries and individuals Puglia enterprise systems and research. The City of Network Plan formalized the contributions of Puglia ILO, which have identified the following ten areas:

1. strengthening of the ILO Network;
2. promotion of skills for the enhancement of R & I;
3. innovative entrepreneurship support;
4. promotion of systems of "Open Innovation";
5. strengthening the connection "Research-Enterprise";
6. support for scouting and exploitation of R & I activities;
7. protection and exploitation of Intellectual Property;
8. promotion of internationalization of R & I;
9. dissemination and scientific communication;
10. rationalization of the Apulian chain of R & I.

5. CONTINUING EDUCATION

The University of Bari accept the definition of "continuing education" given by the APPEAL (Asia-Pacific Programme of Education for All) during the UNESCO Sub-Regional Seminar on Continuing Education held in Canberra, Australia, in November 1987. In that occasion, continuing education was conceived as a «broad concept which includes all of the learning opportunities all people want or need outside of basic literacy education and primary education». This definition implies the following:

- Continuing education is for literate youth and adults;
- It is responsive to needs and wants;
- It can include experiences provided by the formal, non-formal and informal education sub-sectors;
- It is defined in terms of «opportunity» to engage in lifelong learning after the conclusion of primary schooling or its equivalent.

Giving these features, our best practice is the University Service Center for Lifelong Learning (CAP). This is a service of the University of Bari whose main function is to promote and support lifelong learning processes in the university context and to certify and accredit the skills acquired in formal and informal contexts, transforming them into training credits that can be spent on the paths of academic training.

This service encompasses also migrants who want to start a process of recognition and certification of cultural and academic qualifications acquired in their countries of origin.

Starting in 2014, as part of the FEI Projects - "Founded on the Work" and "Work for You", the CAP intercepted the social inclusion and employment needs, creating certification paths and providing consultancy services for career (orientation, certification, validation, recognition) from the European Integration Fund of the Ministry of the Interior.

The CAP - Uniba from February 2016 has addressed in particular subjects from countries in a state of war (Syria, Pakistan, Afghanistan, Yemen, Eritrea, Africa), already holders of political asylum, subsidiary protection and community. However, the service offers hospitality to all types of users interested in receiving information on:

- The educational opportunities and services offered by the University of Bari for the recognition of cultural and academic qualifications;
- How to manage and prepare the practices for the reconstruction of its portfolio of skills and experiences;
- How to recognize formative credits acquired at foreign universities to start the certification process of the qualifications held;
- Possible consultancy services aimed at active job search.

The advice path of the CAP is articulated starting from a phase of reception and analysis of user needs. Subsequently, it passes to a legal consultancy and to an orientation counseling and certification of the skills possessed, which is followed by the start of the certification procedure of the qualifications acquired by the users. The course includes the preparation of practices for the reconstruction of their dossier of skills and experiences acquired in non-formal contexts. It follows a return interview and a final phase of the certification process of qualifications.

REFERENCE LITERATURE

Connor, A. (2009), *18 Rules of Community Engagement*, Happy About, Silicon Valley, CA.

Etzkowitz, H. and Dzisah, J. (ed.) (2012), The Age of Knowledge: The Dynamics of Universities, Science and Societies, Brill, Leiden.

Etzkowitz, H. and Leydesdorff, L. (ed.) (1997), *Universities in the Global Knowledge Economy*, Continuum, London.

Etzkowitz, H. et al. (ed.) (1998), Capitalizing Knowledge: New Intersections of Industry and Academia, SUNY Press.

Etzkowitz, H. (2003), *Forging the Knowledge Economy: The Entrepreneurial University Mission* (with Ranga), In development for Harvard University Press.

Formica, C. (2016), Terza missione. Parametro di qualità del sistema universitario, Giapeto, Napoli.

http://ec.europa.eu/europe2020/index_it.htm
http://www.anvur.it/attachments/article/880/Manuale%20di%20valutazione%20TM~.pdf
http://www.anvur.org/anvur/attachments/article/26/1.%20Legge%20240_2010.pdf
http://www.gazzettaufficiale.it/eli/id/2012/07/03/012G0115/sg

http://www.processodibologna.it/ https://www.crui.it/component/k2/item/2681-giubileo-delle-universita-world-conference-of-university-rectors.html

Ljubownikow, S. (2012), "Lester M. Salamon: Rethinking Corporate Social Engagement: Lessons from Latin America", Kumarian Press, Sterling 2010, *Voluntas*, Vol. 23, Fasc. 1, pp. 285-286.

Scamuzzi, S. and De Bortoli, A. (2014), Come cambia la comunicazione della scienza. Nuovi media e terza missione dell'università, il Mulino, Bologna.

Tuunainen, J. et al. (2015), "Epistemological, Artefactual and Interactional-Institutional Foundations of Social Impact of Academic Research", *Minerva*, 53, Vol. 3, pp. 257-277.

CONTINUING EDUCATION AND UNIVERSITY LIFELONG LEARNING IN CHANGING AND DYNAMIC ENVIRONMENTS

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Abstract: *This paper discusses the challenges and quality enhancement perspectives of continuing education as part of the third mission of universities. Central questions such as market, topical and institutional fits are the basic elements of this approach. This question covers issues such as: How can prior experience with curriculum development processes at universities be used? How should the links between input and output be managed during the development phase? How is the market for specific curricula analysed – or in some cases created? This paper explores a theoretical management approach to combining input- and output-based curriculum design in continuing education. Finally, the practical relevance of the approach is discussed based on a curriculum development process at the Danube University Krems, a specialized and role model university in Austria in continuing education.*

1. INTRODUCTION

In recent times, the development of continuing education and lifelong learning activities at higher education institutions (HEIs) as a part of their "third mission" has been given more attention within the institutions. The increased autonomy of HEIs forces them to improve their budget conditions and in many case, they see university lifelong learning (ULLL) as an additional channel of third party funding. The importance of ULLL is as diverse as the meaning of ULLL at national and institutional level. Many HEIs understand their role in the first two missions teaching (undergraduate and graduate) and research but not as a provider of lifelong learning in a broader sense with services for adult learners. However the market competition for continuing education is growing. Partly because continuing education became a global market by the use of e-learning but also because, those universities involved in continuing education, have increased their engagement and offers in this educational segment. These factors force universities to rethink their programmes and seek strategic positioning as well as to establish core processes like postgraduate curriculum programme development, services for adult learners, market analysis etc. In this process new competitive strategies open the way to a new organisational identity as well. The management and organisation of ULLL is crucial of the success of these activities. How to find relevant content and what are key factors for potential participants became more and more the core question for higher education professionals working in the field.

Since the Bologna Declaration was introduced in 1999, the third mission of higher education institutions (HEIs) has become a matter of increasing interest for different stakeholders like companies, NGO's governments but also university leaders and staff. One major function that has contributed substance to the third mission is the development of continuing education and lifelong learning. Following table shows the different Bologna Process milestones and developments.

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IF4TM Institutional framework for development of the third mission of universities in Serbia

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The Bologna Process: from Sorbonne to Yerevan, 1998-2015

1998 Sorbonne Declaration	1999 Bologna Declaration	2001 Prague Communiqué	2003 Berlin Communiqué	2005 Bergen Communiqué	2007 London Communiqué	2009 Leuven/ Louvain-la-Neuve Communiqué	2012 Bucharest Communiqué	2015 Yerevan Communiqué
Mobility of students and teachers	Mobility also for researchers and administrative staff	Social dimension of mobility	Portability of loans and grants	Attention to visa and work permits	Attention also to pension systems and recognition	Benchmark of 20 % by 2020 for student mobility	Explore path to automatic recognition of academic qualifications	Implementation of key commitments
A common two-cycle degree system	Easily readable and comparable degrees	Fair recognition Development of joint degrees	Inclusion of doctoral level as third cycle	QF-EHEA adopted National Qualifications Frameworks (NQFs) launched	NQFs by 2010	NQFs by 2012	Roadmaps for countries without NQF	Implementation of key commitments
		Social dimension	Equal access	Reinforcement of the social dimension	Commitment to national action plans	National targets for the social dimension to be measured by 2020	Widening access and completion rates	Social inclusion
		Lifelong learning (LLL)	Alignment of national LLL policies Recognition of Prior Learning (RPL)	Flexible learning paths	Partnerships to improve employability	LLL as a public responsibility Focus on employability	Enhance employability, LLL and entrepreneurial skills through cooperation with employers	Employability
Use of credits	A system of credits (ECTS)	ECTS and Diploma Supplement (DS)	ECTS for credit accumulation		Coherent use of tools and recognition practices	Implementation of Bologna tools	Ensure that Bologna tools are based on learning outcomes	Adoption of ECTS Users Guide
	European cooperation in quality assurance (QA)	Cooperation between QA and recognition professionals	QA at institutional, national and European level	European Standards and Guidelines for quality assurance (ESG) adopted	Creation of the European Quality Assurance Register (EQAR)	Quality as an overarching focus for EHEA	Allow EQAR registered agencies to perform their activities across the EHEA	Adoption of revised ESG and European Approach to QA of joint programmes
Europe of Knowledge	European dimensions in higher education	Attractiveness of the EHEA	Links between higher education and research areas	International cooperation on the basis of values and sustainable development	Strategy to improve the global dimension of the Bologna Process adopted	Enhance global policy dialogue through Bologna Policy Fora	Evaluate implementation of 2007 global dimension strategy	
								Learning and Teaching: Relevance and quality

Table 1: The Bologna Process and its focus (The European Higher Education Area in 2018 p. 20)

A second development is related to outcome orientation and the shift from teaching to learning at HEIs. Meanwhile, university policy in Europe has been characterised by increasing reliance on the differentiation of the university system as a modernisation factor, by the catalytic forces of the Bologna Process toward shifts in thinking and acting within HEIs. In the interim, these institutions are being granted more autonomy and their behaviour in the resulting competitive situation is expected to become more customer-oriented, more cost-aware, and more sensitive towards the needs of society and markets. Universities therefore need new mechanisms that allow them to collaborate and interact more effective and efficiency with their stakeholders. (Pausits, 2005).

In this new mode of knowledge production, the role of market needs analysis for new curricula has to become more professional and has to be seen as an integrative part of curriculum development processes in continuing education. Especially in the highly competitive market of postgraduate education, such mechanisms are fundamental for institutional success. The Danube University Krems, Europe's unique state-owned university solely for postgraduate programmes, aligns the educational services and programme portfolios with the needs of the market. This focus requires management and curriculum development approaches, which are able to create and support market-oriented programmes.

The present text highlights the development challenges of a postgraduate curriculum based on market needs and competences. A theoretical framework and experiences for curriculum development in continuing education will be described as an institutional case for meeting such challenges.

2. THE CONCEPT OF MARKET-, NEEDS- AND COMPETENCE-BASED CURRICULUM

Universities have always provided a contribution to decision-making processes for wide society-related topics. Therefore, the third mission was defined as the generation, use, application and exploitation of knowledge and other university capabilities outside academic environments (Molas-Gallart et al. 2002). This definition suggests a rather broad understanding of the tasks associated with the third mission. The services provided by the university for the society are at the centre of this view, and are added to the first two missions, teaching and research, as a third object. The third mission is the driving force (Mahrl and Pausits, 2011) to continue the opening of the universities, to initiate an exchange outside the scientific system, and to find answers to social issues. Continuing education as a special form and for a specific group of people is not only a part of the mission but has a fundamental role in developing teaching and learning at HEIs.

Since Ralph Tyler's book "Basic Principles for Curriculum and Instruction" in 1971 on the meaning, purpose and function of a modern-day curriculum, the re-conceptualisation of curriculum and curriculum development arrived at a fundamental point. The focus changed for strong teaching to learning universities to improve their development processes, e.g. involving market needs and curriculum management aspects within the development practice. (Jonnaert, et al. 2007) One of the driving forces of this new re-re-conceptualisation is the outcome and competence orientation in European higher education. In recent times, competence-based education is addressed by a holistic approach. (Biemans et al. 2004) Competence is consistently seen from the perspective of where it will be used, together with the functional component, personal or behavioural component, cognitive component and ethical component (Cheetham and Chivers, 1996) Competence is an integration of knowledge, skills and attitudes that enables a person to perform a certain task (Wesselink et al. 2007). Competence can be seen as the integrated performance-oriented capability of a person or an organisation to reach specific achievements. (Mulder, 2001) Knowledge and skills are outcomes of learning activities of students in interaction with the learning environment. (Glaser, 1991) The concept of competence has taken a vital place in the curriculum reforms that are currently sweeping across Europe. (Cendon et al. 2008) The entry of competence-based and outcome oriented education into the educational domain, especially from a curriculum perspective, has become a new driving force through the Bologna Process. The relevance of this polysemic concept in continuing education indicates a number of changes.

First of all, the discipline is no longer the starting point. There is a necessity for a genuine transformation of programme designers and educators. The adoption of competence as the organizing principle of a curriculum has to take into account what the exit profiles of graduating students should be and specify the set of situations that these graduates should be able to handle. In postgraduate education, this entails a mixture of identified competences on the basis of the real-life or work-related situations in a specific professional field and the academic logic of the educational programme. Defining the graduates' exit profiles is thus preliminary to identifying the resources required to deal with the situations. This affects the practices of educators as well as the learning methods that students are engaged in, e.g. problem-based learning or action learning. The most important principle is to make postgraduate learning significant for the students and useful for their working environment, an aspect that has been noticeably missing from higher education for a long time. In other words, the choice of competence as an organizing principle of the curriculum is a way to bring working life back into the classroom. (Jonnaert et al.2007)

As an analog to Wesselink et al. (2007) , the basic principles for a competence-based curriculum are as follows:

- Defined competences.
- Competence-development is continuously assessed ahead of, throughout and after the learning process.
- Learning activities are related to learning environments.

- In learning and assessment processes, knowledge, skills and mind-set are included.
- Students' reflection and responsibilities are stimulated.
- The different roles of teachers as coaches and experts are in balance.

Most of the principles have to do with learning and teaching activities as well as university support services; however, the focal point is to define the relevant competences for the target audience. This part, namely how to find the competences, is clearly underdeveloped and remains the missing link in competence-based curriculum development. HEIs answer this new challenge by improving internal processes. From the perspective of the process workflow and institutional development chain, progress in the curriculum becomes critical. This procedural view leads HEIs to a well developed set of organisational and legal steps. The following figure (Figure 1.) shows the curriculum development process at the Danube University Krems:

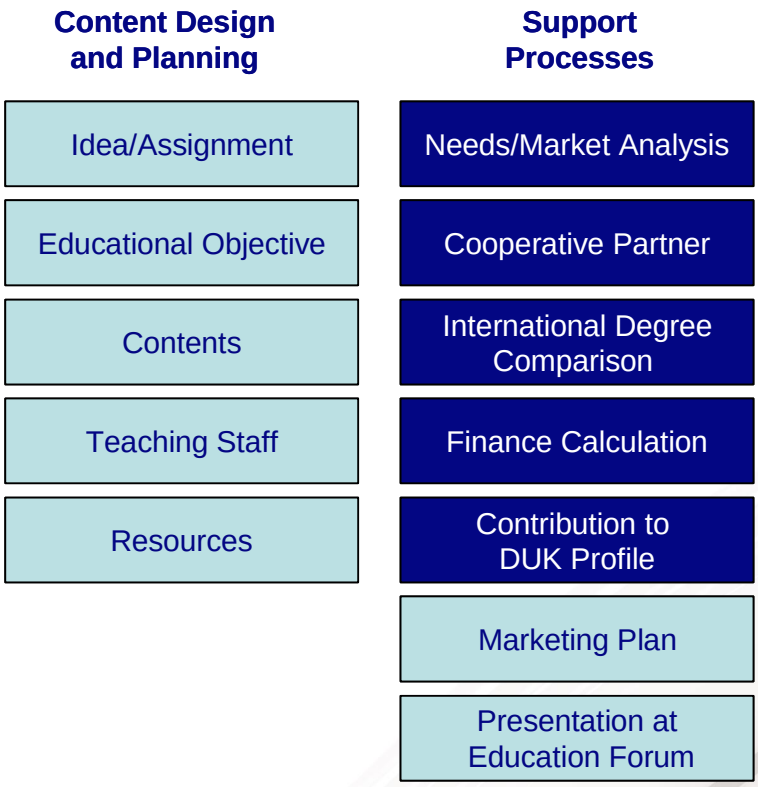

Figure 1. Curriculum development process at the Danube University Krems (DUK)

Alongside the content design and planning processes, the curriculum support processes assure the market success of a new curriculum. Moreover, in competence- and skill-based education these support processes are critical factors for the re-conceptualisation of the curriculum in higher education institutions. This new workflow increases the managerial and administrative tasks during the development stage. Meanwhile, there is also more transparency, which is such an important prerequisite for quality assurance during and after the development phase. In other words, the content design and planning processes could be seen as the input-oriented part while the support processes are the output-oriented part of the development process. A new taylorism has arrived at HEIs in an effort to improve processes to make them more effective and efficient.

In the case of the Danube University Krems, the last stage of the formal curriculum development process is the presentation of the new curriculum at an interdisciplinary intra-institutional formal unit. The positive effects of such a "cross over" unit were that development experiences could used from different fields and departments of the university. This exchange platform helps in putting experience-based curriculum development knowledge to use in teaching and learning settings. In addition, the forum is an instrument of quality management and quality assurance. It is also useful for benchmarking programmes at the university.

3. THE DEVELOPMENT PROCESS

In this section, relevant steps and difficulties in an international environment will be introduced in light of a market- and competence-based approach and according to Table 1. A particular Master's degree development is used as an illustrative case study. The theoretical framework of the curriculum development is based on five different stages: (4.1) assumptions and common understanding, (4.2) market needs analysis and definitions of competence and outcome, (4.3) the competence development processes and (4.4) the student service processes, and (4.5) the monitoring of programme quality and ongoing development of the curriculum after the programme is up and running.

3.1 *Assumptions and Common Understanding: Mission Statements, Goals, and Objectives*

The definition of programme aims and objectives is a first important step in the development process of a new curriculum. Without a common understanding of the partner institutions, the development will fail. In the opening planning phase, the university should be open about different motivations for developing a new curriculum. These may be diverse, such as personal reasons, logical choice or systematic matchmaking, business needs or (academic) staff interests. These motivations will also be pushed by an intersecting point with the university's mission and maintained through the institutional infrastructure, such as a continuing education centre office. (EUA, 2006)

The involved stakeholders need an agreement for the entire structure of the degree programme, regardless whether its function is interpreted as being:

"adaptive", i.e. in terms of the capability to adapt to changing social and professional requirements;

"adaptable", i.e. in terms of the capability to adapt to changing requirements on one's own competences, or;

"transformative", i.e. in terms of the capability to contribute to professional and social changes. (Wildt, 2007)

In the particular case of a continuing education programme, instead of simply teaching scientific knowledge, the degree programme expresses the competence to endlessly obtain new knowledge related to market and student requirements. The programme consequently becomes oriented towards lifelong learning and should be linked to other bachelor, master and PhD programmes in the field. Life long learning consists not solely of continuously acquiring new knowledge, but also of knowledge distribution. More and more these programmes use blended learning approaches that combines e-learning and contact class hours in the best way for part-time students and adult learners. This learning environment and mode allow all involved students to self-regulate their individual learning.

Such a programme has to answer in an adequate way the needs and requirements of the programme's target audience. The shift from an input- to a needs- and outcome orientation took place through a double development process. Often the curriculum development team develops a draft curriculum. Second, the team uses e.g. online customer survey to confirm the developed topics and uses the results to adjust the programme. These questionnaires are designed to reflect the current needs as well as impending topics that will become more important in the future. In this way, the development team is able to cultivate a flexible programme approach for adjusting the focus and content of the programme. This dynamic related to the rapidly changing working environment is essential for such programmes, especially in adult education. Figure 2 explains the set of important factors for participation in a programme as well as the different fields and thematic issues for a market analysis survey. In addition to these, the market analysis delivered other programme management findings related to such issues as pricing, delivery mode, acceptable programme length, etc.

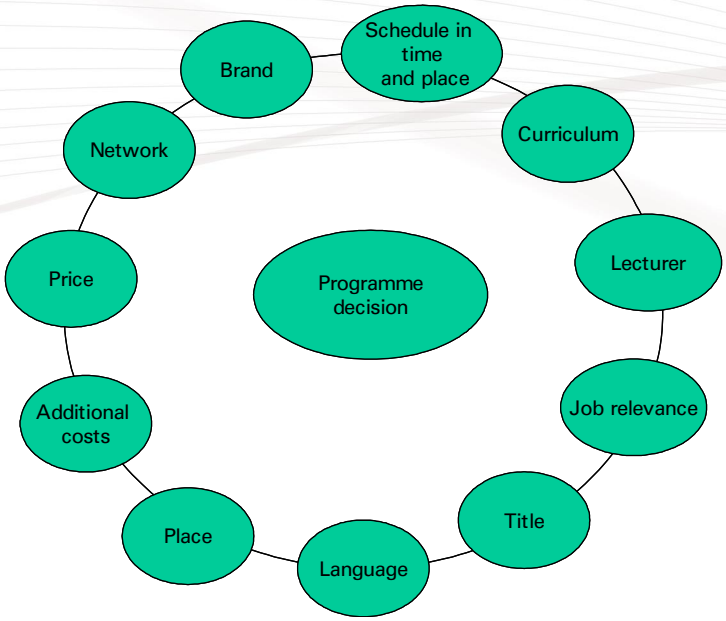

Figure 2: Key factors for student participation in a postgraduate programme

3.2 *Market Needs and Competence Definition*

A main objective of a competence-based programme is not only the definition but the organic integration of key competences into the degree programme, which aims beyond the passive acquisition of knowledge to the productive dealing with knowledge. In order to achieve this objective, the curriculum has to combine three different types of competence: cognitive competence, methodological competence, social and self competence. The defined competences of the programme are a set of these different types of competences. Each thematic module is matched to the defined competences (Table 2.). The relationship between the competence and module is also described. The competence level (high, middle or low) characterizes the module, which helps the academic staff develop educational activities for each module in terms of competence levels. It also helps the academic staff define the competence focus. This competence matrix shows the programme from the perspective of the intersecting competence phase and module. The matrix is also a control mechanism that helps prevent overloading one module with to many competences and vice versa.

	Competence 1	**Competence 2**	**Competence 3**	**…**
Module 1	**High**	**Low**	**High**	
Module 2	**Middle**	**Low**	**High**	
Module 3	**High**	**High**	**High**	
….				

Table 2. Competence matrix related to thematic topics and modules

The competence matrix provides the module developers with an orientation about the entire programme and advice about the competence portfolio for each module. Therefore, the competence matrix helps to develop each module and at the same time could be used as a control mechanism to evaluate the modules in terms of learning outcomes. In the particular case at DUK's degree programme development, the competence definition takes place as a four step concept: First, the project group responsible for the programme mission, goals and expected target audiences describes the competences and thematic modules that should be developed. Second, through a market survey, the target audience evaluates the defined competences and modules and adds additional competences and modules to the programme. In the next step, an external expert group reflects on the set of competences and modules and advises the project team. Finally, the project team defines the ultimate competences and modules

and the relationship between modules and the corresponding competences.

After defining the competences and modules, the project team starts to work on the thematic modules and develops detailed module descriptions based on the principles of the European Credit Transfer System.

3.3 *The education process: Producing competences*

The core process of a study programme is education and knowledge transfer. Developing knowledge, skills and competences are the central elements of curriculum and educational processes. As a result, the curriculum has to be designed such that each student has the sustained opportunity to apply the knowledge, skills, attitudes, and values that have been identified as intended outcomes to important issues, situations, and problems.

Institutions also need to provide information on how to translate generic descriptors into qualification profiles, obtained competences, course types and module descriptions, ratios between contact hours and workload - depending on categories of modules. Then the educational processes employed to help students learn in each module or activity remains fully consistent with research on learning and student development and is thus appropriate for reaching both the module's or activity's specified outcomes and those of the curriculum. The programme needs high transparency so that students understand the purpose, structure, and processes of the curriculum, their responsibilities for learning, and how their progress will be assessed. The key issues in this process are first the openness of the relevant universities and organisation to competence-based education and, second, the compatibility of partner universities' understanding of the criteria levels (design, process, quality and outcomes) of the programme, and, third, the organisational and managerial understanding and workflow between the universities.

3.4. *The service process: Supporting individuals*

HEIs as knowledge-based expert organisations with a strong focus on teaching and research also need an understanding of service. Recently, HEI leaders tend to think of academic services as the third pillar and they have begun to pay more attention to these services within HEIs. Education and research activities are "de facto services" for stakeholders. Faced with strong competition in the HE market, institutions are compelled to search for competitive advantages. The integration of a service culture provides additional support for success, over and above the original tasks of HEIs. In this "service mode", HEIs have to change away from the attitude of being ivory towers and should be transformed into relationship-based organisations. More and more universities try to develop institutional service culture and understand their own mission to provide services for stakeholders. Within this new direction, new products such as continuing education programme, also have to take students into consideration as one of the stakeholder groups at HEIs. The orientation and changes in knowledge formation from teaching to learning refer to a customer orientation in which the potentials and processes are coordinated with the learning prerequisites provided by the students. (Hansen, 1999) Examples of this are the new flexibility of times and places of learning or the use of E-learning. Improvement of an institution's services occurs by orienting the services towards the students, as well as through the better use of students as external factors. This customer orientation is reflected in the main processes of the HEI (i.e. teaching and research) as well as in the perception of students, strategic partners and enterprises as "customers". The first steps toward creating new relationships and developing competitive advantages for the institution in the long run include such initiatives as alumni management and the improvement of academic services. Especially in the case of continuing education programmes, the role of continuing or LLL offices becomes essential and vital for the knowledge creation, transformation and the use between HEIs students and also employers.

3.5. Monitoring Program Quality: Knowing and Improving Actual Results

Due to the rapid development of and changes in knowledge, especially in postgraduate and job related education, curricula are dynamic, organic objects and therefore require continuous adjustments. This can be accomplished by consistent assessment and monitoring of the programme as a product and service, as well as of market needs and changes. As a result, the programme should have an assessment plan that ensures that graduates have the knowledge, skills, attitudes, and values described as intended outcomes of the curriculum. In addition, related quality assurance procedures and a dynamic view on

market needs are essential for the sustainability of the programme in the long run. The quality reflection and development related to the programme life cycle are important prerequisites of a successful programme in the postgraduate environment. Periodical programme re-engineering and review of competences and modules automatically lead to a view of time, programme lifecycles and changes. That is why curriculum development is a process and not a project. The monitoring and adjustment aspect must be considered during the primal development phase. Student perceptions of programme satisfaction should also be used to improve the entire programme. Finally, the question of how intended outcomes are measured must have a clear answer in order to reveal what graduates are able to do and how they can use the competences in their work life.

3. CONCLUSIONS

The university autonomy and governance reforms, the Bologna process, the notion of the knowledge triangle have led to a fundamental discussion on the role and responsibilities of higher education institutions (HEIs) (Altbach and Peterson 2007; D'Ambrosio and Ehrenberg 2007; Huisman and Pausits 2010). These reform processes have significantly influenced the two core missions – teaching and research – of HEIs. Often these reforms uses headings like "from government to governance" (Bergan 2011)), "from teaching to learning" (Nygaard and Holtham 2008) or "from research to innovation" (Etzkowitz and Leydesdorff 2000). Continuing education has a major role in this new agenda. It foresees an EHEA where higher education delivers the competences and skills required for European citizenship, innovation, and employment. The support of HEIs and staff in pedagogical innovation and in integrating teaching and learning with innovation, entrepreneurship, and research become one of the new drivers of teaching and learning in HE. In order to adapt pedagogical models to the changing HE climate characterized by massification, diversification, specialization, and technological developments HEIs needs to coop with new initiatives and innovative pedagogical approaches also in continuing education. In order to develop problem solving or critical thinking, the role of academic staff as the main agents of delivering new modes of teaching and learning became crucial. The report on “New modes of learning and teaching in higher education” (High Level Group Report, 2014) focuses on enhancing teachers’ skills and knowledge and on the respective importance of continuing professional development for teachers in all European institutions. This should be the case in teaching and learning in continuing education also.

At least the curriculum has to be established based on a common educational philosophy and directly linked to the respective institutions’ mission statements. A curricular mission statement and defined curricular goals with planned learning outcomes and competences express the principles, namely: what profile a prospective student should have, who the target audience for the programme is, what graduates should know and be able to do. Furthermore, common attitudes and values for the teaching staff are necessary in order to create a programme oriented on academic environment. These goals and their objectives have to be specified in significant aspects and in behavioural language that will permit evaluation of their success, which is the curriculum's real outcomes. The required result of a curriculum is defined first and foremost through teaching and learning. Therefore, the selection of course experiences and developing students’ competences is essential to the quality of the curriculum. Furthermore, teaching and learning activities must be carefully planned in the development phase in order to create a coherent but flexible curriculum that reflects national, regional and local distinctions yet still retains the defined outcomes and competences of the programme. This implies the necessity to consistently monitor the effectiveness of the curriculum in fostering competence development as well as the actual achievement of predetermined outcome goals. Monitoring the modules and defining quality in teaching services help improve and secure the quality level for all partner institutions and teaching staff involved. An effective programme and curriculum highly depend on academic advising. Academic advising in a postgraduate programme is developmental; it should focus on students’ expectations and needs and assist students to design curricular and non-curricular experiences that help them achieve their own goals and learning outcomes.

REFERENCES

Biemans, H., Nieuwenhuis, L.; Poell, R.; Mulder, M.; Wesselink, R. (2004): Investigating competence-based VET. The Netherlands: Backgrounds, pitfalls and implications. Journal of Vocational Education and Training. Vol. 56., No 4. 523-538.

Cendon, E., Prager, K., Schacherbauer, E., Winkler, E. (2008): Implementing Competence Orientation and Learning Outcomes in Higher Education – processes and Practices in Five Countries. Krems , Department for Continuing Education Research and Educational Management, Danube University Krems

Cheetham, G. and Chivers, G. (1996): Towards a holistic model of professional competence. Journal of European Industrial Training. Vol. 20, No. 5. 20-30.

European Commission (2018) The European Higher Education Area in 2018

European University Association (2006): Guidelines for quality enhancement in European joint master programmes. http://www.eua.be/publications/ (13.09.2008)

Glaser, R. (1991): The maturing of the relationship between the science of learning and cognition and educational practice. Learning and instruction. Vol. 1. No. 2. 129-144.

Hansen, U. (1999): Die Universität als Dienstleister. Thesen für ein leistungsfähigeres Management von Hochschulen. In: Stauss, B., Balderjahn, I.; Wimmer, F., (ed. 1999): Dienstleistungsorientierung in der universitären Ausbildung: Mehr Qualität im betriebswirtschaftlichen Studium. Stuttgart. 369-385.

Jonnaert, P., Barette, J., Masciotra, D, Yaya, M., Morel, D. (2007): From competence in the curriculum to competence in action. Prospects: quarterly review of comparative education. XXXVII (37), 2 / 142. 187-203.

Mulder, M. (2001): Competence Development – Some Background Thoughts. The Journal of Agricultural Education and Extension. Vol. 7. No. 4. 147-159.

Pausits, A. (2005): Student Relationship Management in der akademischen Weiterbildung. Die strategische Ausgestaltung der Kundenbeziehungen an Hochschulen unter besonderer Berücksichtigung des Customer Relationship Management Ansatzes. Universität Flensburg. URL: http://www.2hb-flensburg.de/dissert/pausits/pausits_srm.pdf, (15.11.2015)

The Committee of the Convention on the Recognition of Qualifications concerning Higher Education in the European Region. Recommendation on the recognition of joint degrees. 2004 www.aic.lv/bolona/Recognition/leg_aca/RecJDand_ExpM.pdf (15.09.2008)

Tyler, R. (1971): Basic Principles for Curriculum and Instruction. University of Chicago Press, Chicago.

Wesselink, R., Biemans, H.J.A., Mulder, M. (2007): Perceptions of teachers and students participating in competence-based VET. Paper presented at ECER, 2007 in Ghent. 2.

Wildt J. (2007): On the way from teaching to learning by competences as learning outcomes. In: Pausits, A., Pellert, A. (eds.,2007): Higher Education Management and Development in Central, Southern and Eastern E*urope*. Waxmann.

SESSION 3:

SOCIAL ENGAGEMENT

UNIVERSITIES AS GENERATORS OF SOCIETY'S PROGRESS

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Abstract: *Importance and positive role of the universities as well as the academic and professional community in dealing with more and more complex problems and challenges that we are facing today, is obvious more than ever before. We are witnessing the time of massive transformations and accelerated dynamics of society, both at the local and global level. New knowledge and new technologies are multiplied by the speed that requires constant adaptation and guidance. Therefore, the need for knowledge has become a necessary reality for a modern society, but also for every individual in it. In such a world, universities, their potentials and beneficent effects on many contemporary trends, but also their ability to influence social progress, become an important topic. In this paper, we tried to point out this phenomenon.*

KEY WORDS: UNIVERSITY, ACADEMIC COMMUNITY, SOCIAL PROGRESS

1. INSTEAD OF INTRODUCTION

The problems with which mankind encounters today are increasingly serious and complex. These are no longer the problems and challenges that face some distant communities in some distant meridians, but these problems are such that they equally affect all people. This is because the degree of interdependence of the contemporary international community is such, that what was once isolated problems of isolated communities, today are become problems of the entire humanity. That is because of the nature of the problems today.

Problems such as ecology, global warming, the wars currently under way and, accordingly, the issue of nuclear weapons, the protection of elementary guaranteed human rights, and the states and problems of the communities, both globally and locally, are no longer problems that can be solved by isolated politics or any isolated community without the involvement of a broader, and especially, scientific and academic community in solving these problems. This is because many of the skills that are needed to solve these problems are still offered at academies and universities. The role of universities is changing according to the needs and problems of society. As the professor Eric Thomas said: "The main functions of higher education and universities are predominantly two-fold. One is as educational establishments and the second as generators of knowledge and technology. As educational establishments, their function is to provide able, self-directed learners that are independent and confident, and will go out into society and give to society through leadership or through civic duties. As knowledge generators, they are research institutions there to provide new knowledge, to change paradigms, to aid society in its development and in meeting new challenges as they come along".

2. TRANSITION FROM TRADITIONAL TO MODERN UNIVERSITY

Education for elite, as main concept of education during long period of history of education, become obsolete in moment when educators realized that knowledge can not exists without complex interaction of academic community with society. Universities are not entities untouched by the environment in which they fulfill educational role, new challenges are given to universities and society expects universities to take active role in solving community and social challenges. The understanding

of modern time requires person equipped with knowledge, and spreading of knowledge become one of the main missions for universities.

Application of those principles find place in the legislative of Republic of Serbia. Law on Higher Education, article 3. as one of its main objectives inter alia introduces:

"education of creative population which can absorb and create new knowledges".

This approach has two paramount effects. First one is that universities and other tertiary education institutions are recognized as institutions with specific social function and role. Second is, that higher education institutions lose privilege and received additional responsibilities. This actually means that this institutions should not only follow changes in society and provide needed knowledge, but they should actively influence society not only on purely academic level, they should take active role in solving problems and challenges which local community face.

3. THE ROLE OF THE ACADEMIC COMMUNITY IN PREVENTING RADICALIZATION OF SOCIETY

It is especially expected from the university to act promptly in the multi-cultural ambient, where different religious and national, often domicile and original groups meet, and it is characteristic for some regions in the Balkan. By affirmation of openness and academic dialogue, on topics that are often base for numerous social and particularly political misunderstandings at different levels, the academic community can contribute to relaxation, not only of mutual national and religious relations in local communities, but at the level of the state and region. Round table discussions, debates, panels and other forms of the academic community participation, when we talk on nationalism, intolerance, oneness, violence appearing both in a family and other levels, explaining what should represent the true civic society, it appears today more than ever since as an imperative of the academic community members, and their altruism and wish to contribute to progress of their communities, does not stay unnoticed. More often, the fact is emphasized that "colleges and universities must again define themselves as public wealth, as a protected space for promotion of democratic ideals, social transformations, civic values and critically oriented citizens". For, as it is emphasized by professor Jon Nixon, that education must be developed as "a protected space within which to think against the grain of received opinion: a space to question and challenge, to imagine the world from different standpoints and perspectives, to reflect upon ourselves in relation to others and, in so doing, to understand what it means to assume responsibility". Hence, universities should become spaces not only to create an informed citizen, but also the citizen ready to overtake responsibility in difficult moments, and this is condition sine qua non, of true and mature democracy.

Democracy and democratic potentials of a society, but also an individual, show the significance of knowledge and information in the struggle against a manipulative act of politics, but also uncontrolled influence of non-selective information we are exposed to, demand for permanent alertness of people of knowledge, and this means, before all, the academic community. In the sense, it seems both universities and members of the academic community, can do more. Their expiration before the public is not sufficiently used, either encouraged or protected in the appropriate measure. In the atmosphere of boiling political events, their expirations and warnings can easily be on the beat. Still, the obligation of the university community was and is, stimulating both "as it is emphasized general politics value, improving of standards in the domain of reign of human rights and freedoms, economy development, trade, financing, science and culture". Already mentioned transformation and influence of the university onto social affairs are perhaps the best way and it is also seen in economy. Therefore, we think it is important to look back at this aspect.

3.1. The Role of the Academic Community in Improvement of the Entire Global and Local Ambient

The ambient surrounding us and making our life habitat, represents indeed the key determinant in forming of an individual, the one who is the part of the ambient and makes it. As it has been noticed

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by Marx "it is not the consciousness of men that determines their existence but their social existence determines their consciousness. The social ambient thus forms us into personalities, and forming of a proper social ambient is definitely a significant aspect of the role of the academy. The presence of the academic community with its innovative and visionary ideas and a visionary approach, is from the very reason valuable to the local ambient and it must be felt. Solving of issues from the area if life environment protection, improving of public services, giving suggestions of urban solutions, and also emphasizing onto the possible harmful consequences of the current condition, and a continuous activity in rising awareness of citizens and a lot more, are all areas and issues where certainly the participation of the academic community is expected to be in solving them.

4. THE UNIVERSITY- ECONOMY-PROSPERITY-FREEDOM

In his famous History of Civilization, writing on the influence of science onto civilization, Will Durant noticed, that even at the end of XVIII century, there was an intensive communication between the university and economy:

"As the century was gone by, there was a closer relation between practitioners who strived to produce, and scientist who seeks for truth; The Science Academy sent explorers into fields, factories and workshops … in return, the industry started to refer to science for data and experiments … In XIX century, these relations will transform the economic and physical world".

It is emphasized for the academic community must change the traditional approach to education, and through creation of innovative entrepreneur oriented programmes, it can help in solving of the key issues of the society. The position and function of the university community overcome today its primary role that it accomplished earlier and it still remains unquestionable nowadays. Still, the academic community appears as the entity today, not only helping in solving of the society issues, by identifying issues and doing to solve them, by animating the public and offering pro bono all its knowledge and skills in the society it functions.

However, the process of communication of the academic community and society in identifying and solving of issues is not one way. The dynamics of the modern social flows asks from the university a faster adjustment. It is one of the reasons of a changed role of some actors significant for the social flows, as they are economy subjects whose presence is identified as a significant one, and it is especially related to the process of designing of new courses of life-long learning, but also, what is very significant, to emphasize real needs and expectations of the community, when higher education is in question. It is exactly one of the reasons why the Higher Education Law of the Republic of Serbia has predicted that:

"Higher education institution has Employers Council for accomplishing cooperation in development of study programmes pursuant to the labor market needs".

This is certainly a very significant novelty in the communication of the university and economy, whom it is expected to offer the expected results yet. The connection of economy and university is also significant in the process of accomplishing a changed role of the state, and especially in the sphere of securing and accomplishing of economic and social rights. Thus, it is no wander for many writers, like Professor Ratko Markovic, to separate economic and social rights as the most significant questions the modern state shall face with.

„These rights derived from the changed nature of the modern state, as it is not, like in the epoch of Liberalism only a legal and political institution, but it is also the social and cultural community that intervenes into economic life with certain social aims. By accomplishing these aims, primarily economically weaker ones are protected".

Thus, it is clear for the economic progress to appear as a pre-condition in establishing a true civic society and the society of economically protected individuals. Therefore, the university role in this light of the truth already being established, when we are talking on their influence onto the entire economical and also political flows, additionally gains its significance.

5. INSTEAD OF CONCLUSION

New scientific discoveries and wonderful technology development pull humanity toward unstoppable development. Near future look like promised land were humanity will enjoy in results of endeavor of millenniums of generations. This environment will have environment and social organization ideally adapted to human habitat. During this road, some unavoidable challenges occurred. Resources are limited, wishes are limitless. Development id limited by the resources and they must be used on cleaver and responsible way. fact that if we continue development with existing approach, it can endanger civilization built on its foundations. Development and approach to development must be seriously reconsidered.

"The world is very different now. For man holds in his mortal hands the power to abolish all forms of human poverty and all forms of human life," those words by J.F. Kennedy on his inaugural address are now more actual then ever.

Knowledge and enlightment together can provide pathway for human prosperity and eradication of poverty. This will encourage further humanization of overall human society.

Old and new challenges emerge, famines, ecological challenges, nuclear disasters, limited water resources, global worming, epidemics. Academia can provide intellectual source to combat those global challenges, but academia also need to provide support in tackling local community challenges. This small challenges have important multiplication effects and leaving them unsolved increase impact on the global challenges. Proactive academic community is only one part of solution second is community which cherish and promote quest for knowledge. Beside those two important partners state mu support with policies universities to regain their place and to steer university potential to benefit community. This approach will acquire proper position of universities in complicated socio-political environment of modern time.

6. REFERENCES:

Katarina Antonić, Marksističko shvatanje umetnosti, http://www.princip.info/2018/05/30/katarina-antonic-marksisticko-shvatanje-umetnosti/#, access: 25.10.2018

http://www.trend.uns.ac.rs/stskup/trend_2017/radovi/T3.3/T3.3-9.pdf, access :18. 10. 2018.

https://www.ijp.rs/iz-instituta/vesti/uloga-univerziteta-u-evropskim-i-regionalnim-integracijama_60/, access: 20.10.2018.

http://theconversation.com/why-universities-must-defend-democracy-83481,

https://www.epigeum.com/downloads/ulm_accessible/uk/01_intro/html/course_files/in_2_10.html, access: 18. 10. 2018.

Mladen Subotić, Slavica Mitrović, Leposava Grubić - Nešić, Darko Stefanović, „Uloga univerziteta u razvoju preduzentništva“, Trendovi razvoja: Položaj visokog obrazovanja i nauke u Srbiji“, Trend, Zlatibor, 2017,: access : 18. 10. 2018.

Vil Djurant, Istorija civilizacije - Doba Voltera, Vojnoizdavački zavod-Narodna knjiga, Beograd, 2004.

Ratko Marković, Ustavno pravo i političke institucije, Pravni fakultet Univerziteta u Beogradu, Beograd, 2008.

Rasto Ovin, „Uloga univerziteta u privrednom rastu kroz empirijsko iskustvo u tranzicionoj zemlji“, Ekonomski horizonti, 2008/10. (39-51)

Senad Ganić, „Međunarodno pravo versus nuklearno oružje“, Rizici i eko bezbednost u postmodernom ambijentu, Zbornik radova, Državni univerzitet u Novom Pazaru, Novi Pazar, 2010. (657-664)

Zakon o visokom obrazovanju Republike Srbije, “Sl.Glasnik RS”, br. 88/2017-dr.zakon i 73/2018.

THE UNS CREATIVITY CENTER AS A CENTER OF GRAVITY FOR STUDENTS VOLONTEERING

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Abstract: *Volunteering is one of the key words in the modern human society, because this activity provide help and support to someone, without economical reward from another side. In the new Law for higher education, volunteering activities are evaluated for professors during their promotion at different stages of their career. However, for students, this area is not under careful analysis. This paper is focused on the motives, satisfaction, suggestions for improved conditions for students volunteering in the framework of academic environment – University of Novi Sad, Creativity Center. Results of the specially designed questionnaire, fulfilled anonymously by twelve volunteers, are studied.*

KEY WORDS: CREATIVITY CENTER, STUDENTS, VOLONTEERING, 3D PRINTER, CUTTER

JEL CLASSIFICATION: I2 Education and Research Institutions.

1. INTRODUCTION

Volunteering is a very important measure in our community in general, but also in academic environment. The following criteria can be connected with the volunteering: (a) it is not obligatory; (b) it is not a paid; (c) it is done for the benefit of individuals, organizations, or for society (Dekker and Halman, 2003). Since this is not paid action it has always been a challenge to efficiently organize, manage and evaluate volunteering activities (Hasan et al., 2017). For professor, the volunteering activities are taken into account in their promotion, during career. For students, the volunteering is not usually part of the higher education curriculum (Astin et al., 1999). Generally speaking, students volunteering is beneficial for students, higher education institutions (HEIs) and the wider community, thus it can be said that volunteering is win/win situation for everyone (Fitzgerald and Peterson, 2005). HEIs can be involved in volunteering process as organiser (Paull, et al., 2017) or host - which is in the main focus of this paper. Students are becoming more aware of the need to boost their curriculum vitae (CV) and build up their personal capital – knowledge and experience (Holdsworth and Quinn, 2010). Students can select different organizations for volunteering during study period. Volunteering at HEIs is becoming more and more popular among students in order to boost their CVs, to enhance employability prospects (Handy et al., 2010) and to develop consciousness and responsibility (Bocsi et al., 2017). In addition, studies about volunteering have reported that aspects such as happiness or personality are important for decision of volunteering. Some authors (MacNeela et al., 2014) reported that a result of volunteering behaviour for students also include risk avoidance (such as drinking). Moreover, we can hear very often that students have comments that there is a lack of practical knowledge which they acquired during the study, especially in engineering or bioengineering disciplines. The fulfilment of this gap can be one of the important reasons for students to apply for volunteering at other laboratories and topics which are not included in classical curriculum. This will develop also experience how to work in team or how to relate with supervisors during volunteering period (Barton et al., 2017). In (Jagušt et al., 2017) authors reported that use interesting equipment is one of the most important motivation factors for students volunteering.

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Despite of many studies which have examined students' motivations to be volunteers, there is a lack of papers which analyse infrastructural frameworks for volunteering and especially there is a lack of similar studies in Serbia (or Western Balkan countries).

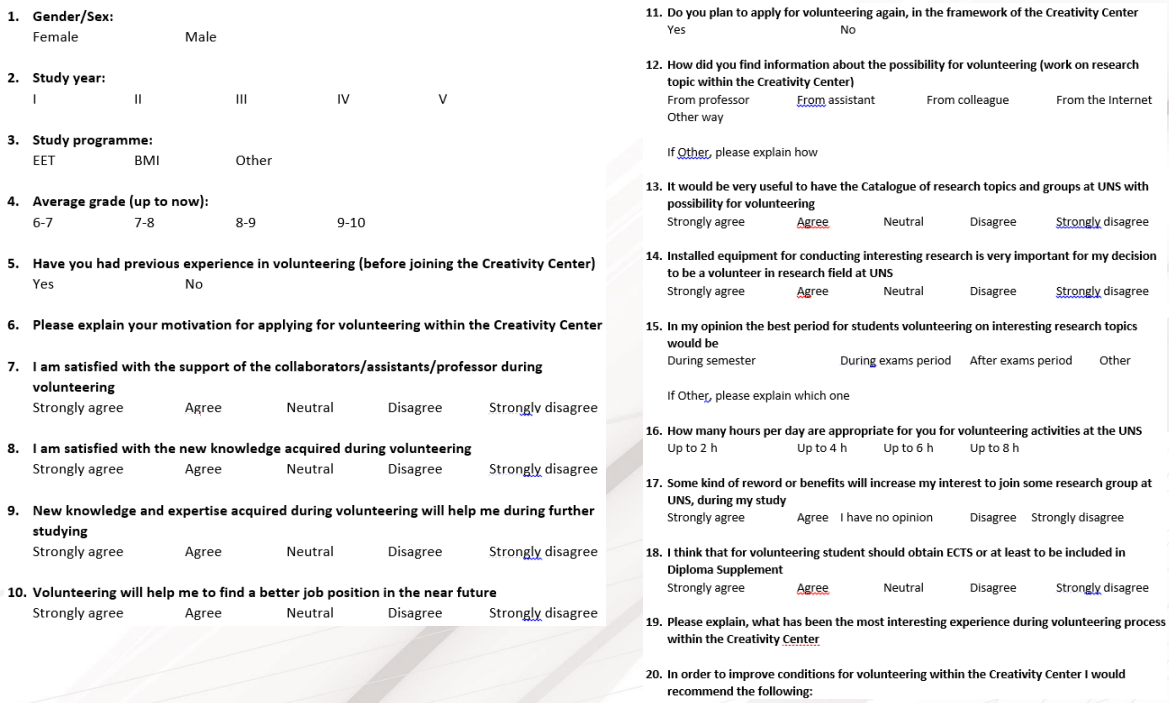
The aim of this study is to examine whether students who volunteered within the Creativity Centre of the University of Novi Sad, Serbia felt that volunteering benefited them and in which aspects. Moreover, their suggestions for improvement of the conditions for students volunteering are presented and analysed and they will be used for enhancing offers and resources for students volunteering in academic ambient.

2. METHOD

Participants. Twelve students of the University of Novi Sad, Faculty of Technical Sciences, were applied for volunteering in previous one year (from establishment of the Creativity Centre), from two studies programmes: (a) Electrical engineering (n=5), (b) Biomedical engineering (n=7). The sample consisted of 9 female and 3 male students, 1 student from the second study year, 3 from the third study year, 6 from the fourth and 2 from the fifth (master) study year.

Procedure. We created a specially designed questionnaire for this purpose as a research instrument, which can be seen in Figure 1. The Likert-scale ranging from 1 (Strongly disagree) to 5 (Strongly agree) was used. The questionnaire was created using Goggle Forms tool and composed of 20 questions. Twelve students, who volunteered from the established the Creativity Center (July 2017) up to now, were invited by e-mail, with explanation of the purpose, to fulfil this questionnaire electronically. We are fully aware that 12 respondents are not huge number, but in open literature were reported similar study with even smaller number of students, for example, 11 in (Barton et al., 2017) or 10 in (MacNeela et al., 2014).

Statistical analysis. The data analysis were conducted using SPSS software tool.



1. **Gender/Sex:**
   Female Male
2. **Study year:**
   I II III IV V
3. **Study programme:**
   EET BMI Other
4. **Average grade (up to now):**
   6-7 7-8 8-9 9-10
5. **Have you had previous experience in volunteering (before joining the Creativity Center)**
   Yes No
6. **Please explain your motivation for applying for volunteering within the Creativity Center**
7. **I am satisfied with the support of the collaborators/assistants/professor during volunteering**
   Strongly agree Agree Neutral Disagree Strongly disagree
8. **I am satisfied with the new knowledge acquired during volunteering**
   Strongly agree Agree Neutral Disagree Strongly disagree
9. **New knowledge and expertise acquired during volunteering will help me during further studying**
   Strongly agree Agree Neutral Disagree Strongly disagree
10. **Volunteering will help me to find a better job position in the near future**
    Strongly agree Agree Neutral Disagree Strongly disagree
11. **Do you plan to apply for volunteering again, in the framework of the Creativity Center**
    Yes No
12. **How did you find information about the possibility for volunteering (work on research topic within the Creativity Center)**
    From professor From assistant From colleague From the Internet
    Other way
    If Other, please explain how
13. **It would be very useful to have the Catalogue of research topics and groups at UNS with possibility for volunteering**
    Strongly agree Agree Neutral Disagree Strongly disagree
14. **Installed equipment for conducting interesting research is very important for my decision to be a volunteer in research field at UNS**
    Strongly agree Agree Neutral Disagree Strongly disagree
15. **In my opinion the best period for students volunteering on interesting research topics would be**
    During semester During exams period After exams period Other
    If Other, please explain which one
16. **How many hours per day are appropriate for you for volunteering activities at the UNS**
    Up to 2 h Up to 4 h Up to 6 h Up to 8 h
17. **Some kind of reword or benefits will increase my interest to join some research group at UNS, during my study**
    Strongly agree Agree I have no opinion Disagree Strongly disagree
18. **I think that for volunteering student should obtain ECTS or at least to be included in Diploma Supplement**
    Strongly agree Agree Neutral Disagree Strongly disagree
19. **Please explain, what has been the most interesting experience during volunteering process within the Creativity Center**
20. **In order to improve conditions for volunteering within the Creativity Center I would recommend the following:**

Figure 1. The specially designed questionnaire to examine student's volunteering motives and satisfaction

3. RESULTS AND DISCUSSION

3.1. The UNS Creativity Center

Five Creativity Centres were established at five universities in Serbia, in 2017, in the framework of the ERASMUS+ project IF4TM, entitled "*Institutional framework for development of the third mission of universities in Serbia*". Among other, the Creativity Center was founded at the campus-based University of Novi Sad as a place where students can develop their creative thinking, learning by doing, entrepreneurial spirit and innovativeness as well as a place for students volunteering individually or in a small groups, under supervision of professors or assistants. Apart from classical equipment such as projector, PCs and laptops, white board (Figure 2a), the Centre has been equipped with modern equipment that facilitates creative and experimental work of students, such as: 3D printer, 3D printing pens, Plotter Cutter, Laminator for rapid prototyping in the field of microfluidics (Figure 2b and Figure 2c), software packages for design, modelling and simulation, equipment for testing, such as syringe pump or flow controllers, etc.

Figure 2. (a) The space for Creativity Center, (b) 3D printer, (c) Cutter

We believe that interesting topic and modern equipment attracted many students to volunteer in this Creativity Center. Students developed high-quality prototypes of microfluidic chips, during volunteering period, which can be seen in Figure 3.

Figure 3. Developed prototypes of microfluidics chips during students volunteering

3.2. The results of the questionnaire

We have had 12 respondents on the questionnaire on Google forms platform. 50% of students has average grade from 9 to 10 (that means the best), 25 % of them in the range from 8-9 and 25 % in the range from 7-8. Furthermore, 66.7 % of them have not had previous experience in volunteering, before joining the Creativity centre at UNS, whereas 33.3% were volunteers earlier, but not in academic environment. Moreover, the same percentage 66.7% of respondents plan to apply for volunteering again.

Related to the motives for volunteering, we set this question in open form and the answers are summarized in Table 1.

Table 1. Students' motives for volunteering

Students answers
Personal development and development of skills and competencies for a career in research.
I was looking for something to do outside my course work. I wanted to have an experience of something as close to a 'real' working environment as possible so volunteering in this group seemed like a good opportunity to have that.
I found this topic the most interesting (2 times).
I like to research and take a part in new interesting topics about medical electronics.
My motivation for applying for volunteering was learning new stuffs in the area of the science which was very attracting and interesting to me. Also, research job is something that I've always wanted to do.

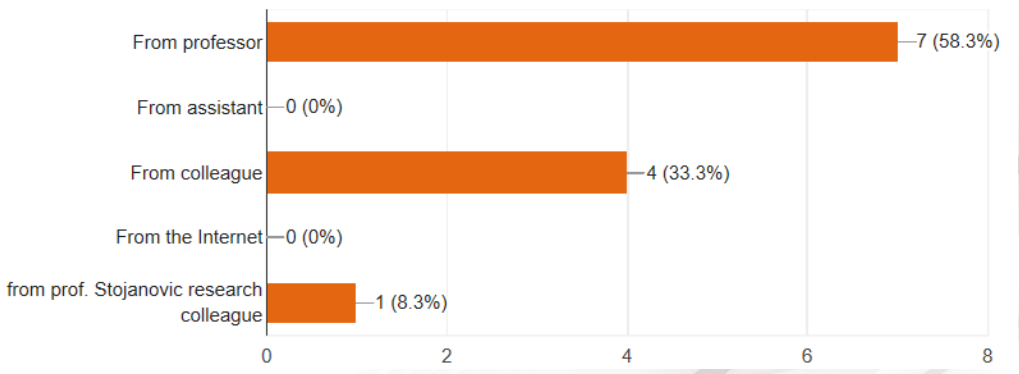
As his student, I got a lot of information and knowledge about new technologies in biomedical engineering that was really helpful. Besides, volunteering is something that every student need to experience. When that is in the field you are interested in, the pleasure is all yours.
I wanted to learn more interesting things, to improve my knowledge in electronics and also to gain some new skills in working on a real project.
New experiences, opportunity to learn in non-traditional way.
I was interested in the subject of research.
Unique chance to stay in touch with the latest trends in nano/micro/electronics and its practical applications, as well as to connect with various companies and key people within them.
Mainly, I wanted to expand my knowledge in the area of electronics. Considering the fact that electronics are extremely applied in medicine, my main motivation was to learn more about new projects and devices.

Thus, we can conclude that main motives of students were to learn something new and interesting which is not covered by courses in the regular curriculum. They wanted to extend the knowledge and to be devoted to attractive research topics and trends which are followed within the Creativity Centre of UNS.

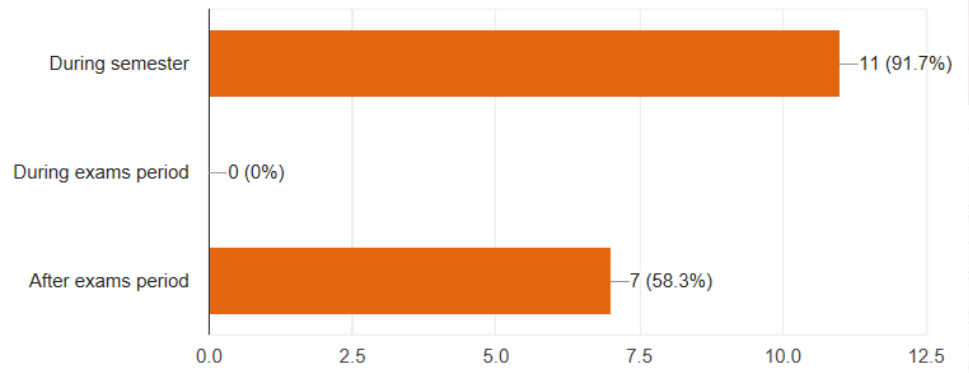
Majority, 83.4% of students are satisfied (*Strongly agree* and *Agree*) with the support of the collaborators/assistants/professor during volunteering. Besides, 75% of respondents are satisfied with the new knowledge acquired in the framework of the Creativity Centre of UNS.

Minority, 16.7% of students *Strongly agree* and 58.3% *Agree* that new knowledge and expertise acquired during volunteering will help them during further studying, whereas 33.3% of them *Strongly agree* and 50% *Agree* that volunteering will help them to find a better job position in the near future.

Figure 4a shows the response related to the way how they got information about the possibility for volunteering, whereas Figure 4b depicts which period they think is the most appropriate for volunteering (it was possible to select more answers for this question).



(a)



(b)

Figure 4. Responses on (a) how students got information about volunteering possibility, (b) when is the best period for students volunteering.

Majority of students obtained information about volunteering from the professor and after that from other students who already had experience of volunteering at the Creativity Center of UNS. Connected with this, 66.7% of respondents *Strongly agree* and the rest of 33.3% *Agree* that it would be very useful to have the Catalogue of research topics and groups at UNS who offer possibility for volunteering (which currently does not exist). Surprisingly majority of students think that the best period for volunteering is during the semester, despite they have other obligations with classes duties. They are ready to devote no more than 4h per day on volunteering activities. The modern equipment was mentioned as a key factor for volunteering - 25 % (*Strongly agree*) and 41.7% (*Agree*). Dependence of some responses as a function of dependent variables is presented in Figure 5.

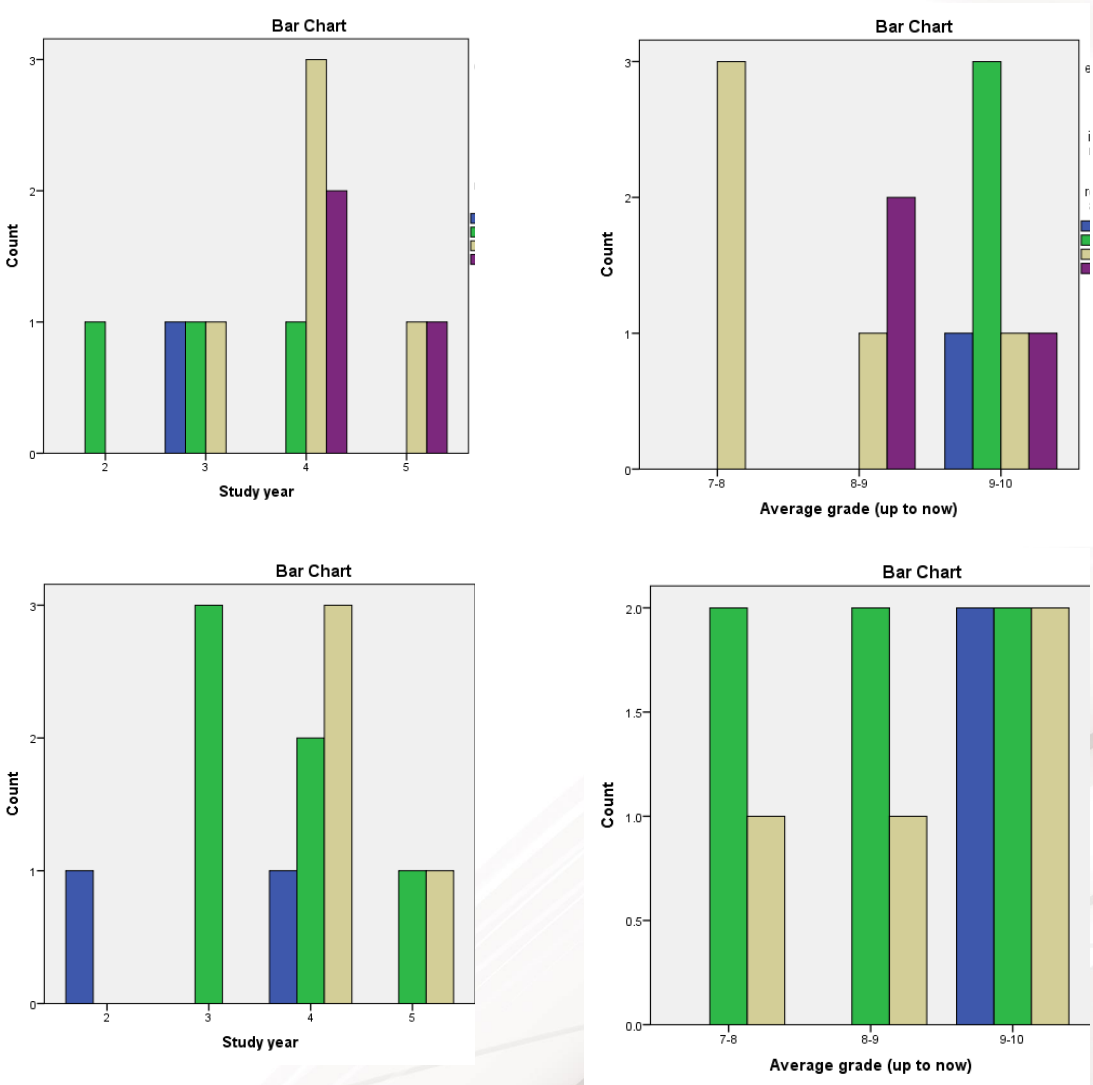


Figure 5. Dependence of some responses on the study year or average grade of students

Figure 5 reveals that students of the fourth study year have the highest awareness about the importance of new and modern equipment for performing successful volunteering at research/academic institution. Furthermore, students with higher average grade are more critical and on above-mentioned questions they gave wide variation of possible answers.

66.7% of students *Strongly agree* and 25% *Agree* that volunteering activities should be valued with ECTS or at least to be included in the Diploma Supplement, which is very important information for the management of HEIs, to foresee this possibility in the near future.

For future volunteers and for improvement of the conditions for volunteering is especially useful the students' responses on the question related to their recommendations for improvements which are summarized in Table 2.

Table 2. Suggestions for improvement conditions for students volunteering

Students answers
More and better communication with the team.
Once you start everything is pretty great, but in my opinion it is a bit hard to find out about this possibility (and other similar activities) in the first place. So I would suggest putting little more effort into letting the students know about the existence of this Creativity center and that they can be a part of it.
Perhaps more new technology.
Maybe more information about conditions of volunteering for students (2 times).
The only thing I would recommend is writing the report every week (or month).
I would recommend making the accurate program of volunteering, more information about the aim of research but also more help and attention from collaborators. I think that is also important to have a deadline when we need to have some results. It also would be great when the research would be completed with a paper that could be published or some certificate which could be mentioned in our CV.
To talk more about volunteering in front of the students because usually they don't even know that they can be a part of it. Also, it would be very useful to learn how to write a simple project (for the beginning, in English language). And maybe, if there is two or more students that apply for the volunteering, they can learn how to work in team on some complicated project.
Modernization of equipment, more frequent feedback from assistants and better explanation of the main point of the project. (2 times)
Money doesn't need to be on top of the list, but some monthly reword should be considered mostly for those undergraduate students which need to find alternative funding for their study payment (especially for those who are not budget students and have to pay scholarship). Additional ECTS points should be considered and special annotation in Diploma Supplement. On other hand all the rewords don't have to be "paid directly" but invested and transferred into improvement of work conditions by providing students with quality equipment (notebook, free software, free hardware, free books for studies, paid courses etc.). For those who are "big fans of traveling", they should be given opportunity to be demonstrators on fairs/presentations in country and abroad because they will satisfy their wishes to travel and visit different places.
I'm really satisfied with everything, but perhaps I would only recommend to exist more separate laboratories, and not to have devices in classrooms.

Some students think that it has to be better and faster communication between supervisors and volunteers. Some of them emphasized the problem with limited space and the necessity for more sophisticated equipment – this can be solved with the completion process of the new building of the Science and Technology Park in Novi Sad. General impression if that students need more precise information about the possibility for volunteering with the exact tasks, deadline, reports.

4. CONCLUSION

This paper presents experience of students from volunteering within the Creativity Centre at the University of Novi Sad, Serbia. Even, the students and supervisors are generally very satisfied with conditions for volunteering it can be concluded that visibility of laboratories for volunteering have to be increased. In this context media (electronic, social) should play a significant role in making volunteerism more appealing to the students. It will be very useful that each students include volunteering in his/her personal career development plan. From HEIs side, it can be considered to foresee some ESPB for students' volunteering activities.

REFERENCE LITERATURE

Astin, A. W., Sax L.J., Avalos, J., (1999), "Long-Term Effects of Volunteerism During the Undergraduate Years" *The Review of Higher Education*, Vol. 2, pp 187 – 202.

Barton, E., Bates, E.A, O'Donovan, R. (2017), "That extra sparkle': students' experiences of volunteering and the impact on satisfaction and employability in higher education" *Journal of Further and Higher Education*, DOI: 10.1080/0309877X.2017.1365827.

Bocsi, V., et al. (2017), "Motives of volunteering and values of work among higher education students" *Citizenship, Social and Economics Education*, Vol. 16(2), pp 117 – 131.

Dekker, P. and Halman, L. (2003), *The Values of Volunteering: Cross-cultural Perspectives*. New York; Boston, MA; Dordrecht; London; Moscow, Russia: Kluwer Academic/Plenum Publishers.

Fitzgerald, K. and Peterson, W. (2005), "UK Research Universities and Community Engagement: Developing a Practical Framework for Community Partnerships" Bristol: University of Bristol.

Handy, F., Cnaan, R.A., Hustinx, L., et al. (2010), "A cross-cultural examination of student volunteering: Is it all about résumé building?" *Nonprofit and Voluntary Sector Quarterly*, Vol. 3, pp 498 – 523.

Hasan, H., Wahid, S.N.S., Jais, M., Ridzuan, A. (2017), "Modelling of volunteer satisfaction and intention to remain in community service: A stepwise approach" *AIP Conference Proceedings* 1842, 030002, doi: 10.1063/1.4982840.

Holdsworth, C. and Quinn, J. (2010), "Student volunteering in English higher education" *Studies in Higher Education*, Vol. 35, pp 113 – 127.

Jagušt, T., Sović-Kažić, A., Nakić, A., Grgić, M., Bojić, I. (2017), "What (de)motivates one to volunteer in K-12 STEM-C outreach activities?" *IEEE Frontiers in Education Conference (FIE)*, 18-21 Oct., Indianapolis, IN, USA.

MacNeela, P. and Gannon, N. (2014), "Development: An Interpretative Phenomenological Analysis of University Student Volunteering" *Journal of Adolescent Research*, Vol. 29 (3), pp 407 – 436.

Paull, M., Omari, M., MacCallum, J., Young, S., Walker, G., Holmes, K., Haski-Leventhal, D., Scott, R. (2017), "Matching expectations for successful university student volunteering" *Education + Training*, Vol. 59, pp 122 – 134.

RELEVANCE OF WEBSITES AND EVENTS IN SCIENTIFIC COMMUNICATIONS

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Abstract: *Higher education institutions (HEI) are constantly urged to use diverse set of communication tools in order to deliver their messages to various target groups. In the modern market, characterized by the fast changes, strong competition and abundance of stakeholders, all actors need to find new ways to reach out their audience. In that sense, the use of the integrated approach is essentially significant, enabling the maximum results of the utilization of online and offline communication tools. The aim of this study is to shed the light on the relevance of the HEI's websites and workshops, for the achievement of optimal communication aims. The case study of the "Methodology guide for innovation" workshop is presented, while websites are analyzed from the conceptual point of view. Both organizational and content aspects are explored, while the specific recommendations are provided both for practitioners and scholars who perform in this field.*

KEY WORDS: MARKETING COMMUNICATIONS, WEBSITE, EVENT, SCIENTIFIC COMMUNICATIONS

JEL CLASSIFICATION: M31, M14

1. INTRODUCTION

In the same manner that data get their purpose only when they are interpreted to information, the information achieve their meaning only when they are communicated to the target groups. Therefore, analyses and various studies deliver value only in the process of their communication to interested public (Young & Quinn, 2012).

There are numerous tools that can be employed for the dissemination of information, while the most used ones by HEIs are: print, online media and events. The overall recommendation is to apply all media integrally, in order to achieve synergistic effects (Tuman & Eng, 2011). However, the cost of the use of certain media usually hinder HEIs and research teams to consider them, while in the most of the cases, they rely on either owned or earned media, rather to paid ones.

It is observable from the following picture (figure no. 1) that the weakness of that approach lies in the fact that the reach is quite smaller compared to the option that the paid tools are used. Nevertheless, given that many programmes (e.g., Erasmus plus, Horizon 2020, Interreg, RRPP, etc.) increasingly highlight the importance of the project visibility (Danube Transnational Programme; European Commission, 2018a; European Commission, c), we may conclude that this notion will be translated to practice through the increasing budgets allocated for communication activities.

Nonetheless, one should not underestimate the power of earned and owned media, since they usually gather the fans of the particular HEI or of the certain topic that a project pertains to, while these fans are usually perceived as the opinion leaders (i.e. influencers) in their own communities. Consequently, they can serve as the brand ambassadors, who will spread the positive word about the project/HEI and therefore, they should be continually informed and appreciated. One of the most effective ways to perform this activity is to create database of fans, by offering of the possibility to subscribe for the newsletter or e-brochure at the specific website.

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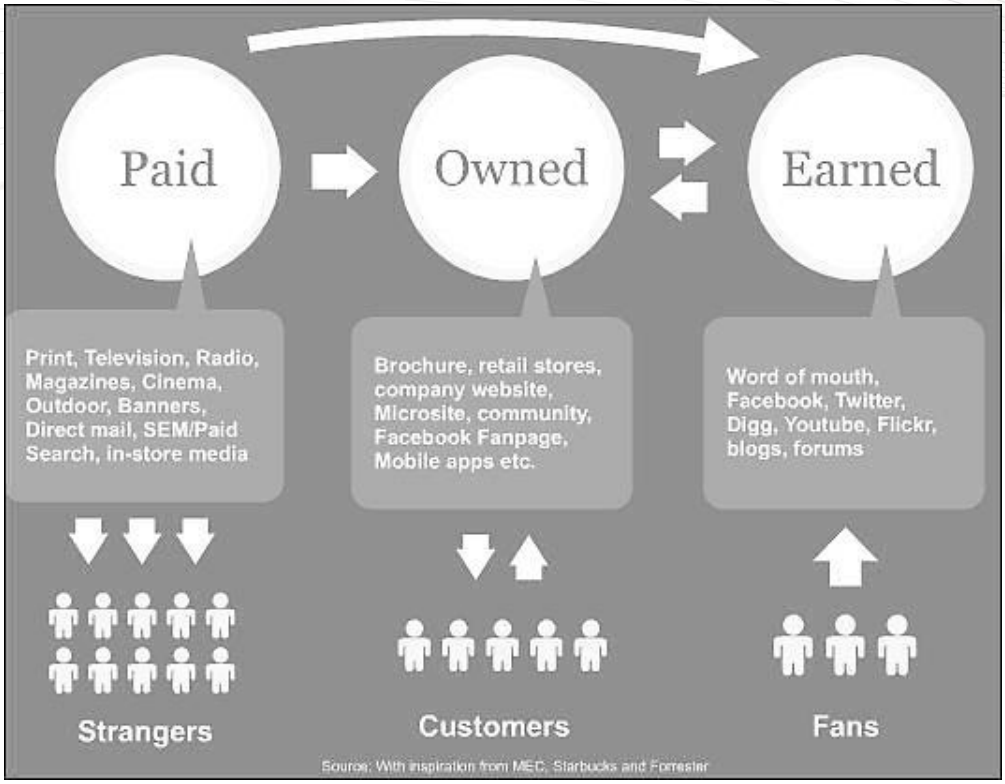
Figure 1: Reach of various types of media



Source: Online Marketing Institute (2013), 5 Critical Steps for Integrating Paid, Owned, and Earned Media, https://www.onlinemarketinginstitute.org/blog/2013/11/integrating-paid-owned-earned-media/

According to law, subscription to media have to be consensual, meaning that e-mail addresses or other private information of users can be collected only upon their acceptance of the Terms of use and provision of the consent to receive the newsletters/brochures. Starting from the March of 2018, new law has been put into force in EU (European Commission, 2018b), stipulating that the consent received by users have expiry date, i.e., they need to be revisited in regular periods of time (depending on the sector in which organization works, it varies from a few weeks to few years) and asked to reconfirm their willingness to receive the promotional materials.

2. HEI'S WEBSITE AS THE COMMUNICATION TOOL

The second stage of the strategy and, later on, of the tactical plan should be understanding of the values that the website of the HEI should offer to its different target groups.

Actually, communication strategists and administrators should answer to the questions: Why would the user would come and stay at our website? What reasons would make them to return to our website? What kind of information they are looking for? How can we incite them to share their positive word of mouth with their community? Naturally, the answers to all of these questions will differ regarding to the situation factors and sector in which HEI operates in. Nevertheless, there are some guidelines that can be effectively applied in the majority of cases. The website needs to be: i) user-friendly; ii) interactive; iii) with a layout that users expect to see; iv) continually fed with the current and interesting information; v) integrated with social media (Filipović, 2017). In the previous table the main requirements of website are depicted according to the major target audiences of HEIs, but these lists should not be regarded as the exhaustive, but more as the necessary parts of the successful website. Provided that new generations are digital natives, while they prefer visual to verbal manner of communications, this kind of content should be put forward in the process of developing and publishing of web materials for HEIs.

Table 1: Values of the HEI website for diverse target groups

	Students	Researchers	Public	Administrators
Content requirements regarding Third Mission	• Legal acts and by-laws on studying • Volunteering oppo rtunities • Calls for mobility, competitions and entrepreneurship possibilities • Workshops, training and other LLL activities provided at their HEIs • Calls for startup centers and collaborative projects	• Legal acts and by-laws on teaching and research work • Volunteering opportunities • Calls for mobility, visiting lectureship and other CE opportunities • Workshops, training and other LLL activities provided at their HEIs • Patent protection and spin offs	• Press room at the website • Video gallery (with interviews and coverage in media and YouTube) • Contacts of PR officer and other relevant staff • Web-shop with HEI's (project) memorabilia • FAQ	• Regulations on the HEI's visual identity elements • Website map • Templates to be used for the submission of content by researchers, students and general public • Frequently asked questions on technical issues
Technical requirements	• integrated with social media • visual content • highly-responsive • adjusted for the use on the cell phones	• efficient browsing • usual layout • verbal content	• professional appearance • attractive design • easily-read news (without scientific vocabulary)	• back-end platform easy to use • time-saving maintenance • suitable capacities for traffic and type of content

It is generally known that we live in the world of information overload, in which countless number of media struggle to draw user's attention. In that sense, it becomes even more indispensable to create and offer content that is individually customized, relevant and provided on different platforms (Mollet et al, 2017). Therefore, HEIs must be present on at least the most used social media (namely, Facebook, Twitter, LinkedIn and Instagram) and be in the constant correspondence with their target audiences. They need to update their content at least on the daily basis and to provide them adjusted to the each of the platforms (e.g., it should be noted that Instagram features pictures, while Twitter put more weight on the verbal message, while LinkedIn offers blogging opportunities). The web sites adjusted to the preview and usage on the smart phones are imperative in the world of modern communications.

Finally, for the purpose of the preservation and growing of the community around a HEI, the most prominent members need to be rewarded. They can be honoured in multiple ways, such as: by giving them some of the HEI's memorabilia, offering them discounted prices to certain courses of LLL offered at HEI, mentioning them or interviewing them for the online media run by the HEI, offering them to promote their examples of good practices, etc. In this way, their loyalty will increase, while they become even more dedicated brand ambassadors and help building the larger member-base.

3. EVENTS AS THE PART OF THE COMMUNICATION MIX: CASE STUDY OF THE METHODOLOGY GUIDE FOR INNOVATION

Modern manners of communications and audience's needs and wishes require constant integration of the "real" and "virtual" communication platforms. Even though some traditional forms of communications, such as fairs, evolved to their virtual manifestations, they still both exist, not being able to replace older forms by newer ones. One of the most prominent types of "offline" communications is certainly the event. In the realm of higher education and science, different sorts of events are organized regularly: public lectures, seminars, conferences, congresses, symposia, demonstration classes, exhibitions, etc. (Bucchi, 2014). Nevertheless, one of the format that has been particularly represented in the scientific communications in the previous decade is a workshop.Workshop is a training class or seminar in which the participants work individually and/or in groups to solve actual work related tasks to gain hands-on experience (Davis et al., 1999). The application of the theoretical knowledge into practical life is the core of this concept.

One of three main pillars of University's Third mission is the dimension of the transfer of technology, which closely relates to the innovation management. Aiming to support the development of technology transfer and innovation dimension within the third mission, to encourage and involve students and researchers in ideas development and bringing to the market and to open public debate on challenges that HEIs face with in innovation processes, two days workshop was organized. Workshop "Methodology guide for innovation" was held at the University of Belgrade, gathering professors, researchers and students, in order to understand the innovation cycle.

Given multidimensional nature of the topic, teachers from various disciplines gave lectures. First set of presentations covered issues of basic principles and definitions of innovation and innovation cycle, innovation modeling (market research, analytical design-technical feasibility, detailed design, test and redesign, production, distribution and marketing). Since IF4TM project support innovation processes on HEIs in Serbia, issues of the national legislative covering innovation and role of HEIs are important part of project. In the second lecture, an overview of the place of innovation in new Laws covering higher education and innovation was addressed. Moreover, the display of the European funding programs was provided, detailing the features of each of them. At the end of the first day, the trainer presented framework for management of innovation processes in Serbia, as well as university innovative platform for Western Balkans as example of good practice.

Second day of the workshop started with the presentation of the importance of the market in the innovating ecosystem. Relations between creativity and innovation, why to innovate and how to produce ideas and innovation were thoroughly elaborated and showcased on the appropriate real-life business cases. In the focus of the following presentation, the relationship between continuing education and innovation was emphasized and elaborated. After that, legal expert presented rules and procedures for protection of intellectual property. Furthermore, existing national models of financing were presented: Innovation fund programs (transfer technology program; Program for cooperation of science and economy), Program of early development (for micro and SME); Balkan venture fund; Ministry of economy program for supporting development of entrepreneurship. The light was also shed on new ways of financing innovation like crowd funding, and challenges which innovator from Serbia face when try to use this type of financing. Finally, the closing presentation was on opportunities for innovation development in Scientific Technological Parks and Business Incubators in Serbia, highlighting the most important case studies from the practice of the Business Incubator of Technical Faculties in Belgrade.

All presentations incurred interesting and lively discussions raised by both students and researchers, who were especially interested in the relationship between the entrepreneurship and innovations. The last open floor debate on challenges that HEIs face with in innovation processes concluded that many financial and legal measures need to be changed or/and established, but as the main obstacle that is needed to be overcome is distinguished to be the mindset, in order to encourage more academic innovators to bring their results to the market.

In order to assess the participants satisfaction with this event, and to identify possible avenues for the improvement of the future editions of the Workshop, the participants have been investigated and their answers are analyzed. The research instrument was developed within Quality control work package of the IF4TM project. Overall, 107 out of 112 participants have filled in the satisfaction survey, which comprised two parts, related to the content and technical execution of the event. Participants rated 17 statements on the 5-point Lickert scale, ranging from "strongly agree" to "strongly disagree", as well as from "most satisfied" to "not at all satisfied". In addition, respondents had opportunity to express their opinions in three open questions too. The results of the survey are provided in the follow up.

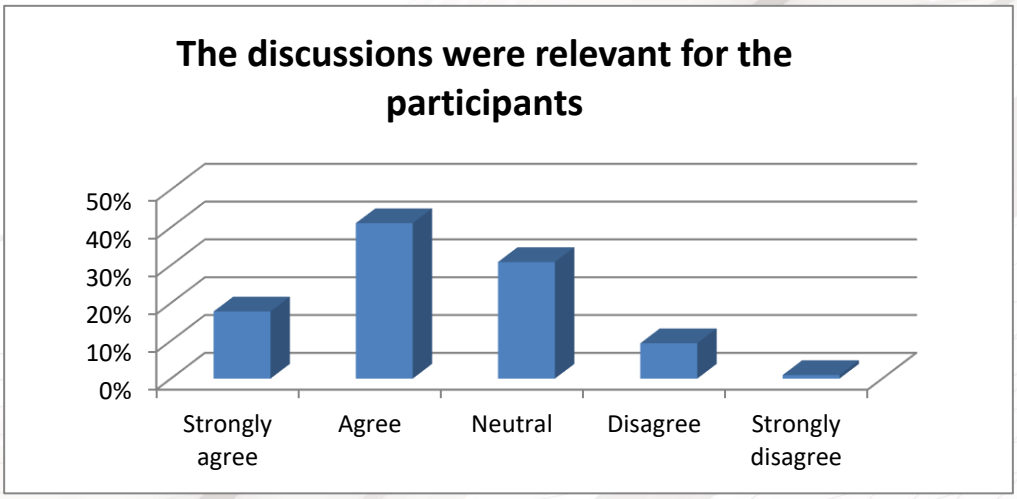
Data presented in the table no. 2 show that participants generally were satisfied with the Workshop, provided that in average 80% of respondents expressed their contentment. However, the discussion aspect was graded with the lowest mark among all, since one third of the respondents was only moderately satisfied and more than one tenth of them was rather dissatisfied.

Table 2: The level of satisfaction with different aspects of the event

	Most satisfied	Satisfied	Moderately satisfied	Rather dissatisfied	Not at all satisfied
The event administration	32%	48%	17%	4%	0%
The structure of the programme	31%	44%	21%	3%	1%
The venue and facilities	39%	40%	17%	4%	0%
The presentations	39%	37%	16%	7%	1%
The discussions	24%	31%	33%	12%	0%

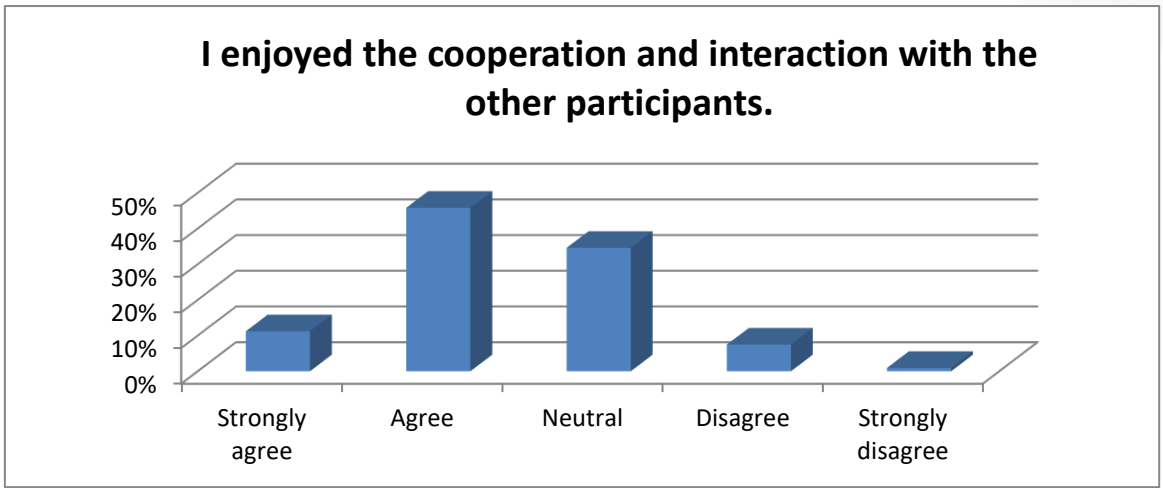
The same answers are obtained in the subsequent question which investigated whether participants found discussion to be relevant for them (Figure No. 2). In this case, slightly more respondents opted for lower grade (i.e. "agree") than for the highest mark ("strongly agree"), comparing to the previous question.

Figure 2: The relevance of discussion for the participants



It is reasonable to assume that participants expected higher level of interactivity and their greater involvement in the workshop, which is distinctive feature of this format of the event, compared to e.g. lectures. This is particularly important with regard to the age of the attendants, given that young generations are used to interactive content and want to actively take part in all tasks to which they are exposed to. Nevertheless, as it is depicted in the figure no. 3, respondents were mostly neutral and satisfied with the collaboration with their workshop peers.

Figure 3: The satisfaction with interaction with other participants



In order to comprehend specific features that contributed to general satisfaction, more detailed questions have been asked and the research addressed particular aspects of the Workshop. Regarding the aim of this event, the most relevant issue to explore was the utility of the content provided in lectures. Therefore, the topics, information, methods and lecturing style have been estimated (presented in the table no. 3).

Table 3: Assessment of the content and methods used on the Workshop

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The information I got will be of immediate use to me	19%	36%	35%	9%	2%
This event covered to a very high extent the topics I have expected.	17%	41%	32%	9%	1%
The materials distributed are useful and informative.	25%	30%	37%	4%	4%
The methods of working were suitable for the topics and for the participants.	18%	43%	31%	7%	2%
The style and level of communication between organisers and participants was professional.	42%	45%	11%	2%	0%

The analysis reveals that target groups were correctly selected and attracted to attend the event, given that the majority of participants found that the knowledge gained here would be of immediate use for them. It is especially encouraging that attendants estimated manner of communication as the appropriate and professional. Approximately one third of all participants opted for neutral answer regarding all questions, which was expected.

Besides content management, the administration of the event is also of the crucial importance. Pleasant surrounding and atmosphere are very important hygiene factors according to Herzberg's motivation theory (DeShields, Kara, & Kaynak, 2005), and even though they cannot influence the increase in satisfaction, they significantly determine the sense of dissatisfaction. It should be noted that technical elements of the event – the event administration and the venue and facilities, rated high scores (table 2), thus positively contributed to the perception of the whole event. Moreover, the time management was also assessed highly positive (figure 4).

Figure 4: The efficiency of the time management of the Workshop

Overall conclusion is that participants were highly satisfied with both content and organisation of the event. About two-thirds (67%) of them cited that they would recommend such an event to their colleagues, while only 11% stated the opposite.

4. CONCLUSIONS

The recommendations provided in the guidelines for various programmes in the domain of higher education and research emphasized the importance of customized communications to each target group, with respect to the field of study. Our research corroborate these conclusions, specifically highlighting the utility of the mix of the communications in online (website) and offline (event) spaces.

In both cases, two aspects are considered – content and administration. Even though the content is of the vital relevance for the satisfaction of the target groups, the organisational aspects are equally significant for the dissatisfaction management. Hence, both of them should be considered integrated, allowing sufficient resources for the efficient execution of each of them. Future studies should focus on the utilization of other electronic media (e.g. social media) and types of events (e.g. demonstration classes, exhibitions, seminars, etc.), as well as of their combination with traditional media (e.g. print ads and press releases). Considering the limited amounts for the communication purposes in science arena, the focus should be on the owned and earned media.

IF4TM
Institutional framework for development of the third mission of universities in Serbia
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REFERENCES

1. Bucchi, M. (2014). *Science and the media: Alternative routes to scientific communications* (Vol. 1). Routledge.

2. Danube Transnational Programme, *DTP Communication Toolkit for projects*, available at: http://www.interreg-danube.eu/uploads/media/default/0001/02/2da382312485e5c038fca3a65677f225b17a4969.pdf

3. Davis, D., O'brien, M. A. T., Freemantle, N., Wolf, F. M., Mazmanian, P., & Taylor-Vaisey, A. (1999). Impact of formal continuing medical education: do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes?. *Jama*, 282(9), 867-874.

4. DeShields Jr, O. W., Kara, A., & Kaynak, E. (2005). Determinants of business student satisfaction and retention in higher education: applying Herzberg's two-factor theory. *International journal of educational management*, 19(2), 128-139.

5. European Commission (2018a), H2020 *Guidance Social media guide for EU funded R&I projects*. Available at: http://ec.europa.eu/research/participants/data/ref/h2020/other/grants_manual/amga/soc-med-guide_en.pdf

6. European Commission (2018b), 2018 reform of EU data protection rules, available at: https://ec.europa.eu/commission/priorities/justice-and-fundamental-rights/data-protection/2018-reform-eu-data-protection-rules_en

7. European Commission (b), Erasmus+ Programme Guide, available at: http://ec.europa.eu/programmes/erasmus-plus/sites/erasmusplus/files/files/resources/erasmus-plus-programme-guide_en.pdf

8. Filipović, J. (2017), *Internet marketing*, CID Ekonomskog fakulteta, drugo izdanje

9. Mollett, A., Brumley, Ch., Chris Gilson, C. and Williams, S. (2017) *Communicating Your Research with Social Media: A Practical Guide to Using Blogs, Podcasts, Data Visualisations and Video.* SAGE

10. Online Marketing Institute (2013), 5 Critical Steps for Integrating Paid, Owned, and Earned Media, https://www.onlinemarketinginstitute.org/blog/2013/11/integrating-paid-owned-earned-media/

11. Tuman, J. Jr., & Eng, P. (2011) "Studies in Communications Management: Achieving Project Success through Stakeholder Management. Chapter 13A". *The AMA handbook of project management* (eds. Paul C. Dinsmore, Jeannette Cabanis-Brewin). Amacom Books, American Management Association, pp. 183-192.

12. Young, E. & Quinn, L. (2012). Making research evidence matter: A guide to policy advocacy in transition countries, Open society foundations: Budapest

EHTHUSIASM VS. SCEPTICISM: SERBIAN RESEARCHERS' VIEWS ON OPEN SCIENCE

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Abstract: *The paper describes a study based on the survey of Serbian researchers' attitudes towards open science. The attitudes on open access and users' preferences regarding institutional open science repositories were examined on a sample of 850 Serbian researchers. The results of the factor mixture analysis revealed three clusters of researchers (names The Sceptics, The Goal-Ori ented, and Personal Motivation) based on five latent dimensions (named Negative attitudes, Personal scientific impact, Scientific communication and knowledge transfer, Efficiency of publishing procedures, and Visibility of repository content). Analyses of differences in class membership among researchers from five broad research fields suggested that the differences are largest regarding tendencies towards efficiency of publishing and personal scientific impact.*

KEY WORDS: OPEN SCIENCE, OPEN ACCESS, INSTITUTIONAL REPOSITORIES, ATTITUDES

JEL CLASSIFICATION: I2 Education and Research Institutions.

1. INTRODUCTION

Several aspects of open science have been recognized as the crucial constituents of the "Three pillars of the Third Mission of the University" (e.g. De Filippo, Bautista-Puig, Mauleón, & Sanz-Casado, 2018). However, despite its relevance on both global and local levels, the concept of open science has largely been an unknown to Serbian researchers. The aim of the BE-OPEN project (Erasmus + KA 2 project, funded by the European Commission; http://beopen.uns.ac.rs) is to provide support for the promotion, implementation, and development of open science practice in Serbia. BE-OPEN is a collaborative effort of Serbian state universities, government, and European partners, co-ordinated by the University of Novi Sad. At this moment, the project is in its penultimate year, with the initial screening studies completed, national platform for open science adopted[2], and the institutional repositories being implemented.

Establishing institutional repositories is arguably the greatest challenge for the project team. Namely, the repositories are envisaged not only as archives of research outputs, but as facilitators of communication between the stakeholders, including, but not limited to, the communication among researchers, industry, and citizens. This is possibly the most evident and most relevant link between open science practices and the "Third mission of the University". The success of such a communication device, apparently, relies on researchers' recognition of the advantages of open science, and on their willingness to use the available capacities of institutional repositories. In other words, the importance of researchers' knowledge and attitudes on open science, as well as of their needs as users of institutional repositoria, should not be underestimated.

Prior to the first phase of the BE-OPEN project, large-scale studies on attitudes on open science have not been systematically conducted in Serbia. Some results, based on the data obtained in other EU projects (Regional Cooperation Council, 2016), point to low levels of knowledge and awareness of open science practices. Similar conclusions can be drawn from the data obtained in the initial phase of the BE-OPEN project (BE-OPEN, 2017). Open data practices were shown to be largely unknown to the participants, and therefore were not considered in this study.

While these data provide insight into the state of affairs regarding the Serbian researchers' stance towards open science, several issues remain open. For instance, can more general patterns of attitudes and user needs be found in survey data? If so, can such patterns serve as foundations for

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[2] http://open.ac.rs/vesti?id=87328781babfe70aad60429fad8f4feb

grouping / clustering that may be related to research fields, implying differences among scientific disciplines regarding the views on open science?

Open access publishing may be regarded as one of the crucial aspects of open scientific communication, and institutional repositories as the principal technological driving force of open science. Thus, the aim of this study is twofold: a) to perform an in-depth exploration of attitudes toward open science and user requirements regarding institutional repositories; b) to explore if such attitudes and / or their more general patterns are related to research orientations. The results may be of substantial importance for the implementation of open science practices in Serbia, particularly for the improvement of repositories' functionality through their customization based on user's requirements.

2. METHOD

Participants and procedure. The survey on open science attitudes and experiences (BE-OPEN, 2017) was conducted in May and June 2017. Email invitations were sent out to approximately 11.000 academic and research staff. A total of 1.209 participants took the questionnaire, with around 83% of them completing it (BE-OPEN, 2017). Participation in the study was anonymous and voluntary. The survey was implemented using the *LimeSurvey* open source survey software (Schmitz, 2012), which was installed on a platform hosted at the University of Novi Sad.

Measure. Out of the 4 broad sections of the questionnaire, the latter two comprised the items related to attitudes and knowledge on open science practices, as well as items addressing users' requirements regarding the contents of institutional repositories. The original version of the survey (in the Serbian language)[1] and the report on survey results[2] are available at the BE-OPEN website. A total of 25 survey items, 15 related to attitudes on open access and 10 to attitudes about repositories, were used in analyses.

Analysis. Since responding to all survey items was not mandatory, the resulting dataset contained a large amount of missing data. For the purposes of this study, 850 participants who provided the information about their primary research field were included in the study. Out of the 850 selected participants, 132 were from the field of Medical sciences, 240 from the field of Sciences, 270 from Social sciences and humanities, 186 from Engineering and Technology, and 22 from the field of Arts. The remaining missing data were imputed using the "k-nearest neighbor" algorithm, suitable for both categorical and continuous data, using the "bnstruct" package in R environment (Franzin, Sambo, & DiCamillo, 2016).

Broad patterns of attitudes toward open science and users' requirements regarding the functionality of institutional repositories, as well as possible groupings based on such patterns, were examined using factor mixture analysis, implemented in the "FactMixtAnalysis" package in R environment (Viroli, 2012a). The outcome of the analysis is a joint factorial-class solution, whereby latent groups (classes) are based on linear combinations of observed variables. Commonly, several solutions including different numbers of factors and classes are tested. The choice of the optimal solution is based on Bayesian information criterion (BIC) (Viroli, 2012a; Viroli, 2012b). In this study, a range of solutions containing 2 to 5 classes and 2 to 5 factors were examined (20 solutions in total), and their BIC values compared.

Differences among scientists from different scientific fields were examined by chi-square test, using contingency tables with class membership as rows, and scientific disciplines as columns. Due to a modest frequency of researchers from the field of arts, two chi-square tests were performed, with the field of arts included and omitted, respectively.

[1] http://beopen.uns.ac.rs/anketa

[2] http://beopen.uns.ac.rs/documents/35a4f18a51b8b1b54a9dec74afea72a3/Survey%20on%20open%20science%20awareness%20in%20Serbia.pdf

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3. RESULTS AND DISCUSSION

3.1. Attitudes towards open access publishing and institutional repositories

Latent dimensions.

Table 1. BIC values for the 5 best solutions

solution	BIC
fma.23.bic	47342.56
fma.24.bic	47312.30
fma.44.bic	46524.72
fma.34.bic	46366.60
fma.35.bic	46249.87

BIC values suggested that the optimal solution is the one with three latent classes and five latent dimensions.

Five latent dimensions (factors) were rotated using "oblimin" oblique factor rotation, in order to obtain a simpler and more interpretable solution. Median factor congruence among corresponding unrotated and rotated factor was .89, pointing to a fair degree of similarity between two solutions. Correlations among factors are relatively modest, whereby the highest positive correlation is .26 (between factors 1 and 3), while there are no substantial negative correlations.

Table 2. Oblimin - rotated factors

X1	X2	X3	X4	X5	text
0.76	-0.05	-0.06	0.10	0.00	Dubious and unsolid (or non-existent) review process
0.74	0.03	-0.01	0.05	-0.01	Lack of support when choosing where to publish my paper
0.74	0.05	-0.01	-0.08	-0.02	Unclear legal and copyright regulations regarding open access
0.68	-0.06	-0.01	0.08	0.02	Lack of visibility in leading international databases
0.67	0.06	0.05	-0.11	0.02	Dubious reputation of some OA publishers (eg. Predatory publishers)
0.63	-0.06	0.20	-0.10	0.01	The need to transfer my copyright to OA publisher
0.58	-0.01	0.01	-0.04	-0.01	Shortage of high quality OA journals
0.01	0.99	0.02	0.02	0.01	better chance for my publications to be cited
-0.03	0.75	-0.04	0.00	0.00	better visibility and availability of my publications

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0.09	-0.10	0.71	0.17	0.00	less rigorous review process
0.01	0.24	0.47	-0.01	0.00	Providing more accessible education material for students
-0.03	0.20	0.43	0.01	0.04	More efficient communication with the industry and society
0.31	0.03	-0.32	0.20	-0.01	High publication fees
-0.04	-0.05	-0.28	0.19	0.10	user-friendliness (simplicity) of updating personal information
-0.07	0.00	0.21	-0.14	-0.12	user-friendliness (simplicity) of document manipulation
0.02	0.01	0.20	-0.18	-0.10	data security and option of permanent storage of materials
0.04	-0.02	0.13	-0.02	-0.03	availability of information on new projects
-0.01	0.02	0.05	0.98	0.00	faster publication time
0.07	0.28	-0.08	0.32	0.01	possibility to keep copyright on my publications
-0.01	-0.03	0.08	-0.08	0.01	availability of information on copyright and licensing
-0.02	0.04	0.06	-0.04	0.64	availability of the data on my citedness
0.03	-0.03	-0.06	0.03	0.59	availability of the data on number of downloads of my publications
-0.08	-0.05	-0.06	0.07	0.24	enabling communication with other researchers
0.01	0.07	0.11	-0.05	-0.18	availability of technical support
0.04	0.04	-0.13	0.01	0.17	availability of information on new publications in my field

The first oblimin factor comprises the items describing the most common negative prejudice related to open access publishing and was named accordingly. High scores on this factor would most likely imply both lack of knowledge and a negative attitude about open access publishing.

Two items ("attitudes") with the highest loadings on the second oblimin factor contain correct information about larger impact of openly available scientific outputs. A few lower secondary loadings also point to basic knowledge about actual advantages of open access publishing. One may assume that higher scores on this factor reflect more pronounced motivation toward higher personal scientific impact.

The third factor's content appears to be the least homogeneous. It implies awareness about the positive effects of open access publishing on scientific communication, both in academia and beyond. There is, however, also a misconception (positive prejudice) that open access publishing implies more permissive reviewing procedures. The fourth salient (negative) loading concerns publication costs,

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suggesting that lower publication costs may, in participants' opinion, facilitate scientific communication. The component was named "Scientific communication and knowledge transfer".

The fourth factor concerns open access publishing procedures, offering a somewhat vague blend of knowledge and misconceptions regarding the publishing process. The participants scoring highly on this factor would be aware of the advantages related to copyright issues, and be convinced that the publishing procedure is faster, but more expensive. The factor was named "Efficiency of publishing procedures".

The fifth factor is exclusively related to users' requirements regarding open institutional repositories. Virtually the only relevant features are the data about number of citations and downloads, as well as certain features regarding communication with other members of scientific community. The factor was named "Visibility of repository content".

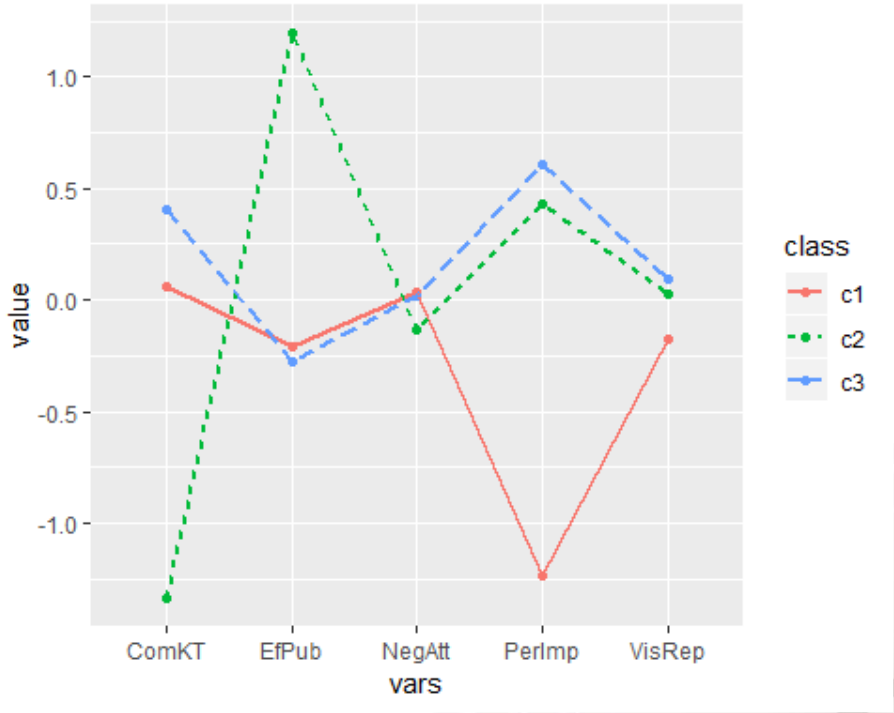

Figure 1. Profiles of the three classes on latent dimensions

Participants grouped in Class 1 (N = 265) score moderately high on negative attitudes toward open access publishing, and low on "personal scientific impact". While these participants express mildly negative prejudice toward open access, they still cannot disregard some of its advantages, particularly regarding communication and knowledge transfer. This group was tentatively named "The Sceptics".

Members of the Class 2 (N = 146), compared to the remaining two classes, score lowest on communication and knowledge transfer, moderately high on negative attitudes, and highest on the "publishing efficiency" factor. While these participants' stance toward open science is apparently less negative than in other classes, they are interested primarily in publishing and gaining personal impact. This class was named "The Goal-Oriented".

Members of the Class 3 (N = 439), compared to the remaining two classes, are less interested in publishing strategies, and most aware of possibilities of gaining personal impact through open access publishing. They also seem ready to adopt the novel approaches that enable knowledge transfer and communication. This class was named "Personal Motivation".

Modest between-group differences were found in repository - related attitudes. Such a result may be taken into account in the process of repository implementation and development - users' needs are virtually the same, regardless of the discipline or stance towards open access.

Table 3. Scientific disciplines and classes: observed frequencies, expected frequencies, and standardized residuals

	Observed frequencies					Expected frequencies					Standardized residuals				
	MED	SCI	SSH	E&T	ART	MED	SCI	SSH	E&T	ART	MED	SCI	SSH	E&T	ART
1	41	84	72	65	3	41.15	74.82	84.18	57.99	6.86	-0.03	1.51	-1.94	1.26	-1.80
2	30	41	37	27	11	22.67	41.22	46.38	31.95	3.78	1.84	-0.05	-1.83	-1.09	4.14
3	61	115	161	94	8	68.17	123.95	139.45	96.06	11.36	-1.36	-1.37	3.18	-0.34	-1.45

X-squared
30.50892

p = 0.0001717682

Table 4. Scientific disciplines and classes (arts omitted): observed frequencies, expected frequencies, and standardized residuals

	Observed frequencies				Expected frequencies				Standardized residuals			
	ED	CI	SH	&T	ED	CI	SH	&T	ED	CI	SH	&T
	1	4	2	5	1.77	5.94	5.43	8.86	0.16	.33	2.14	.10
	0	1	7	7	1.52	9.13	4.02	0.33	.18	.39	1.41	0.75
	1	15	61	4	8.71	24.93	40.54	6.82	1.47	1.52	.04	0.47

X-squared
13.25106

p = 0.03921781

The differences among scientific fields with respect to class membership were examined using chi-square tests. The tests were performed for the entire sample, and for the reduced sample (not containing a relatively small group of researchers in the field of Arts).

The results suggest that the researchers in social sciences and humanities show the highest level of "personal" motivation, while the researchers in medical sciences are most prominently oriented towards publishing. Standardized residuals suggest that the researchers from the fields of sciences and engineering tend to be most (although generally moderately) "skeptical" toward open science.

Although these differences may, and very likely do, have more profound foundations, they may also reflect the state of affairs in scientific production and publication strategies in Serbia in the recent years. Namely, national journals in social sciences and humanities adopt gold open-access approach, with no publishing fees, suggesting that the researchers who publish in these journals are more aware of affirmative aspects of open access, and are most ambitious to employ them. The researchers in the field

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of medical sciences are apparently "extrinsically" and competitively motivated to publish, which may be due to the specific features of the field, but possibly also due to vulnerability to predatory journals and publishers in recent years.

The "technology - related" aspect of researchers' attitudes pointed to a unanimous request for a secure and well-connected repositories that may provide news as well as "standard" measures" (views / downloads counts).

4. CONCLUSION

The results of this study offer a somewhat more profound insight into the patterns of attitudes toward open science (open access publishing) and the required features of institutional repositories, as well as insight into differences in these attitudes among scientific fields in Serbia. While the results indicate that institutional repositories in general do not necessarily have to be "custom-made" with respect to scientific fields, there is still obvious need for education on open science topics. The content of such education should be aimed at defying prejudice about open science and motivating the researchers to attempt to publish open access, or, at least, self-archive their papers in green open access regime wherever possible. On the other hand, the researchers should be educated about different modalities of open access publishing, which also includes the green open access regime.

REFERENCE LITERATURE

BE-OPEN (2017). Survey on open science attitudes and experiences among Serbian scholars. Retrieved from http://www.beopen.uns.ac.rs/documents/35a4f18a51b8b1b54a9dec74afea72a3/Survey%20on%20open%20science%20awareness%20in%20Serbia.pdf

De Filippo, D., Bautista-Puig, N., Mauleón, E., & Sanz-Casado, E. (2018). A Bridge between Society and Universities: A Documentary Analysis of Science Shops. Publications, 6(3), 36.

Franzin, A., Sambo, F., & Di Camillo, B. (2016). bnstruct: an R package for Bayesian Network structure learning in the presence of missing data. Bioinformatics, 33(8), 1250-1252.

http://www.beopen.uns.ac.rs

http://www.beopen.uns.ac.rs/documents/ed1c9a4402cdb96bd792e890fe0c241e/Platforma%20za%20otvorenu%20nauku.pdf

https://wbc-rti.info/object/news/15251/attach/Conclusions_from_SP-FINAL1.pdf

R Core Team (2018). The R Stats Package, version 3.6.0. Retrieved from https://stat.ethz.ch/R-manual/R-devel/library/stats/html/stats-package.html

Revelle, W. (2018) psych: Procedures for Personality and Psychological Research, Northwestern University, Evanston, Illinois, USA, https://CRAN.R-project.org/package=psych Version = 1.8.10.

Schmitz, C. (2012). LimeSurvey-the free & open source survey software tool. Recuperado de.

Viroli, C. (2012a). FactMixtAnalysis: Factor Mixture Analysis with covariates. Retrieved from https://cran.r-project.org/package=FactMixtAnalysis.

Viroli, C. (2012b). Using factor mixture analysis to model heterogeneity, cognitive structure, and determinants of dementia: an application to the Aging, Demographics, and Memory Study. Statistics in medicine, 31(19), 2110-2122.

ASSUMPTIONS FOR IMPLEMENTATION OF SOCIAL ENGAGEMENT AT THE UNIVERSITY OF NIŠ

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Abstract: *In this paper, possible options for university transformation, first of all from the perspective of "University of the future", with particular reference to the engaged university will be considered. Special attention will be paid to a new complex system structure with three subsystems "Research", "Education" and "Social engagement" and in between "Creativity Center" subsystem as the system structure central point. In that sense, optimal organizational structure that can be in the function of Social Engagement implementation at University of Niš will be considered. Social Engagement will be considered as the individual dimension of the Third Mission, but also within the synchronized implementation of other two dimensions, continuing education and technology transfer.*

KEY WORDS: SOCIAL ENGAGEMENT, CREATIVITY CENTER, UNIVERSITY TRANSFORMATION, ENGAGED UNIVERSITY

1. INTRODUCTION

University of Niš was founded in June 1965, as the youngest university on that date - third Serbian and seventh Yugoslavian. With its continuous development and advancement in the field of education and science, the University of Niš has become an important pillar in the higher education system in Republic of Serbia. This is confirmed by its determination expressed through its mission and vision:

MISSION: Integration into the European higher education area in accordance with the highest quality standards of education, research and professional work.

VISION: A modern and recognizable Serbian and European university that is comparable to foreign higher education institutions of the highest rank in terms of quality of study programs, teaching activities, research and professional work.

By its constant development, the University of Niš has been confirming visionary words of our Nobel Prize-winner Ivo Andrić, echoing from the Opening Ceremony held on October 15, 1965:

"*... And the man belonging to our present society needs it more than it was the case with the previous generations, as the goals of the new life urge him to be a more harmonious and more universal personality, rather than a biased and narrow-minded professional. And it is exactly this harmony between the reason and the imagination, this balance between the goals and the responsibility of practical life on one hand and the width and serenity of the spirit on the other that should give our man a distinctive feature and ability to fully develop all his creative powers...*"

Following the modern trends in which the University must have a leadership position, we strive to maintain and strengthen the characteristics of a strong research university with a particularly important and new component, such as the transfer of knowledge and technology to society, but also activities that are referred to as social engagement. The words, with which Prof. Dr. Branimir Janković, the first rector of the University of Niš, ended his first address at the opening ceremony of this higher education institution, were confirmed throughout the latter decades, i.e. throughout a half a century of its academic activities: "*University of Niš is a huge historical event for all of us here, for our region and for our Republic of Serbia. It will broadly develop its technical, scientific,* ***social****, educational and* ***cultural*** *activities and contribute to faster revival of this region, the Socialist Republic of Serbia and our Yugoslav socialist community*." What was once a visionary, today is the essential necessity of a modern university.

Three dimensions of the Third Mission of "a new university" – as defined by one European study (Green Paper) are (i) (Continuing) Education, (ii) Research/Technology Transfer toward Innovation, and (iii) Social Engagement (SE). Bearing in mind that the University of Niš belongs to the

[1] Institution/Affiliation: The University of Niš, Serbia

category of so-called "transformative university (within Serbian legislation)", in this paper implementation of an appropriate SE model at the University will be described and discussed.

2. UNIVERSITY TRANSFORMATION

The University of Paris who appeared around 1150 was synonymous as internationally highly reputed institution for its academic performance in the humanities, at that time in theology and philosophy. Even more, the University introduced several academic standards and traditions that have endured ever since and spread internationally. This period was called “First Mission” and was characterized only by the education process (Fig. 1a).

Further progress in the evolution of the university was promoted by Wilhelm von Humboldt (1767–1835). He was the first who promoted the independence of academia, but also the integration of natural, social sciences and humanities. More important, he suggested for the first time the unity of education (teaching) and research (Fig. 1b). Interrelation between these two categories was through (very broad range of) knowledge transfer.

(a) (b)

Figure 1. University evolution: First Mission (a) and Second Mission (b).

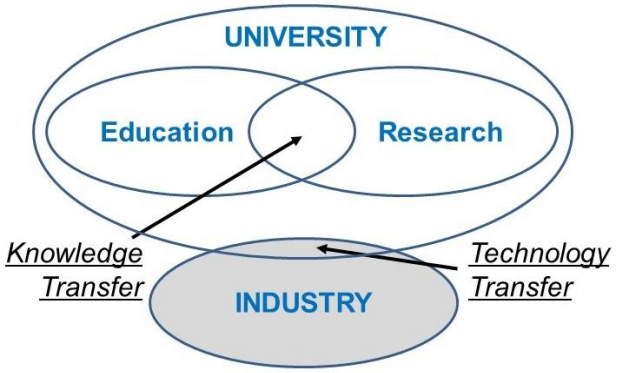

Figure 2. University evolution: Third Mission.

The entrepreneurial model with active university-industry partnership and technology transfer with commercialization efforts has been called “Third Mission” (Fig. 2). The collaboration between university and companies was usually informal (common scientific investigation through joint projects with university researchers) or formal covered by contractual arrangements (research projects to university labs, joint research agreements, and even individual contracts with key researchers). It seems that the university in this organizational scheme was undoubtedly involved in some kind of production, the nature or essence of what it produces remained the same - dissemination of knowledge. Despite the shortcomings of this model, it played a significant role in further transforming the broader role of the university. It may be enough to mention a phenomenon occurred in few universities in the USA, driven by success stories called the high-tech revolution attained by collaboration between for example Silicon Valley and Stanford. It should be especially emphasized that none of these models have lost their relevance to the day.

3. UNIVERSITY OF THE FUTURE

Both classic and future (new, transformed) university must be based on quality and academic excellence. However a successful modern university is looking for something more inside and outside the academic community. In this sense, the university will have to solve various challenges, and accordingly define the optimal organizational redesigned model. It will be possible by combination of educational, scientific, technological, social and environmental transformations.

3.1. Engaged university

This term denotes "transformed university" with probable the strongest and most complex relationship between university and its environment, including social dimension together with technological and economic dimensions. This concept represents a new university which shares its knowledge as far as possible as a free and public good. This new feature of the university, SE ("community engagement" or similarly "civic engagement") as an approach to the "Third Mission", must be something more than a formalized (or codified) concept.

As an example, a global society of universities has evolved on basis of the "Talloires Declaration on the Civic Roles and Social Responsibilities of Higher Education" (2005). Purposes were voluntary activities, including educational functions towards students, and established community relationships in research.

Transformed university should not be only part of their local and/or regional environment, but also part of national and international global knowledge communities. Such university should contribute, through its engagement, to the global integration combining the external resources with the regional needs (Arbo et al., 2007). It should be noticed that regional engagement depends very much on the location of university, so that its involvement in regional development activities increases directly its engagement. Unfortunately, the University of Niš demonstrates the validity of such a claim, since the degree of its engagement is limited (in a long period of time) to its location.

Engaged university concept assumes very high demands of coordination, steering and financing to engage comprehensively in the regional environment (Chatterton et al., 2000). However, it is possible that some engagement activities cannot be integrated and coordinated or the capacities and potentials of university towards this engagement might also be overestimated (Gunasekara, 2006). Even more, the capacities of Serbian universities are mainly governed at the national level, which might reduce their latitude for engagement. This applies not only to the financial issues, but also to the legislation and regulations of study programs, work relations, etc. It seems that the transformation to the engaged university shows the complexities but also the wide variety of activities to approach them.

3.2. Implementation of social engagement

The concept of "transformative university" offers a possibility to introduce SE dimension as a multi-functional university platform engaged with society in a continual and mutual process of creation and transformation of different types of activities (Fig. 3) in which interactive and intensive cooperation of the subsystems Education and Research involves professors and researchers from very broad range of scientific fields, which may often have characteristic of transdisciplinary collaboration.

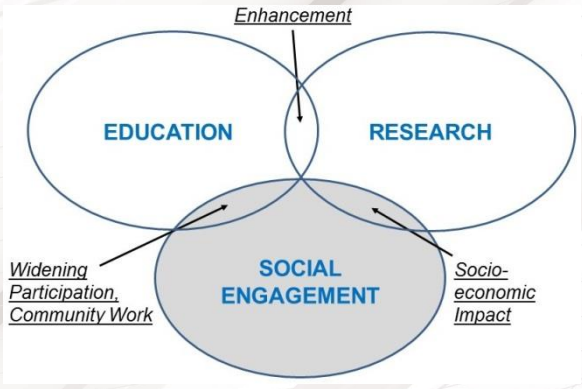

Figure 3. Organisational scheme for engaged university

The University of Niš is a state university and therefore has specific relations with the Ministry of education, science and technological development and with the societal, technical and economic environment (Fig. 4). At the same time, the University expects the participation of surrounding industry, as well as wide range of non-experts and civil society. This is typical (regional) model of interaction between universities and society (Mora et al., 2017).

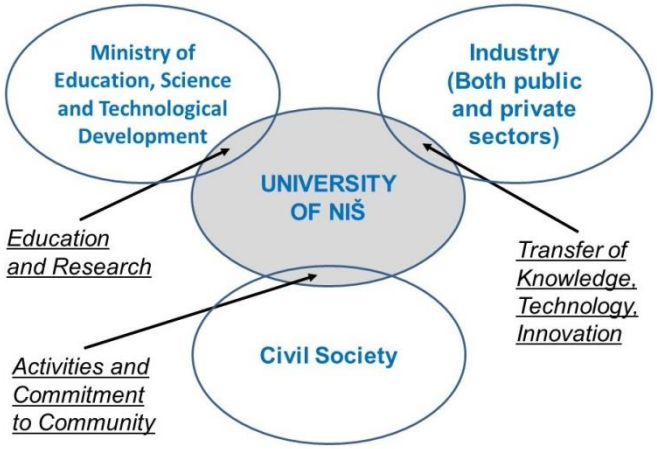

Figure 4. Functional scheme of the University of Niš towards the government (Ministry) and the natural environment (Industry and Society).

Although the SE dimension can be observed independently of the other two dimensions from the Third Mission, a more comprehensive approach would be consideration of the SE along with the other two.

Within the framework of the IF4TM[1] project, special attention is paid to the SE of universities, in particular through instruments supporting the development of creativity, entrepreneurial spirit, team work and multidisciplinary work of students, high school students and young people in general. In accordance with the intention to develop Serbian universities into strong, socially responsible higher education institutions, within this project an initiative has been launched to create five Creativity Centers that would enable the achievement of this goal.

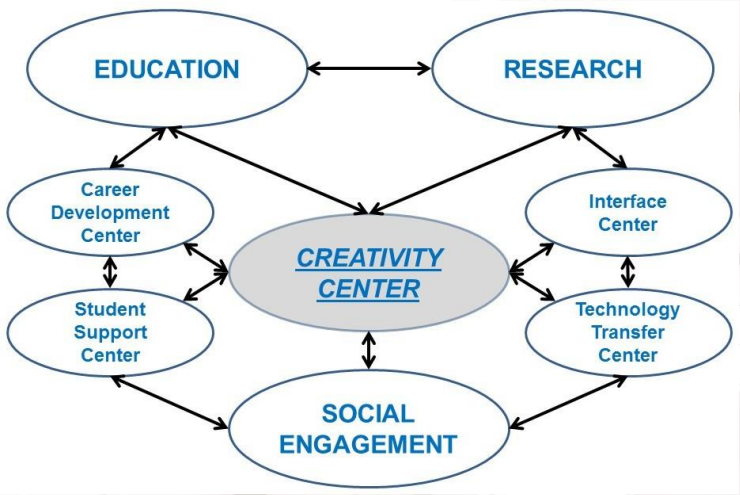

Figure 5. Implementation of Creativity Center at the University of Niš with all institutional units interrelated to the Center.

Such center was also created at the University of Niš. Some of its activities are training programs for the development of creative thinking and acquiring entrepreneurial skills among students, researchers and pupils by helping students and pupils to use equipment and software in the prototype

[1] ERASMUS+ project: Institutional framework for development of the third mission of universities in Serbia, Contract no 561655-EPP-1-2015-1-RS-EPPKA2-CBHE-SP.

workshop of the Center. It organizes and promotes volunteer programs and campaigns of open innovations in cooperation with enterprises. It should help students and researchers in creating and developing the idea of establishing their own business start-up or spin-off companies for commercialization of research results.

Today more than 18 centers are active at the University of Niš, but activities of at least four centers can be especially important for the better functioning of the Creative Center due to their similar or complementary activities (Fig. 5):

Center for Career Development. It was established to support students of all levels in developing skills and abilities that are crucial for their employment, as well as to provide information on education, internship and scholarship opportunities, both national and international. The Center stimulates students to further education, to acquire work experience during their studies and to develop the awareness of modern business conditions.

Student Support Center. This Center provides various forms of support for students. Among other things, the Center provides assistance in learning techniques, as well as monitoring and identification of problems faced by the target groups. A very important activity of the Center is the coordination of the overall activities of student support provided by the University, faculties and other relevant public institutions.

Interface Center. It develops methodologies and tools to enhance the transfer of knowledge towards community, as well as measures to improve higher education in line with current demands of the labour market and society. This Center particularly collaborates with public, private and non-governmental sectors in the country and abroad (especially with Alumni), in order to ensure better competitiveness in the labour market and to increase the employability of graduate students.

Technology Transfer Center. It was established to improve opportunities for the effective application of developed research results at the University. Center is responsible for promotion of various forms of knowledge and technology transfer between the University and industry or society. It provides the placement of new technologies and innovations in the market. Center participates in the creation of collaborative networks in order to intensify technology transfer and renders expertise and support in the development of technological and economic feasibility studies. Its task is to build awareness of the need for legal protection and commercial exploitation of intellectual property and assists in the creation of new innovation centers and business and technology parks that will be established by the University and its faculties.

In order to arrive to a complex system by which the SE may be finally implemented at the University, in our opinion it is necessary to change the previously defined organizational scheme shown in Fig. 5 by including two other centers existing at the University:

Lifelong Learning Center. It develops, defines and implements training courses and modules in the field of lifelong learning, and issues relevant certificates on the training completion. It also provides support in the development of small and medium-size enterprises by enabling a special training program intended for entrepreneurs, but prepares and organizes workshops, courses and training for students and staff at the faculties and the University. It provides training to acquire key competences in the lifelong learning system, such as communication in the mother tongue and foreign languages, competences in mathematics, science, technology, information and communication technologies and social interaction, and development of initiative and entrepreneurial spirit. Center also provides consulting assistance to interested employers related to the kind of knowledge that would be most appropriate for them, regarding their business, technology and market trends. The Center establishes a partnership network with local institutions, such as the City of Niš, the Regional Chamber of Commerce, the Union of Employers, the National Employment Service and others.

Innovation Center. This Center in an organized and systematic manner works on implementation of own and other scientific results and modern technological processes for the purpose of creating innovations, developing prototypes, new products, processes and services. At the same time it organizes transfer the knowledge and technologies into production and services of other economic entities. The Center organizes scientific research, develops innovations, provides consulting services to

companies, public services and enterprises, provides assistance in the establishment of innovative and high-tech companies, provides assistance in establishing incubators and technology parks, and educates and trains personnel.

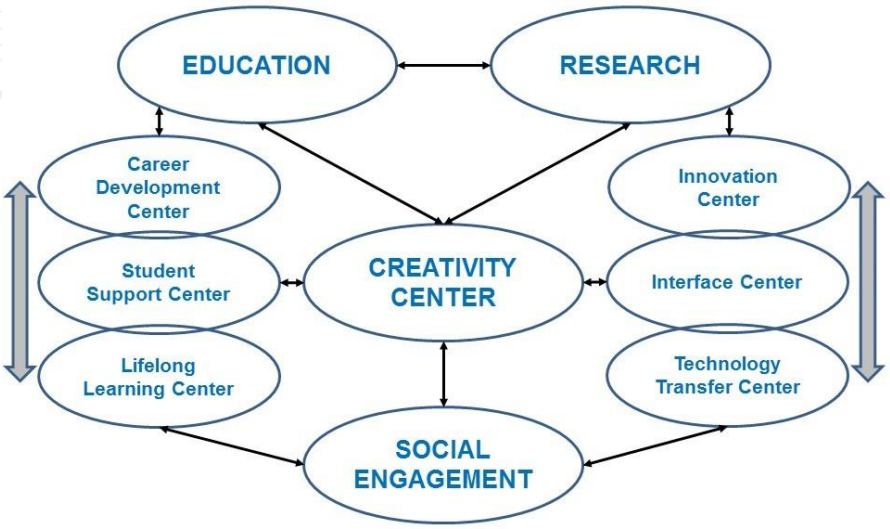

Figure 6. Existing organizational scheme of the systems and subsystems for realization of the Third Mission at the University of Niš. Next to the left of "subsystem of education" there is "open learning platform (OLP)". Next to the right of "subsystem of research" there is "open innovation platform (OIP)".

Having in mind the profiles of two centers' activities, a new complex structure will be as drawn in Fig. 6. In this structure activities related to subsystem "Research" (technology transfer and innovation, etc.), to subsystem "Education" (lifelong learning/continuing education, training, etc.) and to subsystem "Social engagement" (voluntary work and consultation by staff and students, community engagement, etc.) are interrelated with the activities related to subsystem "Creativity Center" as structure central point. In this structure SE becomes the way of engaging the intellectual (creative and intelligent people from academic community) and physical resources of the university in serving the community.

It should be noted that the dissemination and sharing of (academic) knowledge within and/or across OLP (from students at all levels of study to community people) may be combined with socially embedded knowledge. On the other hand, the transfer within and/or across OIP includes both specialized and multi-disciplinary scientific knowledge and both technological and social innovation. It is assumed that there are the necessary creative forces from academia, surrounding industry, local government and finally community to drive activities that will accelerate the wider SE of the university. Both mentioned platforms are directly in function of the subsystem of SE. At the same time all four subsystems (Education, Research, SE and Creativity Center) are interconnected but simultaneously connected with two platforms too. Although this special organizational structure of SE sub-system can be formal, it may generate numerous innovative partnerships with different subjects, such as small businesses, rural communities, socially and economically disadvantaged groups (associations, networks and incubators), etc.

Another important parameter is funding. As a rule, SE activities will be funded by the University with resources from their own budgets. This may be a problem (limitation) in the implementation of the SE, but it can be solved by funding from some international projects dealing with similar issues.

SE activities may be both centralized or decentralized towards faculties. In order to synchronize all activities, the University will develop a system for planning, managing and monitoring SE activities (maybe called "Management for SE activities"). Such a system will enable the planning of optimal individual and systematic plans of SE, but at the same time it will be a generator of new activities according to the actual requirements and real needs of the community. Due to effective coordination, this system will initially be centralized (at the level of University), but its competence will be decentralized very quickly towards its faculties. It is expected that synchronization of the activities of the University and its faculties will provide all the preconditions for full and transparent realization of the function of SE.

The University is especially interested in monitoring and assessing the impact of overall SE activities within the University and its faculties. The only problem in the realization of this intention may be that certain SE activities may be also embedded in continuing education or even in technology transfer activities. Hence it may be more appropriate to monitor the overall impact of "Third Mission" than to monitor the impact of each individual dimension. In this regard, the monitoring of the impact and effects of "Third Mission" should in fact be at the level of the organizational structure shown in Fig. 6.

4. CONCLUSION

In this paper, possible options for university transformation (from the perspective of university of the future) with particular reference to the engaged university were considered. In this regard, optimal organizational structures are considered that can be in the function of SE implementation in the wider or broader sense. SE is considered as the individual dimension of the Third Mission, but also within the synchronized implementation of other two dimensions, continuing education and technology transfer.

It should be concluded that for successful partnerships between the University and community, the University must have a clear view of the real needs of SE in its closer or wider environment but in relation to the University capabilities, and by selection of social activities which will be of mutual benefit.

The most important contribution to this consideration may be the fact that the SE will be introduced and treated at the University of Niš in the same way as education and research. In that sense, SE will be (as soon as possible) included in its university missions. As a matter of fact, SE will be treated in some way as ‘‘university extension’’ to which priority will be given.

REFERENCE LITERATURE

Arbo P. and Benneworth P. (2007), "Understanding the Regional Contribution of Higher Education Institutions: A Literature Review", *OECD Education Working Papers*, No. 9, OECD Publishing, Paris. http://dx.doi.org/10.1787/161208155312

Chatterton P. and J. Goddard J. (2000), "The Response of Higher Education Institutions to Regional Needs", *European Journal of Education*, Vol. 35, No. 4, Higher Education and the Stakeholder Society, pp. 475-496.

Green Paper, Fostering and Measuring "Third Mission" in Higher Education Institutions http://www.e3mproject.eu/Green%20paper-p.pdf [Accessed 10/20/18]

Gunasekara C. (2006), "Reframing the Role of Universities in the Development of Regional Innovation Systems". *The Journal of Technology Transfer* 31(1):pp. 101-113.

http://talloiresnetwork.tufts.edu/wp-content/uploads/TalloiresDeclaration2005.pdf [Accessed 10/20/18]

Mora J-G, Serra M.A. and Vieira M.-J. (2017), "Social Engagement in Latin American Universities, Higher Education Policy", *International Association of Universities* 0952-8733/17.

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