CREATIVITY, INNOVATION AND INTELLECTUAL CAPITAL IN THE DIGITAL AGE

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THE ROLE OF INTELLECTUAL PROPERTY DIAGNOSIS IN INNOVATION PROCESS

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Abstract: *Innovation critically depends on a range of conditions such as finance, skills, markets, competition and standards, policy framework, and, what is of great importance, intellectual property rights (IPR). The intellectual property system can be seen as one of the most critical role in innovation process today. Rights such as patents, trademarks, designs and copyrights, enables innovators exclusive right to use their knowledge creations and to facilitate knowledge and technologies transfer. Although the relevance of the intellectual property is obvious, that is confirmed in a practice, companies don't use it in the suitable range. Therefore, the aim of this paper is to present the importance of having an adequate insight into intellectual property conditions and prospects for the companies; to indicate the appropriate IPR for different stages of innovation process; to present the importance and the role of IP diagnosis and audit for companies of different sizes; to identify different maturity models with different patterns in a form of archetypes that are in line with the degree of IP practice.*

Keywords*: innovation, intellectual property, diagnosis, IP audit, maturity models*

1. INTRODUCTION

The realm of intellectual property (IP) goes beyond than just innovation and interferes into many areas of art, culture and commerce. In the same way the scope of innovation is spreading beyond the established fields where IP traditionally had a major impact. As a consequence we can see some new fields where IP has become very important such as business model innovation, open collaboration and social and community-based innovation. Achieving success in the field of innovation in the years ahead, is closely related to understanding of how changes in the future may impact, and be impacted by, shifts in IP (Taplin, 2013). IP is spread all over the business development and strategies, from product development to design, from service delivery to marketing, and from raising financial resources to exporting or expanding its business through licensing or franchising. It should ensure the trust, confidence and loyalty to the consumers (Sukarmijan & Sapong, 2014).

In spite of the enormous relevance of the IP, SMEs (Small and Medium Enterprises) barely consider the strategic value of their IP. The study conducted by the Office for Harmonization in the Internal Market (OHIM) in 2015 that showed that only 9% of European SMEs being IP owners, which is quite poor. Notwithstanding, these companies, on behalf of IP ownership, on average generate 32% more revenue per employee then others. SMEs' have a significant contribution concerning innovation performance but they are in a subordinate position to the large companies in regard to IP use, due to constraints corresponding to their size. Generally, SMEs can be considered as driving force of innovation, but they have difficulty to turn this potential into a competitive advantage (De Leon & Fernandez Donoso, 2017).

Lots of companies are unaware of the importance of IP. Different surveys clearly marked how low is the percentage of public awareness about IP and that it is only understood by institutions and organizations which are involved in the field (Sukarmijan & Sapong, 2014). Thus, the objective of this paper is to discuss the significance of IP to companies of different sizes which often tend to neglect IP as business asset, to indicate the interdependence of innovation and intellectual property, to emphasize why it is important for companies to do the IP pre-diagnosis and audit and to propose different maturity models that can be used for the assessment of the intellectual property management within the company.

For researchers, this paper may be interesting because it discusses a very important topic and gives the systematize review of the latest literature on the topic of innovation and intellectual property. On the other hand, for practitioners, the paper may be interesting as it emphasizes the importance of intellectual property and IP diagnosis and audit.

Starting from this point the paper is organized in tree main sections, first related to interdependence of innovation and intellectual property, describing the importance and furthermore, necessity for companies to protect their inventions, second related to explanation of the role that have the IP diagnosis and audit, and fourth related to different maturity models of IP practice.

2. INNOVATION AND INTELECTUAL PROPERTY RIGHTS

Managing innovation better than competitors may be observed as one of the main objectives of today's business. One of the ways to realize this is to use different intellectual property rights. It can be said that if some invention is left unprotected, the larger companies may immediately take a chance to adopt and commercialize this invention at a more affordable price, which can be a big lost for original inventor (Sukarmijan & Sapong, 2014).

Intellectual property rights (IPR) enable some company to protect its intangible assets and to profit based on the exclusive rights gained by this right from their creative and broadly innovative activities. Studies have shown that value of Intangible assets account for more than half the value of companies. Nowadays when companies compete more on innovation, creativity and quality than on price, the intellectual property has become powerful tool (http://ec.europa.eu/growth/industry/intellectual-property_en).

An IP right represents a legal right that is based on the relevant national law. The existence of one such right is confirmed only when the requirements of the relevant IP law are met and, eventually, if required, registered. This IP rights have enabled the grant, generally for a limited period of time, based on property of right that makes monopoly position that keep out all others to have commercial benefit from the invention. There can be found different types of IP rights (Figure 1) (Kalanje, 2009).

Figure 1: Intellectual property rights

Since intellectual property rights enables the creation of revenue and is used to protect the company's competitive position, there is a need for better understanding of the IPR in innovation management for a various reasons: (1) R&D is increasingly being conducted in countries where IPR protection is still weak; (2) IPRs are of critical importance to research partnerships and projects; (3) open innovation paradigm is shaking up the conventional understanding of IP protection. IPRs are important on both the micro- and the macro-level, and are subject to analysis on the regional, industrial or firm level (Candelin-Palmqvist, Sandberg, & Mylly, 2012).

The IP system should play a significant role since it enables innovative companies to gain and retain its innovation-based advantage. To have benefits from innovation, one company should take into consideration the full range of IP issues throughout all stages of the innovation process. To protect an invention one of the many roles that IPR may have for the company (OECD, 2011):

- global market positioning
- signaling current and prospective 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.

Hall and Harhoff (2012) emphasized particularly important role of IPR in accessing external finance, especially in the venture capital market. Patents often represent the only collateral (required by the banks) that knowledge-intensive start-ups can use to raise funding. An effective IPR system enables lead time for growing the businesses before being imitated. For new or innovative companies, especially SMEs, time is critical point in a sense of raising funds, supply chain development and reaching the market. Additionally, effective patent protection may allow a new firm to compete on the basis of differentiation rather than on the basis of costs. Effective patent system also allows companies to license their invention. In some cases, costs and complexity of the patenting process may be considered as hampering innovation factors, but apart from that if used strategically patents can serve as a reliable source of new, additional or higher revenue for SMEs.

Cockburn and MacGarvie (2011) in their research underlined patents can be considered as a constraint for new companies' entrance especially in software industry. Patenting is one of the most common adopted strategies to discourage the entry of rival companies (Stošić, Vasiljević, & Milutinović, 2015). Based on previous, it can be said that fostering of IPR usage by SMEs should be regarded as an integral part of innovation policy.

3. IP AUDIT AND IP PRE-DIAGNOSIS

A comprehensive IP management strategy should be a considered as one of the key parts in the company's business strategy. It is vital for some company to have a good understanding of exactly what IPR own or control. IP assets need to be inventoried and managed in much the same manner as other company assets.

Intellectual property audit is considered as the first step in IP asset management strategy that may be used for business strategy development or for company assets evaluation (Wilson & DeCarlo, 2003). IP audit is a tool used for gathering information on how IP assets relate to the company business in order to integrate IP strategy into business strategy. Since a value of a knowledge based, innovative company lies mostly in IP assets and other intangible assets, investigation of IP asset is required for evaluating the company's business (Fahmi, 2007).

In order to perform an IP audit, the nature of the company's business must be understood, and understanding of company IP assets is prerequisite for assessment of the company value (Fahmi, 2007). With that respect, various factors need to be analyzed such as company's business goals, competitors and related risk and opportunities in order to estimate the value of the IP assets.

IP audit can be performed by the company's personnel or by an external counsel whereby top-down and bottom-up approach may be applied. In top-down approach the company management is being interviewed, whereas in the bottom-up approach the relevant information is collected from all the employees. The latter approach may require more time, but it provides thorough analysis of IP assets identifying not only the created IP, but linking it with the structure of the organization, i.e. where the IP is created and by whom it is created (Wilson & DeCarlo, 2003).

Identification and record of internally developed and externally acquired IP as well as determining ownership of the identified IP is seen as the principal goal of IP audit. As other aims of the audit Chang and Yastreboff (2003) are proposing strategic measures of IP management within business strategy and operations, as well as measures regarding IP policies and practices for identification, protection and treatment of IP. The IP audit specifically includes identification of company policies and practices in managing IP including identification, protection and treatment of IP, including management of trademarks, confidentiality, invention disclosures and governing IP and secrecy in relations with the employees (Ch'ang & Yastreboff, 2003).

Beside the above mentioned objectives of the IP audit, Chang and Yastreboff included valuation of identified IP as IP audit objective. The valuation may refer to qualitative valuation only, stressing the benefits of the IP assets to the business. However, it may additionally include quantitative valuation aimed at assessing economic value of the identified IP assets. They have proposed an approach for defining IP audit scope depending on the motivation for audit, which may refer to the purchase of acquisition of another business and general review of IP asset management strategy (Ch'ang & Yastreboff, 2003). Regardless of the motivation for IP audit, the authors propose three IP audit stages. Stage 1 refers to defining the scope and identification of IP assets, identification key risk areas concerned and assessment of IP management policy and procedures. In stage 2 substantive audit of each IP asset is identified, including the issues of creation of IP asset, its ownership, scope and term of protection. Stages 1 and 2 are performed by personnel interviewing and are followed by stage 3 referring to analysis and reporting on recommendations on effective IP management.

French Industrial Property Office – INPI developed another IP audit approach, called intellectual property pre-diagnosis (IPD), tailored for innovative SMEs with the objective to support SMSs in integrating industrial property strategy into their development strategy (Battistelli, 2088). More specifically the IP audit is aimed at (1) raising company awareness on IP, (2) stressing the relevancy of IP policy and (3) identification of courses of actions. The IP audit not only facilitates access to innovation networks and technologies, but to innovation funding. It also enables easier entering into partnerships and technology transfer agreements, as well as enforcing of IP rights.

For that reason INPI developed and offered IP audit service tailored to the needs of SMEs called Intellectual property pre-diagnosis (IPD).

Following the experience of INPI, the European Patent Office (EPO) has also recognized the need for support of innovative SMEs that typically lack both information on IP protection and IP management. Namely, there have also been recognized the need for both IP protection and IP management by SMEs, which is preferably carried out consistently by means of a proper IP strategy in order to keep competitive advantage based on innovativeness (EPO, 2017).

Subsequently, the EPO adopted the service and the methodology developed by the INPI and offered it for implementation by the European Patent Organization members states in 2008 and now after, 10 years several national IP offices, including the Serbian Intellectual Property Office, have still been delivering the IPD. It has also been offered to the research organizations like universities and research centers (EPO, 2017).

The scope of the IPD is not only registered rights like patents, trademarks and industrial designs, but unregistered IP like copyright and trade secrets as well. It also takes into consideration business process and information about suppliers and other key players like partners and clients (EPO, 2017). Namely, the intellectual property is identified and analyzed in business context by understanding companies' competitive advantage. This is followed by the measures for IP protection and further IP management through IP strategy and IP management procedures.

The IPD is conducted in four phases. In the first phase the auditors prepare for the interview by gathering publicly available information on the SME organization, its products, projects and other activities, and by reviewing recipients IPR and other publications. This is followed by the interview that is conducted based on questionnaire containing six groups of questions. The first group of questions is related to company products, processes, services and market, as well as its competitive advantage. The second group of questions relates to innovations, R&D activities and technology. The third group is related to company organization, human resources and training activities. More specifically it may include gathering information on how knowledge is gained, adopted, exchanged and managed especially among those who actively participate in it, like R&D departments. The fourth group of questions is related to other parties like suppliers, partners, sub-contractors, clients as well as to legislation regulating the business (national, EU legislation, standards). The fifth group is related to registered IP like patents and trademarks and unregistered IP like copyright and trade secrets that are protected by contracts. The interview is followed by the phase of report drafting and final phase of report handover.

4. THE OVERVIEW OF DIFFERENT INTELLECTUAL PROPERTY MATURITY MODELS

It can be said that different tools developed for IP diagnosis and audit at the same time represent the basis for identifying maturity levels in the context of intellectual property. The key purpose of the maturity models is to capture different patterns in a form of archetypes according to the degree of IP practice. Different maturity levels should depict the current situation in the company. Moreover they should present insight of how companies approach to intellectual property, and propose measures for further development. One of the main objective of this models is understanding of interrelationship between different dimensions (which differ for different maturity models). Lower maturity refers to low knowledge of the IP while effective and efficient use of the IP represents the characteristics of higher maturity levels (De Bruin, Freeze, Kaulkarni, & Rosemann, 2005). One company can pass through different maturity levels meaning that it met all the requirements or improved their knowledge in the sense of the IP practice.

In the field of intellectual property various maturity models can be found, such as those presented in Enjolras, Galvez, Camargo and Morel (2015), Moehrle, Walter and Wustmans (2017), Gibb and Blili (2013).

Enjolras, Galvez, Camargo and Morel (2015) apply the AIDA methodology to IP management, approach from the Henri Tudor Research Centre (Luxembourg). This methodology, initially used in sales, has progressive character (A – Attention or the company is familiar with the main principles of IP; I – Interest or

the company started with the application of IPR; D – Desire or company regularly manages IPR in all phases of new product development; A – Action or company values and markets its intangible assets). As we can see, these levels of maturity are formed with respect to IP practice. This method is applied through a serious of questions that are set up for the company. Based on the answers, given during the interview, the outcome is generated and it can be used to address the key issues and key advantages of the company. It also gives comparison of the company in regards to ideal position. This method can be adapted for different business sector or profile of company. One of the main disadvantage of the method is that questionnaire is too long and it require a lot of time for realization.

Gibb and Blili (2012) introduced one more approach to IP management for SMEs through a framework that enables the detection of the current situation along with possibilities for further development. They identify twelve capabilities (six related to operational and other six related to strategic level) that make up dimensions of the model against which to benchmark companies. This model for intellectual asset governance is described through five progressive maturity levels (Dormant – the company is unaware of the importance that IP has in the business; Ad-hoc – company engaging IP management in the value chain but as reaction on external influence; Dynamic – company has a clear commitment to the IP management; Ambitious – company apply proactive strategy which is in line with the general strategy of the business; Pioneering – company apply strategy which is in line with both general strategy and business model, it may have separate IP department).

Moehrle, Walter and Wustmans (2017) proposed 7D patent management maturity model. This model is applying both top-down and bottom-up approach, meaning that it suggests five core dimensions which are in line with the identified five main principles (strategic principles), and two supporting dimensions (serve as to support the guiding principles). Five core principles are: portfolio, generation, intelligence, exploitation and enforcement. They are activated through separate management decisions (for example, company doesn't want to enforce some patent). Supporting dimensions of organization and culture should strengthen the core dimensions and express a limited power of patent managers in influencing the maturity levels. Each dimension (core and supporting) comprise elements that are to some extent separable and performable on different levels (Portfolio contains lifecycle management, portfolio management, strategy fit). From the bottom-up approach, this model includes patent functions, meaning that patent doesn't have only function of protecting some invention from the imitation but also for technology monitoring and forecasting as well as gathering of information about the competitors. Therefore, they identified 24 capabilities related to patent functions which are assigned to above mentioned dimensions. The demonstration of how elements of patent management are represented by means of capabilities, this model suggests five maturity levels: (1) level N – Neglector; (2) level 1 – Starter; (3) level 2 – Intermediate; (4) level 3 – Performer; (5) level 4 – Conductor. The 7D model is applied through five steps. Once the model is adjusted to the companies' environment, the maturity level of each element is determined. Then one can seek the targeted maturity level by identifying, prioritizing and implementing measures for the further development of each element.

There are a lot of different maturity models proposed by different authors and institutions. All of them have the same idea to describe the capabilities through different maturity levels, and all of them should propose measures for further development.

5. THE ROLE OF IPR APPLICATION IN THE INNOVATION PROJECT

Concerning the relation between intellectual property maturity level and innovation process success, it is very important for companies to recognize the role of IP practice in the different stages of innovation process. As it can be seen from the Figure 1, patent search is relevant throughout all stages of the innovation process (phases based on Cooper's Stage-Gate model (Cooper, 2011)), having somewhat different purposes, starting from an early ideation stage. For example, the main role provides the possibility to check if some patent is free of charge (doesn't need license) in the earlier steps of the project, to see if there is a need for licensing of the existing patent, to do the search on novelty of own invention ideas, and in later stages to be an early warning system for competitor activities. Patent application is usually part of the development and later stages, and is afterward followed by patent search (search of patent database, for example Espacenet that allows better overview of the field and better communication with competent authorities).

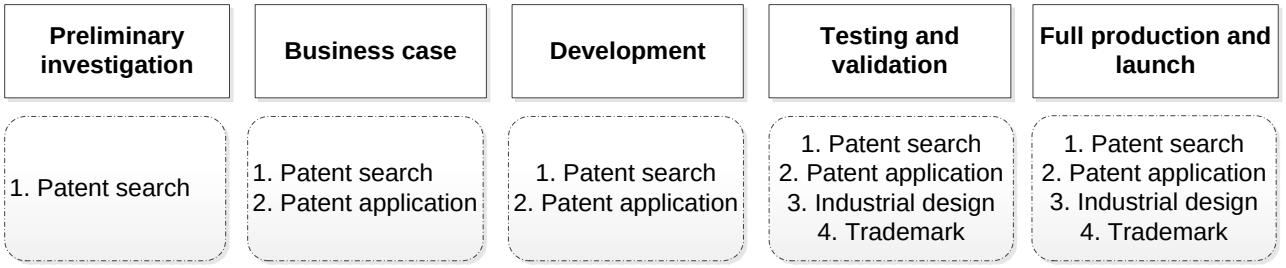

Figure 2: IP over the innovation process (adapted from (Gennari, 2013))

Industrial design is typical for later stages, starting with the design of the prototype. It is closely related to the utility test which should confirm the appropriate design through variety of prototypes (rapid prototyping). Trademark as IPR is preferable used in the later stages after having checked the novelty by trademark searches. Trademark can be developed earlier but it is best to register it shortly before entering the market with the product or service (Gennari, 2013).

5. CONCLUSION

Managing intellectual property on a strategic level became a necessity since it enhance the companies' possibility to achieve competitive advantage. Companies of different sizes, especially SMEs, are constantly being exposed to various challenges, so it is important for them to face that challenges and take measures in direction to exploit the IP and protect it wherever possible. Like everything else in the company, IP must be managed, valued, monitored if the full potential wants to be derived, and before anything of this, company must acknowledge the value of IP and to see it as an inseparable business asset. Clearly, the IP become a key factor in the innovation process, starting from the creation of new ideas to their launching on the market as products or services. Of big importance for companies which has this approach is to know and to understand how to manage intellectual property through stages of the innovation process. if don't, it can be found various IP support services that may assist SMEs in acquiring the knowledge of the value of their IP and knowledge of all IPR as well as their advantages and inconveniences. To be aware of its intellectual property and advantage that it can obtain by the property, company should use the IP audit or IP pre-diagnosis or to use different maturity models. This kind of support services except making the company be aware of the meaning and importance of IP, they have been used to measure the competencies company has in IP management and to make some proposals for improving the current situation if the company' current situation is on the lower maturity levels.

Having the aforementioned in mind, in can be concluded that much more effort should be invested in the direction of the IP management, and that companies, if not till now, should use IP support services such as diagnosis, in order to improve own protection and to seize better position within the competition. This paper can be considered as a starting point for the future research which should be directed to improvement of the diagnosis.

Disclaimer

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THE ROLE OF HUMAN CAPITAL IN THE FUNCTION OF THE INNOVATION POTENTIAL OF THE REPUBLIC OF SERBIA

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Abstract: The subject of this research is connection between educational system and the innovative potential of the Republic of Serbia. Special importance is given to factors such as government expenditure on education; government expenditure on education per pupil (secondary); assessment in reading, mathematics, and science; pupil-teacher ratio (secondary); tertiary enrollment; graduates in science and engineering; tertiary level inbound mobility. The aim of this work is to illustrate impact of human capital on the creation of the innovative potential of selected country. The second part of the paper is devoted to detailed research of the educational system of the Republic of Serbia and movement of state on the ranking list of the Global Innovation Index.

Keywords*: innovation process, human capital, innovation of the state, education, universities*

1. INTRODUCTION

Innovations are concept that is broadly defined as the commercialization of new knowledge. It is recognized as one of the key drivers of growth and productivity (Ganotakis, 2012). It is also described as a product or service, a continuous or discontinuous, radical or incremental change that creates a new value (McCormick and Maalu, 2011). According to the Organization for Economic Co-operation and Development (OECD, 2013), such value creation implies the implementation of new or significantly improved products, processes and marketing or organizational methods in companies. Group of authors (McAdam, Reid, Harris and Mitchell, 2008) point out that the importance of innovation is that they are the result of increasing global competitiveness; reducing product life cycle; and rapidly changing consumer demands.

Emphasizing the importance of innovation, it is important to note that such process requires a large investment of both material and intangible resources. However, even those investments do not imply a secure success in creating a new value, because there are certain barriers on the way to the goal. They can be classified in many ways, but most often differ according to the place of origin - barriers in the company's internal and external environment (Piatier, 1984).

As the topic of this paper focuses on the importance of non-material resources, special attention is paid to human capital, which together with the lack of internal resources and technical expertise; the management of time, culture and systems fall within internal constraints. In this regard, (Barañano, 2005) in the SME research in Portugal reveals two barriers to innovation, and one is one that refers to the lack of quality human resources. However, this author is not the only one who has identified this problem. Authors from Portugal (Vieira, 2007); Spain (Madrid-Guijarro, Garcia and Auken, 2009); Great Britain (Tovstiga and Birschall, 2007); Germany (Tiwari and Buse, 2007); Cyprus (Hadjimanolis, 1999); Czech Republic (Necadov and Scholleva, 2011); Switzerland (Comtesse, Hodgkinson and Circle, 2002); France (Galia and Legros, 2004); Italy (Iammarino, Sanna-Randaccio and Savona from Italy,2006); Brazil (Mussi and Spuldaro, 2008) and, finally, from Iran (Kamalian, Rashki and Arbabi, 2011), they also concluded that an ever-present limitation in innovation relates to human resources. They defined this deficiency as: lack of knowledge quality for managing innovation; recruitment of adequate human resources; lack of specialists in the innovation area; or insufficient investment in employees. Based on these researches, exceptional importance of human capital can be seen.

2. RESEARCH METODOLOGY

This study uses two variables. One is educational system of the Republic of Serbia, which was analyzed on the basis of The Statistical Office of the Republic of Serbia. Due to lack of specific data in the above-mentioned source, we also used data from reports published by important organizations such as UNESCO, OECD and the World Economic Forum. The second variable is the rank of the country for innovation. In order to analyze this parameter, the Global Innovation Index (GII) reports were taken.
The way in which this index was calculated implies an average of two sub-indices: Innovation Input Sub-Index and Innovation Output Sub-Index, after which the results were ranked on the scale from 0 to 100.

Innovation Input Sub-Index that should enable innovative activities which are: (i) Institutions, (ii), (iii) Infrastructure, (iv) Market sophistication, and (v) Business sophistication. Innovation Output Sub-Index implies two indicators: (vi) Knowledge and technology outputs; and (vii) Creative outputs. This research is oriented towards human capital, so attention was given to the second group of indicators called Human capital and research.

All indicators are composed of several sub-indicators, but only those that fall into Human capital and research are shown below: (i) Education -Expenditure on education; Government expenditure on education per pupil, secondary; School life expectancy; Assessment in reading, mathematics, and science; Pupil-teacher ratio, secondary; (ii) Tertiary education - Tertiary enrolment; Graduates in Science and engineering; Tertiary level inbound mobility; and (iii) Research and development (R&D) that will not be used for further analysis. We found the reasons this to be high costs of SMEs research and taking risk in such steps. Therefore it requires finding alternative ways of innovation, which imply a focus on internal resources and ability of the company itself (Rammer et al., 2009).

3. IMPORTANCE OF HUMAN CAPITAL IN THE INNOVATION PROCESS

Human capital is a set of knowledge, skills, creativity, intelligence and abilities that an individual possesses (Becker, 1964). It is essential part of innovation and also significant, because it represents the main source of new ideas and knowledge within the company (Snell and Dean, 1992). It is also the embodiment of better education and higher productivity (Santos-Rodrigues et al., 2010; Storper and Scott, 2009).The authors (Edvinsson and Malone, 1999) have a similar theory, and in their work they point out that human capital includes competence (knowledge and skills); attitudes (motivation and behavior); and intellectual agility that is related to ability to innovate, imitate, create change and solve problems.

The relationship between human capital and state-level innovation is named conversation, according to Bourdieu (Bourdieu, 1986), or different forms of capital that can be converted into resources and other forms of economic viability. At the individual level, the process has been studied and confirmed by several authors (Becker, 1964) and in general, the argument is that those who are educated have a better work experience and invest more time, energy and resources in improving their skills - leading to positive results, both at the individual and at the social level (Dakhli and De Clercq, 2003).

4. THE IMPACT OF EDUCATION ON THE INNOVATION POTENTIAL OF THE ECONOMY

In the theory of human capital and economic development, there is a hypothesis that knowledge and skills human resources possess directly raise productivity (Becker, 1964) and increase the economy ability to develop and adopt new technologies (Nelson and Phelps, 1966). On the other hand, (Lundvall and Johnson, 1994) emphasize that higher education has an impact on innovation for two reasons: people with diplomas can find and develop new technologies; and the educated population can contribute to technological advancement.

When it comes to the impact of education on state innovation, a low level of education in underdeveloped areas is an obstacle to the development of innovations in such countries. Historically, it is possible to establish a clear link between education and various eras of industrialization. For example, in the pre-industrial phase, education needs were referred to basic literacy, while in the industrial phase, needs were transferred to medium and later to professional skills. However, the post-industrial era, in which we are currently living, is characteristic by it's necessity of significant share of the population with tertiary education (Aubert, 2005).

On the other hand, Prais examined how the education system can boost total productivity (Prais, 1995). This author points to the need for a balance between academic staff dedicated to academic issues and the encouragement of professional development to enable future employees and to enable current students to acquire technical skills that will later help them to create innovations in companies (Dakhli and De Clercq, 2003). It can be concluded once again that innovations that contribute to creation of a competitive advantage are strongly linked to the knowledge of human resources.

5. RESEARCH RESULTS

According to the Global Innovation Index for 2017, the Republic of Serbia is 62nd out of a total of 127 countries. This is the state only in front of Bosnia and Herzegovina, while all other countries of former Yugoslavia are in front of the Republic of Serbia.

The number of students in the Republic of Serbia is continuously increasing as indicated by the red line in Figure 1. In the academic year 2016/2017, 262.108 students were enrolled in tertiary education and this is the largest number of enrolled students in higher education institutions in the history of the country. In comparison with academic year 2015/2016, it is 10.946 more students and with 2006/2007, 23.398 more students.

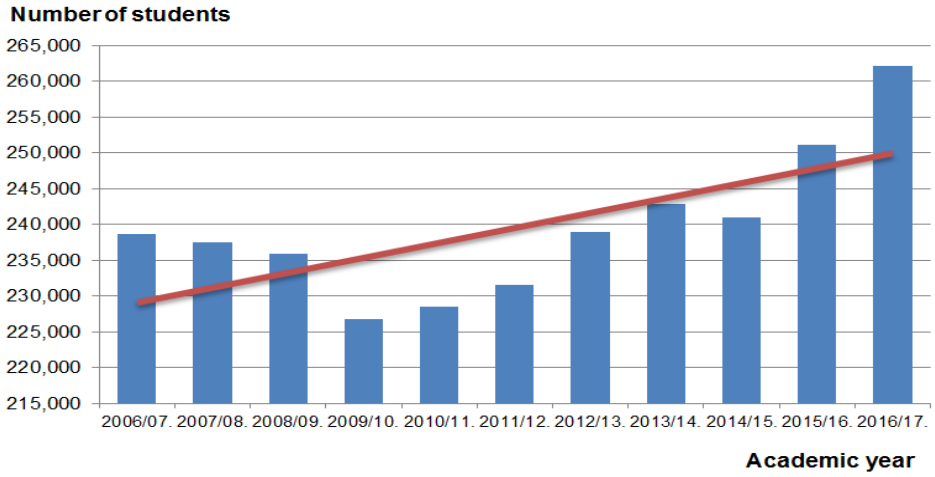

Figure 1: Number of enrolled students at universities from academic year 2006 to 2016, the Republic of Serbia
Source: Statistical Office of the Republic of Serbia, 2017

According to the Global Innovation Index, it can be noted that the Republic of Slovenia is the most innovative state of all countries of the former Yugoslavia, since the innovation potential was measured at the national level (Global Innovation Index, 2017). Taking into account the data of number enrolled students in the academic year 2016/2017, it can be said that the Republic of Serbia is in a more favorable position than the Republic of Slovenia in which, in the same period, the number of subscribers decreased by 36.000 compared to ten years ago and amounted to 79.547. However, in order to fully confirm this research, it is necessary to take into account the population of the states and see if this number is really positive.

By dividing the population of the two countries from 2016, an amount of 3.42 was obtained, which is an indicator of how many times the Republic of Serbia should have more students than the Republic of Slovenia. On the other hand, value 3.29 is the result which shows the ratio of the number of young people in higher education institutions in the countries in the academic year 2016/2017. Considering the previous amount of 3.42, it is possible to conclude that the Republic of Serbia still has fewer students, but that percentage is not so negative.

Table 1: Number of enrolled students at universities, according to gender and state/private property in academic year 2016/2017, the Republic of Serbia

	Total	Man	Woman
Total	**262.108**	**115.206**	**146.902**
State universities	189.553	78.309	111.244
Private universities	28.678	14.381	14.297
State high schools	39.731	20.218	19.513
Private high schools	4.146	2.298	1.848

Source: Statistical Office of the Republic of Serbia, 2017

Also, one of the indicators of the Human Capital and Research Indicator, is number indicator of Graduates in Science and Engineering. In academic year 2016/2017, including total number of students, 61.748 had access to engineering, manufacturing, construction and natural sciences. If this number was expressed in percentage, that would be 23.56%. The shown result is slightly less than the amount of the previous academic year (23,91%).

On the other hand, in academic year 2016/2017, 10.964 students graduated in the field of engineering, manufacturing, civil engineering and natural sciences, out of which 51.596, representing 21.25% (in academic year 2015/2016 - 20.81%). Compared with the Republic of Slovenia indicator, which is 25%, this is a worse result.

Another important indicator of Human Capital and Research sub-indicators is Expenditure on Education. Although this parameter is very important for the education system of state, the problem of finding it in the national documents of the Republic of Serbia was noticed. Therefore, UNESCO data that is shown in the Global Innovation Index reports was also used, and shown below in Table 2.

Table 2. Expenditure on education of the Republic of Serbia

	2008.	2009.	2010.	2011.	2012.	2013	2014.	2015.
Government expenditure on education								
% of GDP	**4.71**	**4.75**	**4.59**	**4.49**	**4.43**	-	**4.18**	**4.04**
% of total government expenditure	10.84	10.94	10.51	10.6	9.6	-	9.1	9.19
Government expenditure per student (in PPP$)								
Primary education	6.723,19	6.876.14	6.552,35	6.607,45	-	-	-	6.569,74
Secondary education	1.608.64	1.609,23	1.592,8	1.693,25	-	-	-	1.673,06
Tertiary education	4.739,17	4.825,61	5.188,85	5.383,72	5.251,46	-	-	5.054,66

Source: UNESCO UIS. Serbia, 2018

The GII measures innovation potential of the Republic of Serbia since 2008, while data on the percentage of GDP, that the Government allocates for education, is publicly available on the UNESCO site for the period until 2015. For this reason, the correlation link is reviewed for the period from 2008 to 2015. Accordingly, based on Figure 2, it can be concluded that parameter value of the Government expenditure on education is continuously decreasing. At the same time, such investments in this chart do not affect the position of the state on the ranking list GII. It is noted that the government expenditure on education parameter corresponds to the position of the state on the GII ranking list in the next year. In other words, if the Government of the Republic of Serbia allocated 4.59% of GDP in 2010 for education, this percentage contributes to the state's potential in 2011. However, the conclusion that investment in education (not) affects the position of the Republic of Serbia in the GII is irrelevant. Two reasons for this were found: (i) the number of entities observed is very small for such conclusion, and (ii) there is a possibility that other indicators influenced the improvement of state position at the level of the Global Innovation Index. Since two real movements in Figure 2 are not harmonized, it is stated that investment in education has no correlation with the rank of the Republic of Serbia on the GII.

In a document entitled "The Republic of Serbia Public Finance Review for 2015 by the World Bank Group" it was written that "The government finances all levels of education, but most of the costs - about 42% go to primary education, about 22% to secondary and about 25% tertiary education " (World Bank Group, 2015).

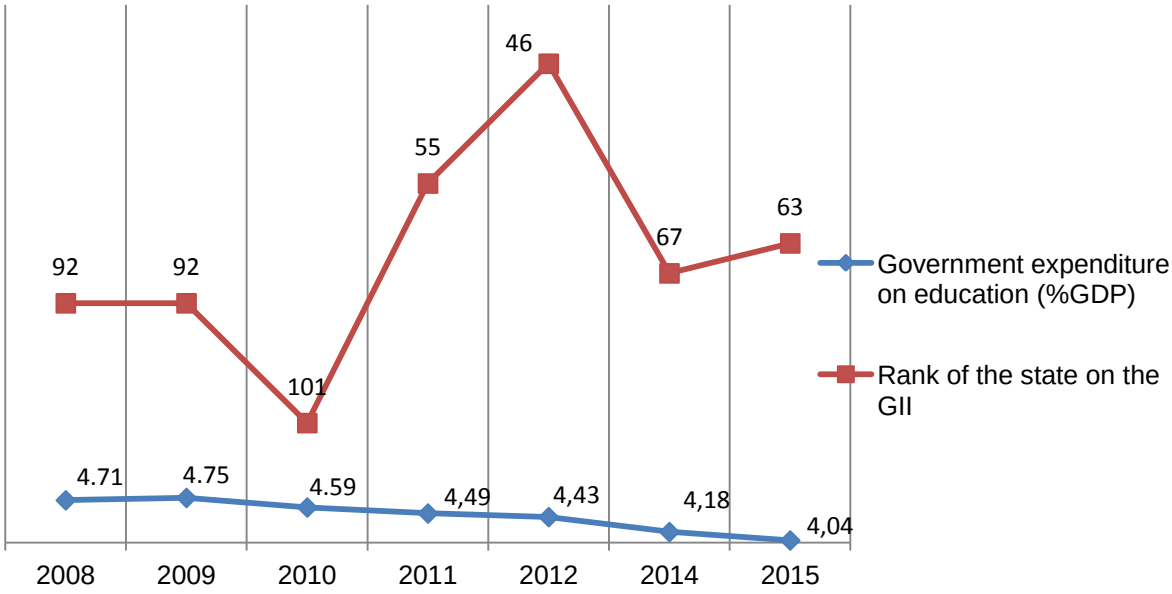

Figure 2: Level of Government expenditure on education and Rank of the state on the GII
Source: Global Innovation Index, 2017

However, out of all indicators that affect the country innovation, PISA (OECD PISA, 2015) results in mathematics, science and reading represent the worst segment of indicators Human capital and Research. In 2012, the average OECD in mathematics was 494 points and the Republic of Serbia had 449. In the reading field, the country scored 446 points (OECD average 496) while it completely dropped out of science - 445 points (the average OECD- 501). Similar situation occurred in 2009 - from 442 points (OECD average 493), mathematics 442 (OECD average 496), and science from 443 points (OECD average 501).

According to latest report (Population Census), that can be found on the website of Statistical Office of the Republic of Serbia (Statistical Office of the Republic of Serbia, 2011), only about 10% out of total population in the Republic of Serbia was highly educated. More precisely, out of total number of men, 10% were highly educated, 6% had higher education, 54% secondary education, 20% primary education, 8% were incomplete primary education and 1% were without scholar education. On the other hand, of the total number of women, 11% were with higher education, 5% with higher education, 44% with secondary education, 21% with elementary education, 14% with incomplete primary education and 4% without scholar education. It was noted that 1 - 2% of the total population have unknown education. However, due to already mentioned continuous increase in enrollment of young people to universities, it is expected that the next survey will show better results than those in 2011.

6. CONCLUSION

It can be concluded and confirmed that human capital is essential for development of innovations. As it turned out, the state power is contained in the intellectual and cultural performance of society, but in the traditional tangible assets. Therefore, the belief is that future belongs to those countries that are rich in knowledge, because they will create changes and new knowledge which bring innovations with them. What does not benefit the Republic of Serbia is the World Economic Forum's Global Competitiveness Report (The world economic forum, 2017), showing that for 2017 - 2018, the Republic of Serbia, out of a total of 137 analyzed countries, has 134th place. According to report “The Country Capacity to retain talent for 2016-2017” out of a total of 138 countries, Serbia is on the 137th place (The world economic forum, 2016) and in 2015 – 2016 report on the last 140th position (The world economic forum, 2015). Therefore, it is concluded that the main precondition for success in the 21st century is investment in knowledge, skills, creativity, intelligence, innovation and ability of society. Of course, it is rather necessary to establish and implement clear mechanisms in the government strategy for education development. Consideration of this very important issue will lead the Republic of Serbia to progress more rapidly, according to the developmental criteria. For more sensitive progress, a high level of engagement of all relevant factors will lead to development of human capital, as an unbearable category in the development of a modern society. Allocation for education and science from total GDP must be increased, in order to show positive trends and improve these results in future.

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DISCLOSURE ON INTELLECTUAL CAPITAL IN THE AGE OF INDUSTRY 4.0: EVIDENCE FROM ITALIAN CAPITAL MARKET

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Abstract: *Matter of interest is the disclosure on Intellectual Capital (IC) in the era of global "knowledge economy" or global "knowledge society". The aim is to verify the level of disclosure that Italian companies have on the components and on the relevance of their IC. Using the "Content analysis" and a specific method already tested in managerial literature, we propose a report that measures the intellectual capital with the adoption of 21 functional indicators, which consider specific aspects of intangible assets of a firm. Applying the content analysis to financial statements of 31 companies included in FTSE Italy Technology Index and FTSE Italy Financial Services Index, we find that the level of overall disclosure is, on average, moderate but increasing. Observing the disclosure index related to the specific component of intellectual capital considered in this research, all the aspects of IC have benefited, on average, of an improvement in the level of external communication.*

Keywords*: Intellectual capital, corporate disclosure, knowledge resources, financial statement*

1. INTRODUCTION

This paper focuses on the relevance of intellectual capital (IC) in the era of global "knowledge economy" or global "knowledge society". In the last few years an increasing number of companies have realised that the conditions for running a competitive business in turbolent markets are innovation and flexibility. Indeed, the knowledge resources of a firm represent an increasing part not only of its products, but also of its value because they allow to innovate, compete and grow. Therefore a company's strategic development may depend on the whole organization being ready to make use of distinctive knowledge resources. The main developed economies around the world has been characterized by an increasing exploitation of knowledge resources (i.e. employees, customers, processes and technologies) by small medium and large enterprises. Being able to take advantage from that kind of resources will be a decisive condition for the firms, at the present and in the future, to have success and growth.
In this context, it raises a need to employ the best tools and methods to support and measure the knowledge creation and application, and to structure an effective knowledge management system. All of the components of IC should be considered and improved, to obtain a strong competitive advantage. The intellectual capital statements represented a way for managing and bringing focus to the development of the company's knowledge resources. Providing a status of the company's knowledge through text, figures and illustrations, the intellectual capital statement is a useful tool for companies wishing to improve and apply systematically its intangible assets, human expertise and relationship power.
The intellectual capital statement is one of the tools of voluntary disclosure that a company could use; it may integrate the set of information already given by the financial statement, which is the main tool of mandatory disclosure. However, a relevant part of Italian companies, including those listed in capital markets, do not use the intellectual capital statement to communicate outside their effort to develop knowledge resources. Therefore, it is the duty of the mandatory communication, i.e. of the financial statements, to provide that kind of information. This is the reason why, given the relevance of knowledge resources, we consider interesting to check quality and quantity of information about the intellectual capital reported in the financial statements.

2. LITERATURE REVIEW

Over the past 30 years, there has been a remarkable increase in articles, books, conferences and job titles all related to the primary issue of harvesting intellectual capital through knowledge management.
Although we study the disclosure of Italian companies on the components and on the relevance of their intellectual capital, the analysis of measurement models of intellectual capital was necessary to understand the drivers that compose the IC in order to orient the choices of items considered in our model of analysis.
The strategic rule of the intangible assets, which have evolved from "needed to win" resources to "needed to play" resources, has been confirmed from the 90s. In 2001, Thomas Stewart, former editor at Fortune magazine, proposed a cover story by exclaiming that brainpower and intellectual capital were becoming America's most valuable assets. Intellectual capital quickly became part of a new lexicon describing novel forms of economic value. It belonged to a paradigm where sustainable competitive advantage was tied to individual and organizational knowledge. Reliance on traditional productive tangible assets such as raw

materials, fixed capital, and land no longer accounted for investments made and wealth created by new and prospering companies. Instead, leveraging knowledge assets became the key reason attributed to corporate success stories during the dawn of the internet age (Bontis et Al., 2010).
The reasons for this evolution can be brought back to the real market and to the financial market changes. The first one is characterized by a demand which has moved to more sophisticate goods and services, which have a strong technology connotation or a distinctive character; secondly one there is a widening gap from the market value to the book equity with all the connected consequences (even negative – fraud).
The evolution of the rule of the intangible resources in business management has led to an evolution of the accounting studies, developing pricing models that can be distinguished between pure currency paradigms and integrated currency paradigms. Simultaneously there was the affirmation of the intangible assets strategic rule and the necessity of their measurement. The pure currently paradigms try to estimate the intangible constituents using only monetary values, for example to unite the immaterial resource value with the difference between the market value and balance sheet value. The integrated models create new approach and estimation methodologies, base on the joint use of monetary measures and physical-technical measures that are able to take particular innovative features of the immaterial resources.
While the accounting researchers were focused on the concept of value and the cost and the initial expense of the immaterial resources, in the other discipline the attention of professors and academics was dedicated to knowledge, information, brand, reputation and human resources management process; a wider item list that was difficult to manage for them because there wasn't enough information (Johanson and Henningsson, 2007). The common ground between the ideas of the academics is represented by the concept of IC, which is a still widely debated notion because the doctrine and the procedure have proposed a whole host of definitions, which sometimes are similar but not exactly the same and no one has been generally accepted, but the components can all be lead back to human capital, structural capital and relational equity.
Nowadays, there are many methods for measuring the intellectual capital, the doctrinal approach affirms that a model can be considered scientifically valid if underlying model can be frame in the "weakly defined" model category – that overtakes the four conditions of clarity, objectivity, robustness theoretical and generality. Then, in this work, we try to overcome the current model limits by identifying a method which can become a common practice. The different approaches for knowledge measurement can be divided into four principal categories:

1. Direct Intellectual Capital methods (DIC). This method estimates the monetary value of the intellectual capital (knowledge) by the identification of the components that make up the knowledge. Once that the components have been defined, they are commended individually and also using an aggregated ratio. For example, fall in the category: EVVICAE by McCutcheon (2008), FiMIAM by Rodov e Leiaert (2002), Intellectual asset by Sullivan (2000), Total value creation by Anderson and McLean (2000), Value Explorer di Andriessen and Tiessen (2000), Inclusive Valuation methodology by McPherson (1998), Accounting for the future by Nash (1998), Technology broker (intellectual capital audit) by Brooking (1996), Citation-weighted patents by Dow Chemical (1996), HR Costing/Accounting by Johansson (1996);
2. Market Capitalization Methods (MCM). These methods calculate the difference between the market capitalization of the organization and its net asset. This value is the knowledge value in the organization ownership. For example Q by Tobin (1950), Invisible balance sheet by Sveiby (1989), Calculated intangible value by Stewart (1997), Stock and flow by Bolisani and Oltramari (2012), are part of this category.
3. Return on Assets methods (ROA). The ROA is and index which is calculated by dividing the average pre-tax income of the company, related to a certain time period, for the company's average assets (related to physical assets). In this case, the same concept is applied to the business knowledge which the methods of this category calculate the economics return. The ROA calculated in this way can also be useful when is related to the ROA of different years or is related to the ROA of different companies of the same sector. For example, Knowledge Capital Earnings by T Lev (1999), Economic Value Added by Stern and Stewart (1997), Value Added Intellectual Coefficient by Pulic (1997), are part of this category;
4. Scorecard methods (SC). These methods identify the different components of the intellectual capital (and of the business knowledge) and on these are calculated the appropriated indicators and index which are introduced in a schedule or in a graphic, according to the classical approach of the balanced scorecard (Kaplan and Norton, 1996). For example, ICU report by Sanchez (2009), InCas by EU (2008), RICI by Schiuma, Lerro and Carlucci (2008), Knowledge asset value creation map by Schiuma and Carlucci (2006), IabM by the Japanese Ministry of Economy and Industry (2004), SICAP by many authors (2004), National Intellectual Capital by Bontis (2004), Index by Topplinjen/Business IQ, Sandvik (2004), Public sector IC by Bossi (2003), Danish Guidelines by Mouritsen, Bukh and others (2003), IC-dV AL Bonfour (2003), Intellectus model Sanchez-Camizares (2007), Knowledge Asset Methodology by the Global Bank (2002), IC Rating by Edvisson (2002), Value Chain Scoreboard by Lev (2002), Meritum T by Meritum Guidelines (2002), Intangible asset statement by Garcia (2001), Value creation index by Baum et al (2000), IC-Index T by Roos et al

(1997), Balanced scorecard by Kaplan and Norton (2006), Holistic accounts by Ramball Group (1995), Skandia Navigator T by Edvisson and Malone (1997,) Intangible Asset Monitor by Sveiby (1997), are part of this category.

Some methods constitute widespread practise, even in a limited context; such as: the Danish Guidelines, the IABM method, remarkably diffused in Japan (support by the Japanese government), the Citation weighted patents method promoted and implemented by Dow Chemicals and the Business IQ method. Nevertheless, the usage of these methods is cordoned off a specific company, a sector, a geographic area and no one of these have achieved a state of global acceptance and may not succeed in the future.
The methods that can be considered more firm in terms of objectivity and identity are the methods which belong to the ROA category or that one "adjusted" to the knowledge measurement, such as the Accounting for the future or the Q of Tobin (for these methods there is not clear definition of concepts and proprieties), while SC approaches are more frail in term of objectivity and generality.

3. METHODOLOGY

3.1. Method and dataset

Our research aims to verify the level of disclosure that Italian companies make on the components and on the relevance of their intellectual capital.
The methodology applied in our research job is based on the "Content analysis" (Krippendorff, 1980; Yi and Davey, 2010), that requires a survey and consequent analysis of data and information in financial statements about knowledge resources. As a methodological approach frequently used in social communication and in environmental communication (Hackston and Milne, 1996), the application of this method is based on five stages:

- Choice of the report to classified the information;
- Choice of the analysis unit with which is assessed the presence or the absence of the research information (the sentences, the paragraph, the page, the entire document);
- The coding procedure and the evaluation of its robustness;
- The codification;
- The ex-post verification of the reliability of the reach data.

Effectively, the choice of the report, for the information classification about the intangible assets of the company, has been placed on the methodological scheme formalized by OECD (Guthrie et Al. 1999). The measurement report of the intellectual capital of the companies is divided in three sections:

- The interior section is referred to the organized capital (divided in intellectual proprieties and infrastructure assets), which is represented by the set of codified know-how within the company structure, the capacity for innovation and research, the efficiency of internal processes, the corporate culture, the degree of cohesion of the management and the ability to attract new skills;
- The external section of the relationship capital is based on the wealth of relationships established with the market, with stakeholders and with current and potential customers;
- The human capital section, is expression of the set of knowledge, skills and abilities of the people who work in the company.

Every section is measured with the adoption of functional indicators – at all 21 items – which measure specific intangibles. Compared to the original report, in the external section we have changed the franchising agreements index with the ethical and environment index. As analysis unit for the assessed of the presence or absence of the information search by the indicator we decided to use "the sentences" because it is considered more reliable than a print page or than an entire paragraph (Hackston and Milne, 1996). More specifically, each sentence is associated at a score that could represent one of the different intangible asset indicators, measured with the semantic differential with a coefficient between 0 and 3. Indeed:

- Score 0 is assigned when the information isn't qualified (not quantitatively reported with reference to the traditional accounting documents - balance sheet and income statement not described qualitatively in other documents - the management report, the code of ethics, etc);
- Score 1 is assigned when the information is qualified only qualitatively or only quantitatively (with reference only to the traditional accounting documents - balance sheet and income statement for the quantitative aspect or only to the management report, the code of ethics or other corporate documents for the qualitative aspects);
- Score 2 is assigned when the information is qualified both quantitatively and qualitatively;
- Score 3 is assigned when the information is quantitative qualified and specificly it is qualitatively in-depth (the strategic and competitive nature of the agreement is specified).

With regards to the implementing rules of the “content analysis” one of the critical elements for its operation and adjustment is about the “strength” (Krippendorff, 1980) of the codifying procedure because the classification scheme could suffer from the subjective assessment of the researchers (Guthrie et Al, 2004). Following that literature, it is possible to identify different kinds of “strength”:

- The reproducibility: referred to the risk of making codify systematic errors when more than one researcher is involved in the activity;
- The care: referred to the researchers ability to apply the codify procedure uniformly in different time periods;
- The stability: referred to the possibility to link the reproducibility of the results with a determinate standard laid down in advance.

INTELLECTUAL CAPITAL COMPONENTS	*Score*	*Disclosure Index*
Structural Capital		
Patent	$p1 \in (0,3)$	
Copyright	$p2 \in (0,3)$	
Brand/trademark	$p3 \in (0,3)$	
Intellectual property disclosure index		$IPDI = \frac{(p1 + p2 + p3)}{3} \in (0,3)$
Corporate Culture	$p4 \in (0,3)$	
Management processes	$p5 \in (0,3)$	
Information systems	$p6 \in (0,3)$	
Networking systems	$p7 \in (0,3)$	
Research projects	$p8 \in (0,3)$	
Operational capital disclosure index		$OCDI = \frac{(p4 + p5 + p6 + p7 + p8)}{5} \in (0,3)$
External Relation Capital		
Clients	$p9 \in (0,3)$	
Loyalty	$p10 \in (0,3)$	
Distribution channels	$p11 \in (0,3)$	
Partnership	$p12 \in (0,3)$	
Research agreements	$p13 \in (0,3)$	
Financial Partnership	$p14 \in (0,3)$	
Licensing agreements	$p15 \in (0,3)$	
Franchising agreements	$p16 \in (0,3)$	
Ethics & Environment	$p17 \in (0,3)$	
*Reputa*tional Capital disclosure index		$RCDI = \frac{(p9 + p10 + p11 + p12 + p13 + p14 + p15 + p16 + p17)}{9} \in (0,3)$
Internal Capital		
Training programs	$p18 \in (0,3)$	
Employees	$p19 \in (0,3)$	
Business process knowledge	$p20 \in (0,3)$	
Business process competencies	$p21 \in (0,3)$	
Human Capital disclosure index		$HCDI = \frac{(p18 + p19 + p20 + p21)}{4} \in (0,3)$
INTELLECTUAL CAPITAL DISCLOSURE INDEX		$\boldsymbol{ICDI = \frac{IPDI * 3 + OCDI * 5 + RCDI * 9 + HCDI * 4}{21} \in (0,3)}$

The empirical research concerns the analysis and the quali-quantitative study of the financial statements of a sample of companies listed on the Italian stock market, relating to the fiscal years 2010 and 2016. In particular, the sample comprises the listed companies included in the "super sector" indexes FTSE Italy Financial Services and FTSE Italy Technology, listed at the "Borsa di Milano".

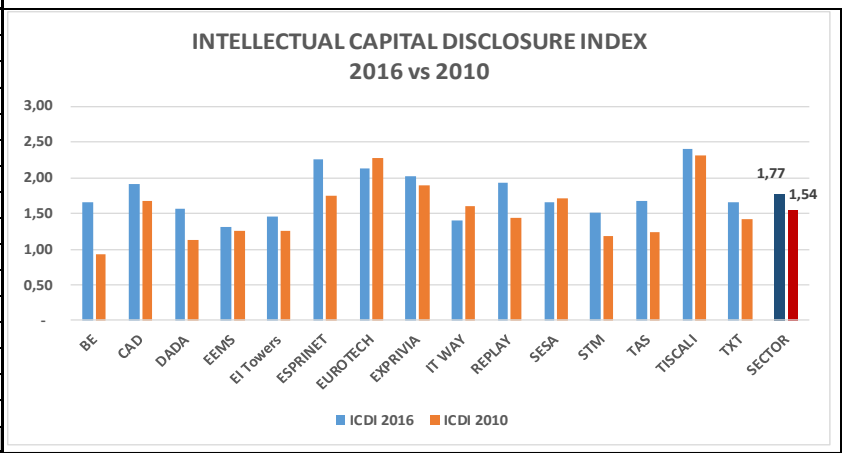
FTSE Italy Technology	FTSE Italy Financial Services
1. Be	1. Anima Holding Spa
2. Cad it	2. Azimut Holding
3. Dada	3. Banca Generali
4. Eems	4. Banca Ifis
5. Ei Towers	5. Banca Intermobiliare
6. Esprinet	6. Banca Sistema
7. Eurotech	7. Conafi Prestito
8. Exprivia	8. Dea Capital
9. It Way	9. Exor
10. Reply	10. Gequity
11. Sesa	11. Lventure Group
12. Stmicroelectronics	12. M&C
13. Tas	13. Mittel
14. Tiscali	14. Mutuionline
15. Txt	15. Tamburi Investment Partners
	16. Tecnoinvestimenti.

Therefore, to apply the content analysis, 62 financial statements relating to 31 listed companies were examined.

3.2. Evidences

Applying the content analysis to financial statement of companies included in FTSE Italy Technology, it results that the level of overall disclosure is moderate but increasing. Indeed, the Intellectual Capital Disclosure Index of the examining sector moves from a level of 1,54 in 2010 to a level of 1,77 in 2016 (+15,1%). Just 3 companies of the sector have worsened their overall level of disclosure, having the other 13 bettered their one.

LISTED COMPANIES	INTELLECTUAL CAPITAL DISCLOSURE INDEX		
	ICDI 2016	*ICDI 2010*	*Δ %*
BE	1,66	0,94	*76,9%*
CAD	1,91	1,67	*14,9%*
DADA	1,57	1,14	*38,5%*
EEMS	1,31	1,25	*5,2%*
EI Towers	1,45	1,26	*15,2%*
ESPRINET	2,26	1,75	*29,1%*
EUROTECH	2,12	2,27	*-6,6%*
EXPRIVIA	2,01	1,89	*6,4%*
IT WAY	1,41	1,60	*-12,1%*
REPLAY	1,94	1,44	*34,1%*
SESA	1,66	1,71	*-2,9%*
STM	1,50	1,18	*27,2%*
TAS	1,67	1,24	*34,6%*
TISCALI	2,41	2,30	*4,6%*
TXT	1,65	1,41	*16,6%*
SECTOR	**1,77**	**1,54**	***15,1%***

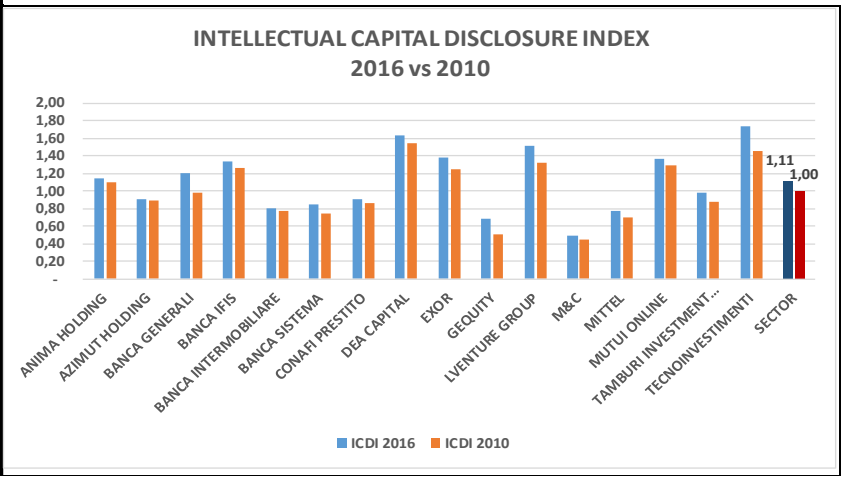


Observing the disclosure index related to the specific component of intellectual capital considered in this research, all the aspects of IC have benefited, on average, of an improvement in the level of external communication. The highest level of disclosure is concerning the communication of intellectual property and operational capital, the worst is inherent to the human capital. In terms of improvement between 2010 and 2016, the largest increase in the disclosure index is recorded for operational capital.

LISTED COMPANIES	INTELLECTUAL PROPERTY DISCLOSURE INDEX			OPERATIONAL CAPITAL DISCLOSURE INDEX			RELATIONAL CAPITAL DISCLOSURE INDEX			HUMAN CAPITAL DISCLOSURE INDEX		
	IPDI 2016	*IPDI 2010*	*Δ %*	*OCDI 2016*	*OCDI 2010*	*Δ %*	*RCDI 2016*	*RCDI 2010*	*Δ %*	*HCDI 2016*	*HCDI 2010*	*Δ %*
BE	1,00	1,00	*0,0%*	2,60	1,20	*116,7%*	1,22	0,78	*57,1%*	0,50	0,25	*100,0%*
CAD	1,33	1,67	*-20,0%*	2,40	2,00	*20,0%*	1,67	1,22	*36,4%*	1,75	1,25	*40,0%*
DADA	2,00	1,33	*50,0%*	1,80	1,20	*50,0%*	1,33	1,22	*9,1%*	0,50	0,50	*0,0%*
EEMS	1,67	1,00	*66,7%*	1,40	1,60	*-12,5%*	1,67	1,33	*25,0%*	-	0,50	*-100,0%*
EI Towers	1,33	2,00	*-33,3%*	1,40	0,80	*75,0%*	1,67	1,56	*7,1%*	1,50	1,00	*50,0%*
ESPRINET	2,00	1,00	*100,0%*	2,40	1,80	*33,3%*	2,11	2,22	*-5,0%*	2,50	2,25	*11,1%*
EUROTECH	2,67	3,00	*-11,1%*	2,00	2,20	*-9,1%*	2,56	2,67	*-4,2%*	1,00	0,75	*33,3%*
EXPRIVIA	2,00	2,00	*0,0%*	2,20	2,20	*0,0%*	2,00	1,56	*28,6%*	1,50	1,25	*20,0%*
IT WAY	1,67	2,00	*-16,7%*	1,40	1,40	*0,0%*	1,78	2,00	*-11,1%*	0,50	1,00	*-50,0%*
REPLAY	1,67	1,33	*25,0%*	2,40	1,80	*33,3%*	1,56	1,11	*40,0%*	1,50	1,00	*50,0%*
SESA	1,67	2,00	*-16,7%*	2,00	1,80	*11,1%*	1,78	1,89	*-5,9%*	0,50	0,75	*-33,3%*
STM	2,33	2,33	*0,0%*	1,20	0,60	*100,0%*	1,89	1,56	*21,4%*	0,50	0,50	*0,0%*
TAS	1,67	1,33	*25,0%*	1,80	1,20	*50,0%*	1,89	1,78	*6,3%*	1,00	0,50	*100,0%*
TISCALI	3,00	3,00	*0,0%*	2,80	2,60	*7,7%*	2,22	2,11	*5,3%*	0,50	0,50	*0,0%*
TXT	1,67	1,67	*0,0%*	1,80	1,40	*28,6%*	1,78	1,44	*23,1%*	1,00	1,00	*0,0%*
SECTOR	**1,84**	**1,78**	***3,8%***	**1,97**	**1,59**	***24,4%***	**1,81**	**1,63**	***10,9%***	**0,98**	**0,87**	***13,5%***

Applying the content analysis to the financial statement of companies included in FTSE Italy Financial Services, it results that the level of overall disclosure is not sufficient, and lower than the sector considered above. However, the Intellectual Capital Disclosure Index of the examining sector moves from a level of 1,00 in 2010 to a level of 1,11 in 2016 (+10,7%). All the companies of the sector have bettered their overall level of disclosure.

LISTED COMPANIES	INTELLECTUAL CAPITAL DISCLOSURE INDEX		
	ICDI 2016	*ICDI 2010*	*Δ %*
ANIMA HOLDING	1,14	1,10	*3,8%*
AZIMUT HOLDING	0,91	0,89	*2,4%*
BANCA GENERALI	1,21	0,99	*22,5%*
BANCA IFIS	1,34	1,26	*6,3%*
BANCA INTERMOBILIA	0,81	0,78	*3,5%*
BANCA SISTEMA	0,85	0,74	*14,4%*
CONAFI PRESTITO	0,91	0,87	*5,0%*
DEA CAPITAL	1,63	1,54	*6,0%*
EXOR	1,39	1,25	*11,0%*
GEQUITY	0,68	0,51	*33,8%*
LVENTURE GROUP	1,51	1,32	*14,1%*
M&C	0,49	0,44	*9,8%*
MITTEL	0,77	0,69	*11,2%*
MUTUI ONLINE	1,36	1,29	*6,1%*
TAMBURI INVESTMENT	0,98	0,87	*12,4%*
TECNOINVESTIMENTI	1,74	1,46	*19,1%*
SECTOR	**1,11**	**1,00**	***10,7%***



Observing the disclosure index related to the specific component of intellectual capital considered in this research, all the aspects of IC have benefited, on average, of an improvement in the level of external communication. The highest level of disclosure is concerning the communication of operational and human capital, the worst is inherent to the relational capital. In terms of improvement between 2010 and 2016, the largest increase in the disclosure index is recorded for operational capital.

LISTED COMPANIES	INTELLECTUAL PROPERTY DISCLOSURE INDEX			OPERATIONAL CAPITAL DISCLOSURE INDEX			RELATIONAL CAPITAL DISCLOSURE INDEX			HUMAN CAPITAL DISCLOSURE INDEX		
	IPDI 2016	*IPDI 2010*	*Δ %*	*OCDI 2016*	*OCDI 2010*	*Δ %*	*RCDI 2016*	*RCDI 2010*	*Δ %*	*HCDI 2016*	*HCDI 2010*	*Δ %*
ANIMA HOLDING	1,00	1,00	*0,0%*	1,40	1,40	*0,0%*	1,22	1,00	*22,2%*	0,50	0,50	*0,0%*
AZIMUT HOLDING	1,00	1,00	*0,0%*	1,00	1,00	*0,0%*	0,89	0,78	*14,3%*	0,50	0,50	*0,0%*
BANCA GENERALI	0,67	0,67	*0,0%*	1,60	1,20	*33,3%*	0,78	0,89	*-12,5%*	1,50	1,00	*50,0%*
BANCA IFIS	1,00	1,00	*0,0%*	1,60	1,40	*14,3%*	1,22	1,44	*-15,4%*	1,25	1,00	*25,0%*
BANCA INTERMOBILIA	0,67	1,00	*-33,3%*	0,80	0,60	*33,3%*	1,22	1,11	*10,0%*	0,50	0,50	*0,0%*
BANCA SISTEMA	0,67	0,67	*0,0%*	1,00	0,80	*25,0%*	1,00	0,89	*12,5%*	0,50	0,50	*0,0%*
CONAFI PRESTITO	0,67	0,67	*0,0%*	1,00	0,80	*25,0%*	1,33	1,56	*-14,3%*	0,50	0,50	*0,0%*
DEA CAPITAL	1,33	1,33	*0,0%*	2,00	1,80	*11,1%*	1,67	1,44	*15,4%*	1,00	1,25	*-20,0%*
EXOR	1,33	0,67	*100,0%*	1,40	1,60	*-12,5%*	1,33	1,56	*-14,3%*	1,50	0,75	*100,0%*
GEQUITY	0,67	0,67	*0,0%*	0,80	0,40	*100,0%*	0,56	0,56	*0,0%*	0,50	0,50	*0,0%*
LVENTURE GROUP	1,33	1,00	*33,3%*	1,80	1,60	*12,5%*	1,44	1,33	*8,3%*	1,00	1,00	*0,0%*
M&C	0,67	0,67	*0,0%*	0,40	0,20	*100,0%*	0,44	0,67	*-33,3%*	0,50	0,50	*0,0%*
MITTEL	0,67	0,67	*0,0%*	0,80	0,60	*33,3%*	1,22	0,89	*37,5%*	0,25	0,75	*-66,7%*
MUTUI ONLINE	1,33	1,33	*0,0%*	1,40	1,40	*0,0%*	1,78	1,56	*14,3%*	0,75	0,50	*50,0%*
TAMBURI INVESTMENT	0,67	0,67	*0,0%*	1,40	1,00	*40,0%*	0,78	1,11	*-30,0%*	0,50	0,50	*0,0%*
TECNOINVESTIMENTI	1,67	1,33	*25,0%*	2,20	2,00	*10,0%*	1,33	1,11	*20,0%*	1,00	0,50	*100,0%*
SECTOR	**0,96**	**0,90**	***7,0%***	**1,29**	**1,11**	***15,7%***	**1,14**	**1,12**	***1,9%***	**0,77**	**0,67**	***14,0%***

By comparing the two considered sectors, we observe that the companies of FTSE Italy Technology present a level of disclosure significantly higher than the other sector.

SECTOR	INTELLECTUAL CAPITAL DISCLOSURE INDEX		
	ICDI 2016	*ICDI 2010*	*Δ %*
FTSE Italy Technology	1,77	1,54	*15,1%*
FTSE Italy Financial Services	1,11	1,00	*10,7%*
Δ %	***60,0%***	***53,9%***	***n.a.***

This finding is confirmed examining all the elements of intellectual capital.

SECTOR	INTELLECTUAL PROPERTY DISCLOSURE INDEX			OPERATIONAL CAPITAL DISCLOSURE INDEX			RELATIONAL CAPITAL DISCLOSURE INDEX			HUMAN CAPITAL DISCLOSURE INDEX		
	IPDI 2016	*IPDI 2010*	*Δ %*	*OCDI 2016*	*OCDI 2010*	*Δ %*	*RCDI 2016*	*RCDI 2010*	*Δ %*	*HCDI 2016*	*HCDI 2010*	*Δ %*
FTSE Italy Technology	1,84	1,78	*3,8%*	1,97	1,59	*24,4%*	1,81	1,63	*10,9%*	0,98	0,87	*13,5%*
FTSE Italy Financial Services	0,96	0,90	*7,0%*	1,29	1,11	*15,7%*	1,14	1,12	*1,9%*	0,77	0,67	*14,0%*
Δ %	***92,5%***	***98,4%***	***n.a.***	***53,3%***	***42,6%***	***n.a.***	***58,7%***	***45,8%***	***n.a.***	***28,4%***	***29,0%***	***n.a.***

4. CONCLUSION

The research aims to measure the level of disclosure on intellectual capital that characterizes some Italian listed companies. Applying the content analysis to financial statement of 31 companies listed on Milan Stock Market, we measured 21 functional indicators representative of the 4 main aspects of IC, attributing to each one a coefficient between 0 and 3.

It results that, on average, the level of overall disclosure is moderate both in 2010 and 2016; but comparing the results of this 2 fiscal years, the level of disclosure appears to be significantly increasing. Observing the disclosure index related to the specific component of intellectual capital considered in this research, all the aspects of IC have benefited, on average, of an improvement in terms of communication.

The highest level of disclosure is concerning the communication of intellectual property and operational capital, the worst is inherent to the human capital. In terms of improvement between 2010 and 2016, the largest increase in the disclosure index is recorded for operational capital.

Comparing the companies included in FTSE Italy Technologies Index with those included in FTSE Italy Financial Services Index, it results that the level of overall disclosure of the seconds is not sufficient, and lower than the first ones. This finding is confirmed examining all the elements of intellectual capital. Anyway, almost all the companies of the 2 sectors have bettered their overall level of disclosure. This finding is confirmed examining all the elements of intellectual capital.

Concluding, the increase in the disclosure index, emerging from the comparison of the communication level in 2010 and in 2016, confirms the relevance of intellectual capital in the age of Industry 4.0.

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AGILE APPROACH IN INNOVATIVE MEDICINE DEVELOPMENT

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Abstract: *The paper presents key elements and features of innovation projects in pharmaceutical industry, especially concerning innovative drug development. Nowadays, in a time of dynamic changes and challenges, pharmaceutical companies (also known as Life Sciences) are facing dual imperatives to deliver innovative therapy that addresses unmet patient needs in a timely manner and to achieve profitable growth. Achieving these targets very often requires transforming the current business model or internal process improvement. The focus of this paper is to assess the possibilities of agile approach incorporation in iterative Stage Gate framework in innovative medicine development and also to try to identify what concrete actions can be undertaken in each phase in order to have more efficient and faster availability of innovative therapy which will be measured with appropriate innovation indicators.*

Keywords*: innovative medicine, agile, innovative process, pharmaceutical industry, research and development, efficiency*

1. INTRODUCTION

Pharmaceutical innovation is one of the driving forces behind the tremendous progress in life expectancy and better health we have experienced in the last 60 years. As a result of complex interaction and strong partnership between science, health care, and industry, pharmaceutical innovation represent a crucial contribution in improving public health and at the same time is the main driver for growth and competitive status in pharmaceutical industry.

Developing a new drug is a very complex, high risky and long process. From screening to reimbursement process, it's not easy to understand each and every stage of the long chain of events going from a scientific discovery to a packaged product on the shelves of a local pharmacy? The level of complexity and fragmentation throughout the R&D pipeline, pervasive government actions and regulations impact the flow of pharmaceutical innovation. Each of these stages can either accelerate or stop pharmaceutical innovation, meaning the difference between a new medicine and no treatment for patients.

Therefore, in order to increase R&D productivity, recommendation for representatives of research-based pharmaceutical companies, for those who still didn't, would be to deploy stage gate framework, phase designed process for new product development (NPD) based on project management and risk based approach. This challenge is difficult, but not impossible to overcome. Consequently, this will result in better project planning and risk mitigation strategy for project timelines, inter – dependency of projects, resource allocations, budgets and research outcomes (https://www.pharmafocusasia.com/articles/increasing-speed-randd-stage-gate).

The last but not the least, the most important is the agile methodology approach and the benefits implementation results, how to make the whole process more efficient, to improve speed to the market and to increase development productivity. When it comes to patients and medical treatment, the main success criteria of the project progress is timing. Time is of essence here.

2. KEY PHARMACEUTICAL INDUSTRY FEATURES

Global sales of medicines and pharmaceutical products represent the international expansion of medical technology that is the result of a highly intensive research and development in the countries exporting these technologies. At the same time, the importing countries benefit through improved health care, even if those countries do not participate in the process of research and development.

The pharmaceutical industry is responsible for the development, production and sale of medicines. The main characteristics of pharmaceutical industry and pharmaceutical market are strong competition, wide distribution, steady growth of the market and strict regulations (through price control and treatment costs). In the period from 2001 to 2016 pharmaceutical industry achieved the significant growth, ending 2016 in total

reached revenues 1105.2 billion USD. (https://www.statista.com/statistics/263102/pharmaceutical-market-worldwide-revenue-since-2001)

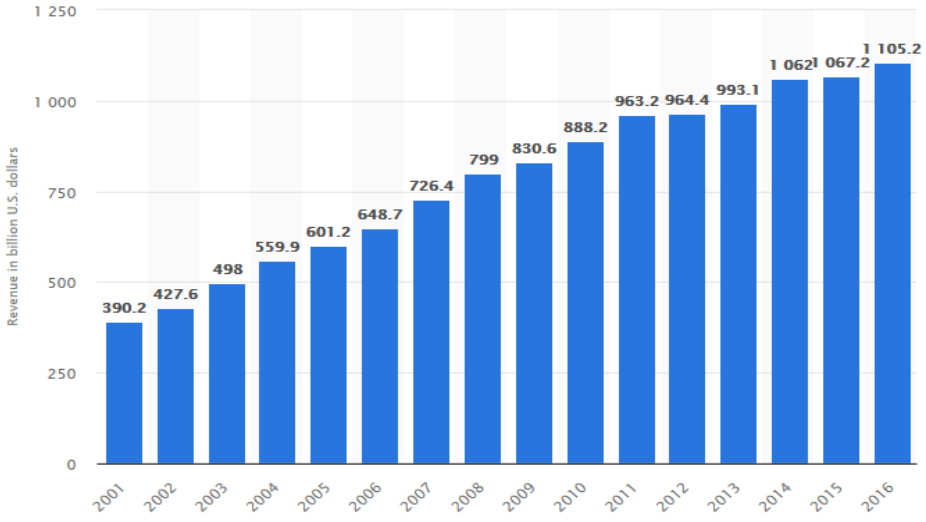

Figure 1: Revenue of the worldwide pharmaceutical market from 2001 to 2016 (in billion U.S. dollars)

Pharmaceutical companies are engaged in the research, discovery, development, production, and sale of chemical and biochemical compounds. The industry makes an essential contribution to improvements in the prevention and management of ill health and disease. In this way, the quality of human life is protected, preserved and improved. Innovative companies in pharma industry will not survive in the marketplace unless develop a succession of new products that are able to compete successfully with those manufactured by competitors or may also need to improve its established products to remain competitive in the face of other companies' new or improved products. Based on statistical estimation, investments in R&D should increase to over 180 billion USD by 2022: (https://www.statista.com/statistics/309466/global-r-and-d-expenditure-for-pharmaceuticals/)

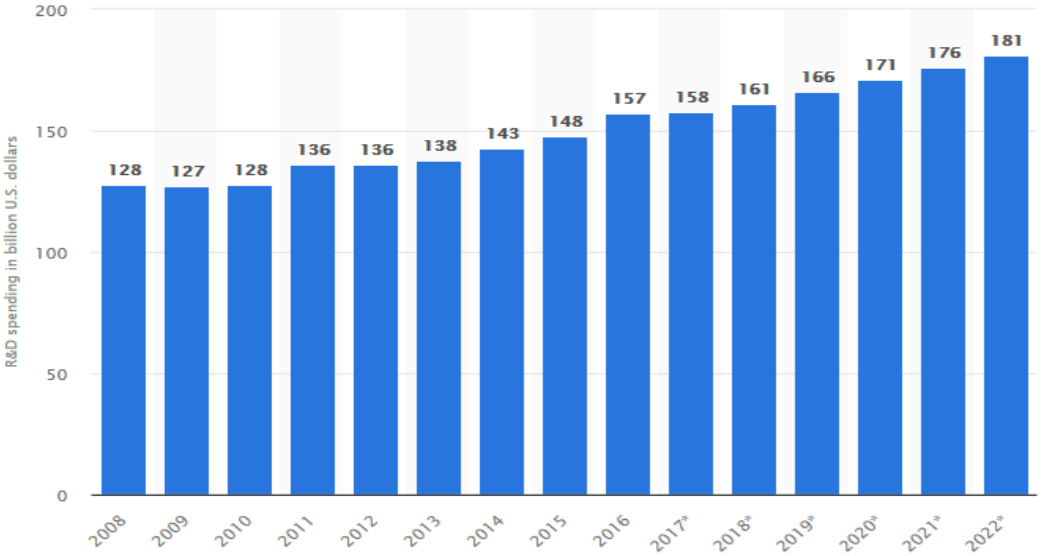

Figure 2: Total global pharmaceutical research and development (R&D) spending from 2008 to 2022 (in billion U.S. dollars)

R&D involves initial discovery, investigation, and pre-clinical and clinical testing of chemical compounds. Investing in R&D is critical for commercial success achievement in the pharmaceutical industry. The outcome of pharmaceutical R&D is risky and uncertain, it does not, however, guarantee success. Of the 5,000 to 10,000 screened compounds, only 250 enter pre-clinical testing, five enter clinical testing and one is approved by the FDA, Food and Drug Agency (Pharmaceutical Industry Profile 2012 Washington, DC:

PhRMA page 30, Fig 3). Developing a new medicine takes in average 10 to 15 years. On average, **only three out of ten** approved drugs recover average R&D costs.

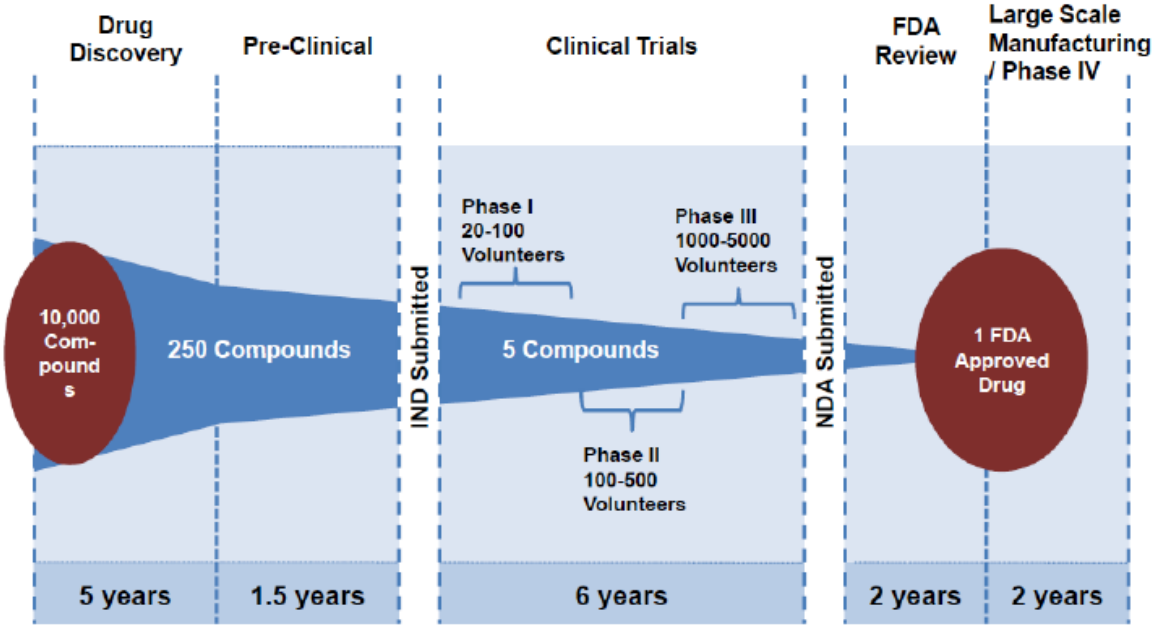

Figure 3: The Drug Development Process

IP protection is of paramount importance to this industry. **IP** (intellectual property) **rights drive innovative activity** and value creation across the pharmaceutical industry and national economies. Without the benefit of intellectual property protection, pharmaceutical companies could not undertake the massive research & development investments required to develop new medicines.

As a result of R&D successful process, pharmaceutical innovation responds to unmet public health needs, brings greater societal benefits such as releasing other healthcare resources, increasing work force productivity and improving macroeconomics through greater investment in human capital by healthy population (http://www.who.int/topics/innovation/en/).

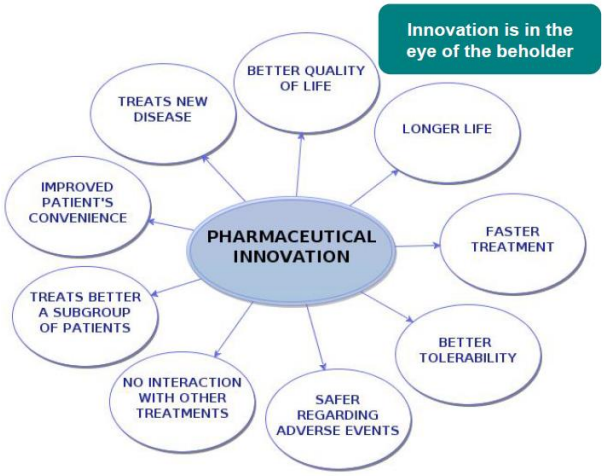

Figure 4: Value of innovation (Policy Passport MSD, Internal document)

Seven stakeholders have been identified as key role players in deciding whether a medicine is innovative, using different definitions of innovation at different points in the product lifecycle. The process starts with the *researcher*, who identifies the scientific potential of a particular molecule. It continues with the *investor*, who backs that belief with capital; the *regulator*, who approves the labelling claim; and the *pharmaceutical company*, which commits resources to the production and promotion of the treatment. Once a medicine has reached the market, it is the h*ealthcare payer, provider* and *patient*, respectively, who adjudicate on its innovativeness: the healthcare payer by paying a premium price for it; the provider by choosing it over other therapies; and the patient by taking it as instructed or even pressing for a prescription (Pharma 2020: Marketing the future Which path will you take?).

3. INTRODUCING AGILE PRINCIPLES INTO INNOVATIVE DRUGS DEVELOPMENT

In regards of stated above, launch of pharmaceutical innovation is long, complex, risky and expensive iterative process, resulting from cross- functional team interaction. At the same time, the benefits have been tremendous with ending result that pharmaceutical innovation is what helps the patient.

Lately, there is a huge pressure on pharma industry to shift their focus and investments on improving productivity and innovation access. This statement became almost an imperative. Constructive approach would require Stage-Gate framework including detail phase – review designed for New Product Development (NPD). NPD system is based on effective project management and risk approach. The stage gate framework (Cooper, 1990) is a series of systematic, constructive and cross functional reviews providing increased scrutiny over R&D projects, where the gates refer to key decision points at each important milestone of the project to assess: what has been achieved, whether it is sufficient, and based on the information available if the project can be moved to the next stage (https://www.pharmafocusasia-.com/articles/increasing-speed-randd-stage-gate). This approach will enable timely identifying any process and technology concerns and tracking of project performance progress. Incorporating agile methodology in existing Stage-Gate framework is resulting in hybrid model for innovative medicine development (Cooper, 2017). Added value in agile approach will result in improving speed to market which is critical when it comes to innovative therapy and unmet medical need and increasing development productivity. Generally speaking, agile development methods are introduced in software industry, mainly coming as request to adaptive planning, evolutionary delivery, timely – boxed iterative approach and flexible response to change (Cooper & Sommer, 2016). This is why it should be useful to have in mind set of 12 principles introduced by that The Agile Manifesto in IT (Langdon, 2017), established in 2001, and among them are:

- Working software to be delivered quickly and iterated frequently (in cycles of weeks rather then months - sprints);
- Working software to be primary measure of the progress;

The next-generation of innovation projects management incorporates elements of agile development, enabling usage of short time-boxed increments, in form of sprints and scrums, in which the deliverable is something that can be demonstrated to stakeholders (Stošić & Milutinović, 2017). Agile approach is focused on execution and ending project result. The main benefits are coming from:

- Better internal communication (daily scrum – morning meetings organized to discuss the potential issues;
- Increased visibility for management trough intuitive progress metrics;
- More flexible and efficient planning, agile is powerful tool for microplanning providing higher level of control;
- Improved customer feedback;
- Stronger motivation and engagement of project team consequently is resulted from better communication and control on higher level.

When it comes to medical innovation and agile approach – the main question is the way of driving more efficiency in terms of investments and timing and optimizing a long research cycles in order to have more accelerated process (Cooper, 2014). In the sense of innovative medicine development, lean approach in combination with agile methods produce synergy effect and significant contribution to process efficiency improvement by eliminating the not value added activities (Cooper, 2014).

In general, R&D and innovative activities for the successful development of pharmaceutical products go through the following phases (MSD Internal document):

1. Identification of disease area and specific disease target;
2. Identification of compounds showing the most promise for treating disease targets and for eventual testing in humans;
3. Assessment of potential for development and efficacy leading to approval for testing in humans;
4. Phase I clinical trials on volunteers and ongoing nonclinical studies to refine the compound's safety profile and to establish its dosage range;
5. Phase II clinical trials on patients with the targeted disease to further test the drug's safety and efficacy;
6. Phase III clinical trials to further determine the drug's effectiveness and benefits, as well as potential adverse reactions to it; and
7. Phase IIIb or Phase IV– Post-launch clinical trials following the appropriate local regulatory approval.

Considering phased approach, R&D productivity improvement can be measured (MSD Internal document):

- Using conventional methods of R&D based on the latest technology solutions;
- Implement risk based and quality approach at the early stage research;

- Project management methodologies in the place – in order to improve result and decision making done by management and parallel functions.

Internally speaking, pharmaceutical companies' capabilities assessment will investigate any gaps in process or technology, determination of strengths and weakness enabling successful implementation of innovation process (Edgett, 2014). To achieve these objectives, pharmaceutical company must have a sufficient capital structure to fund the large costs and bear the substantial risks involved in performing R&D.

Advancement in Drug Discovery and Development can be reached out with implementation of new approaches to clinical trials (roughly takes six to seven years) and using different and modern statistical methods. This will drive more efficiency in the process by reducing the cost and time to bring new medicine to the market, consequently making the process more agile.

Agile methodology can also be assessed in FDA approval process, by having more alignment between scientific discovery and FDA, ending with accelerated agency's acceptance of innovative medicine development. Applying the most modern technology and engaging strong staff infrastructure, FDA's medicine review can be perform without no delays that cause longer development stage, missed opportunities, cost increase and the most important impact - delays in patient treatments.

Considering activities in IV stage of the process, this is to emphasise the importance of local government actions and regulatory country specifics. Strong collaboration between science, healthcare and industry on the local level lead to improved policy outcomes: better health, human capital creation, higher productivity and economic growth. It's substantial for innovation to be recognized as priority for local health care system. First off all, agile character can be added in country regulatory approval as the first step is to get Marketing Authorization Statement from Drug Agency in order to have launched medicine in the market. According to Law on Medicines and Medical devices in Serbia, it's defined that local regulatory approval takes 210 + 30 days. Instead, process can be improved by implementing *fast track approval for innovative medicines, particular major breakthroughs as* it's done in EU. For instance, In France, some innovative products without competitors can be made available prior to Market Authorization under the system of Temporary Authorizations (www.efpia.eu). National health policies are the key role player for enabling pharmaceutical innovation launch and release. These include important government investment in basic biomedical research, strong intellectual property protection, an efficient and transparent regulatory process and a pricing model that focuses on value and not just costs.

4. A REAL-LIFE EXAMPLE IN SERBIA

Merck Sharp&Dohme is a global healthcare group of companies that provides innovative solutions in the field of health care through its medicines, vaccines, biologic therapies, and products for animal health, and consumer care products. The group operates under the name of Merck Co (US territory). As research-driven pharmaceutical company, primary activities are to discover, develop, manufacture, and launch innovative vaccines and medicines that treat and prevent human illnesses. Merck Co as one of the leading innovative companies, invests considerable funds into R&D activity, cooperating with a number of laboratories, medical centers and doctors from different countries.

Case study is related to immune oncology treatment and MSD's PD – 1 inhibitors launch in Serbia market.

Oncology market has been exploded a few year ago by launching a few significant oncology products. Globally, oncology innovation is energized by a number of immunotherapies, making up 31% of the total pipeline. Approvals of oncology late-stage medicines will be accelerated with many having gained FDA's Breakthrough Therapy Designation; 46% of the total number of breakthrough designations in oncology (http://static.correofarmaceutico.com/docs/2014/12/01/informe_ims.pdf). Immune therapies are expected to gain many follow-on indications using the immune system to target cancer broadly rather than targeting site-specific tumors. PD-1 targeting drugs that boost immune system response show robust clinical response in trials and strong potential to grow the market in the next five years. (http://static.correofarmaceutico.com/docs/2014/12/01/informe_ims.pdf).

According to In Market Sales data 2015, the value of total pharma market in Serbia was 600 mil EUR and oncology market was 40 mil EUR. As per the same resource, market share of MSD in oncology segment in Serbia was 0,9%.

The story of PD–1 origination is very interesting. There are some similarities with Fleming's discovery of penicillin, at least when it comes to randomness (Drucker, 1985). The beginning of PD–1 dated back to the

end of the last century and is linked to the company Organon. After 2 mergers, firstly, Schering-Plow acquired Organon in 2007, and only two years later, Schering Plow was acquired by Merck Co., so PD-1 was born in Merck. Details about the origin PD-1 inhibitor are listed in the article *The Startling History Behind Merck's New Cancer Blockbuster.* Phase I of clinical trials KN–001 started in 2011. Initially, the study enrolled 32 patients and later on ended up with more than 1.100 patients. The first observations have been given by Antoni Ribas, one of the main investigators in the melanoma study, in the following statement: "*Among the first 7 patients we enrolled, 6 patients had objective responses. I realized I was probably lucky and this high rate of responses would not hold up forever, but also realized that [pembro] was different from all the other cancer immunotherapy we had tested to date, all of which had response rates in the 10-15% range." Ribas emphasizes his "main concern was that the study as designed had very few additional patients to enter, and I could not go to sleep if the trial closed and I would have suitable patients who could respond like the others and no slots for them." His pleading apparently dovetailed with the strategy on which Merck had embarked. As Ribas notes, the study "eventually grew to include 655 patients with metastatic melanoma and a similar number of patients with lung cancer, becoming the largest phase 1 trial ever done in oncology." (Note: This extraordinary Phase 1 study was recently summarized by Eric Rubin and colleagues in the Annals of Oncology.)*

The result of clinical studies was that the FDA (Food and Drug Agency, USA), in 2013, ranked PD – 1 as "Breakthrough designation group of drugs," meaning that this therapy is a revolutionary advancement in the treatment of melanoma cancer. A year after, in 2014, FDA approved PD-1 for advanced melanoma, and Europian Medicine Agency (EMA) approval was obtained in 2015.

Applying project management methodology in PD-1 development in Serbia, defined WBS structure is presented in Fig 5 below:

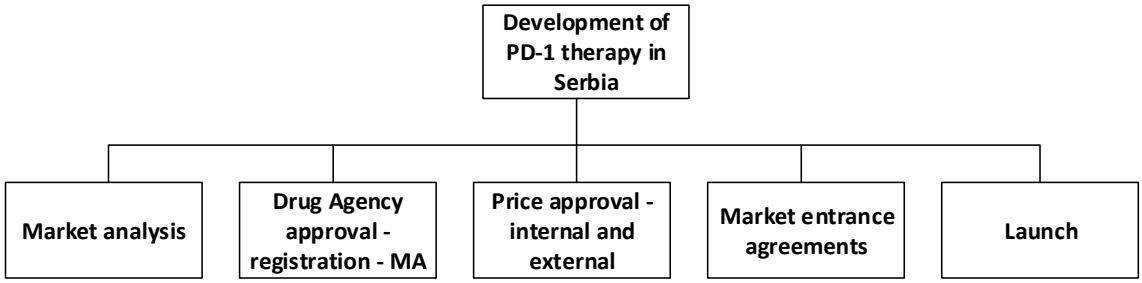

Figure 5: WBS project structure

As per data given by Serbian Medical Society, the annual number of newly diagnosed patients with melanoma disease is about 700, assuming that approximately 220 patients may receive treatment of PD-1, with stage IIIb or IV disease (170 patients are the first line), concluding that there is huge unmet need for melanoma treatment in Serbia. According to the Cancer Registry of the Republic of Serbia, 252 patients, in annual average died from melanoma, 149 men and 103 women. Compared to other countries in the world (Australia and New Zealand), Serbia with rates of disease belongs in the group of countries with a lower risk of disease, but the number of patients increases every five years by 20 percent, primarily due to uncontrolled exposure to UV radiation of the population in the last 50 years. The fact is that the number of patients from melanoma progressively increases and the risk group is younger population, around 40 years old. In 2016 and prior the leading medicine in melanoma therapy in Serbia was class BRAF.

Drug Agency in Serbia approved PD-1 for melanoma in May 2016. Basically, regulatory PD-1 milestones and *fast track approval*, gave the project of development PD – 1 inhibitors agile character based on "breakthrough" innovation.

Approval for price has been obtained in a very short period of time due to the statement of the public health importance. This is also one of the agile steps in the project path.

Innovative medicine launch requires strong cooperation between key stakeholders - Drug Agency, National Health Insurance Fund, Ministry of Health, Ministry of Trade, Republic Expert Committee, Central Commission for Medicines, Scientific Leaders, Patient Associations. National Health Insurance Fund (NHIF) has a critical role as decision maker in terms of funding when it comes to innovative therapy access. Based on EFPIA resource, rate of availability measured by the number of medicines available to patients in European countries for Serbia is low, since for the period 2013 – 2015 the Serbia took penultimate place, only Latvia had less products on reimbursement list in the mentioned period. This was consequently resulted by limited funds of National Health Insurance Fund for the purpose of innovative therapy access. If the higher

percentage of GDP is invested in health care system, than the county has stronger potential for innovative therapies implementation. Project has been strong supported by Scientific Leaders with high competency who recognized the importance of PD-1 even there were no local clinical trial results done for PD-1.

Public health authorities need to manage budgets under significant pressure. Innovative access agreements can accelerate access and improve the affordability of medicines. Managed Market Entry Agreements can serve as an effective catalyst for the rational uptake of innovative treatments. MSD is open to the development of innovative agreements that help to accelerate access for patients. By end of 2016 Market Entry Agreement has been concluded with National Health Insurance Fund. This way enables faster PD-1 delivery to patients which characterized this action as agile and in parallel this was process innovation since this was the first MEA implementation in Serbia (including also MEA agreements between NHIF and a few other pharmaceutical companies at the same time).

Very strong and dedicated cross-functional MSD team was involved in the project: Regulatory Manager, Market Access Manager/External Affairs Lead, Marketing Business Unit Lead, Medical Manager, Key Account Manager, Customer Service Specialist, Finance Analyst, including also General Manager. As very well aware of PD-1 potential based on clinical trials results done in other countries and driven by experience of other markets who already launched PD-1, team was empowered to lead this project and to perform as "one Merck" including strong collaboration, regular meetings and follow ups.

In the table 1, there is a CANVAS model defining Key Partners, Key Activities, Key Resources, Value Propositions, Customer Relationships, Channels, Customer Segments, Cost Structure and Revenue Streams (Cantamessa, M. & Montagna, F., 2016):

Table 1: Project presented by CANVAS model

<table>
<tr>
<td rowspan="2">Key Partners

Key patners for PD-1 development are: NHIF, Drug Agency, Ministry of Health ,Republic Expert Committie, Central Commission for Medicines, Scientific Leaders, Patients Associations, Phoenix Pharma;</td>
<td>Key Activities

Registration of medicine; Reimbursement list and Market Entrance Agreement (MEA); Increase awarness on prevention in melanoma cancer; Medical education;</td>
<td rowspan="2">Value Proposition

The most efficient therapy for melanoma pationts;
1st line for most efficacy;
Implementation in all advanced melanoma regardless of BRAF
Increase overrall survival rate (OS) and Progression Free Survival (PFS); Decrease Adverse Event (AE);</td>
<td>Customer Relationships

MSD as reliable partner in oncology market;
Scientific Leaders with high compentency who recognized the importance of PD-1 are very interested in innovative therapy implementation;</td>
<td rowspan="2">Customer Segments

Customers are Health Care Proffesionals (HCP"s), pharmacists, nurses, patients, Patient Associations Focus is on 6 Centers and 50 HCP's Medical Oncologists and Dermatooncologists;</td>
</tr>
<tr>
<td>Key Resources

Key resources are innovative medicine, our Team, and ethical business approach;</td>
<td>Channels

Channels of distribution are Indirect using partner who is at the same time our distributor Phoenix Pharma.
Phoenix Pharma delivers medicine to the 6 referent centers where therapy can be received;</td>
</tr>
<tr>
<td colspan="3">Cost Structure
Expenses are our investements in medical education during National and International Congresses and events, Symposias, Round Tables, Advisory Bords, Expert Input Forums. Investments are also related to various commercial activities, drug donation and free goods;</td>
<td colspan="2">Revenue Streams
For our founder MSD BV revenue as actually sales, for local entity, MSD, revenue is achieved based on mareketing services performed and done in the country;</td>
</tr>
</table>

Launch activities are done in accordance with marketing plan. The main objectives are medical education and increase awareness on prevention in melanoma cancer. PD-1 was launched in January 2017 following with strong sales growth.

Tool for measurement innovative project performance are Key Performance Indicators (KPI's) which selection depends on organization or industry. Selection process is usually done based on management tools, such as balance scorecard is (Knoke, B. & Eschenbaecher J., 2012).

Sales per month in 2017 in EUR are presented In **Table 2**:

Table 2: Melanoma market Serbia 2017 (In Market Sales Dec 2017)

Class	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Total 2017
PD - 1	19,280	39,084	186,188	273,960	229,899	251,597	215,503	295,740	304,452	379,979	299,904	434,706	2,930,293
BRAF	1,896	75,423	256,600	258,925	335,934	58,781	28,776	11,597	-3,858	0	0	17,344	1,041,417

Market share per month is presented in **Table 3**:

Table 3: Melanoma market share Serbia 2017 (In Market Sales Dec2017)

Class	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17
PD - 1	91%	34%	42%	51%	41%	81%	88%	96%	91%	100%	100%	96%
BRAF	9%	66%	58%	49%	59%	19%	12%	4%	-1%	0%	0%	4%

As per In Market Sales data Dec 2017, PD-1 for melanoma was the medicine with the greatest absolute sales growth among all therapeutic areas during 2017 achieving the sales growth of 352 mil RSD.

At this point, one of the critical KPI's considering the nature of innovations in pharmacy is definitely time spend from idea generation to commercialization and medicine delivery to patients. Cumulating the agile actions in different project phases, from first clinical trials in 2011 to market delivery in Serbia in December 2016 ending with only 5 years of innovative project duration and innovative medicine development (in average it takes 10 to 15 years).

During the 2017 approximately 100 patients were treated with PD-1 for melanoma in Serbia. According to clinical studies results, around 50% will live five or more than five years and in opposite median survival would be from 6 to 9 months. Given that melanoma principally affects the younger population, this therapy for them means a longer life and hope that in the next 5 years a new "breakthrough" medicine can be launched to translate this deadly disease into a chronic. In the spirit of the mission and better access to innovative therapy, this is the most valuable achievement for research-based pharmaceutical companies that innovative medicines can help and improve lives of patients.

5. CONCLUSION

In this paper we discussed the possibilities of agile methodology implementation in innovative medicine development process and resulted outcome. Based on stated above, this question is challenged but step by step could be achievable particular now when pharmaceutical companies are facing uncertainty and risk coming from external environment and internally. At this point, this is to underline that the number of factors coming from different sides and stakeholders affect the innovation process if self, which makes the whole process even more complex (regulations, approval process, industrial and healthcare policy, efficiency in country healthcare system).

Obtaining R&D investments is first step in preparation for medicine innovation project, but not sufficient enough. Solution is in well-designed Stage-Gate framework, conceptual and operational road map, phased process with list of activities per iteration, enabling in that way systematic, constructive and cross functional reviews including project management and risk based approach. Adding to this framework the agile character, new hybrid module can be introduced aiming to improve process efficiency and medicine delivery. Implementing this module by shortening the project cycles, the innovative medicine development get accelerated approach in terms of faster project execution which is critical for patient treatment.

"Our industry is poised to translate our most promising scientific breakthroughs into meaningful treatments capable of tackling the most urgent and vexing medical challenges of our times. we stand committed to driving progress for patients today – and hope for tomorrow."

- Kenneth C. Frazier, Chairman & Ceo, Merck

"Today, delivering authentic healthcare innovation worldwide is more challenging and complex than ever. it demands a sharp focus on what customers need. It requires the development and delivery of data, knowledge and products that make a difference."

- Clive A. Meanwell, Md, Phd, Chairman & Ceo, The Medicines Company

"The process of making a new medicine is a marathon that requires endurance and commitment. We cannot reach our goals without the help of partners from inside and outside the company."

- Tadataka Yamada, md, Chief Medical & Scientific Officer, Takeda

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INNOVATION ACTIVITIES AND COMPETITIVENESS OF THE COMPUTER PROGRAMMING SECTOR IN SERBIA

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Abstract: *The research findings presented in major extracts in this paper are results of a survey of the software/computer programming (CP) sector in Serbia conducted by Institute Mihajlo Pupin from November 2017 to January 2018. The software industry has been the most dynamic and fastest growing sector in Serbia in the last decade. In this paper authors will present the key issues relating to innovation activities and international competitiveness of CP sector, as well as framework conditions which should be provided to companies in CP sector in order to maintain fast growth and strong international position. In particular, the focus is on the role of government policies in shaping the international competitiveness of the CP sector in Serbia. Specifically, the paper pays attention to the international competitiveness of software industry as to how it has developed the way it has in recent years and what have been the key factors that has strengthened this sector.*

Keywords*: Innovation activities, Computer Programming Sector, Competitiveness, Serbia*

1. INTRODUCTION

Software development takes place across the economy. The tight links and complementary of the software sector with other industries are highlighted in several OECD studies (OECD, 2002, 2004, 2006). Serbian CP sector is capable of producing competitive software solutions, recognized all over the world. In recent years, the CP sector in Serbia has been becoming the most attractive sector of the economy. Rapid development and promotion of IT services, especially in the field of internet and mobile technologies, application development, and outsourcing, is evident. Recent data revealed by the national bank has indicated that software/computer programming (CP) sector in Serbia has become one among key sectors in economy. The CP sector has reached 760 million EUR export in 2017, with net effect of 463 million EUR (table 1).

Table 1: Republic of Serbia: Services, 2011 - 2017

Computer services (million of EUR)	**Y2011**	**Y2012**	**Y2013**	**Y2014**	**Y2015**	**Y2016**	**Y2017**	**Ratio: Y2017 / Y2011**
Export	170.888	221.287	295.832	344.416	454.736	589.820	759.716	444.57%
Import	126.774	149.280	160.819	172.343	166.902	193.325	296.288	233.71%
Balance	**44.115**	**72.008**	**135.013**	**172.073**	**287.834**	**396.497**	**463.427**	1050.50%

Source: National Bank of Serbia (NBS), http://www.nbs.rs/internet/english/80/platni_bilans.html , downloaded April 09, 2018

This is one of the facts that inspired authors of this paper (researchers at the Mihajlo Pupin Institute) to conduct a survey of the software/computer programming (CP) sector in Serbia from November 2017 to January 2018 as part of the wider set of activities under the development of the Smart Specialisation Strategy of the Republic of Serbia (JRC and IWB, 2017). One of the key research questions for survey of the CP sector in Serbia was: *What are the factors that make CP sector in Serbia competitive on the international market?* (Kutlača et al., 2018). In this paper we shall elaborate some of key issues relating to international competitiveness of CP sector, as well as framework conditions which should be provided to companies in CP sector in order to maintain fast growth and strong international position. This study was motivated by the need to understand factors that guide the software exports and competitiveness on international market. It is also important because the strategic loopholes could be identified so that the additional measures could be introduced.

2. CASE STUDY OF COMPUTER PROGRAMMING SECTOR IN SERBIA

2.1 Case study as part of the Smart Specialisation Strategy of Serbia

In the beginning of the year 2017 the Government of the Republic of Serbia has created an Interministerial Working Body (IWB) to develop a Research and Innovation Strategy for Smart Specialization (RIS3) in partnership with the European Commission's (EC) Joint Research Centre (JRC). Following the RIS3 methodology, main activities in 2017 were addressed to quantitative analysis of the available data, statistics and information, in order to identify priority sectors in Serbia which developing potential is based on research and innovation. One among identified priority sectors is computer programming (or software engineering, SwE)[1] sector.In order to better understand what features of this sector in Serbia are, additional case study is commissioned by the JRC; some results of this survey are presented in this paper. Finding of case study are based on three sources: online survey of companies; interviews with main stakeholders in the sector; analysis of statistical and other available data and information.
The online survey ran from 7 November to 25 December 2017, with questionnaire distributed to 1,089 software companies in Serbia; 195 companies responded to the questionnaire, and this is 18% response rate. Online survey, interviews and overall analysis, provided answers on number of pre-defined research questions, two of them are topic of this paper:

- What are the main strengths of the ICT sector in Serbia that could potentially be successful at theinternational (niche) market?
- What needs to be done to further develop these strengths?

2.2. Innovation activities of CP sector in Serbia

Innovation may be broadly defined as the successful commercial introduction of a new product, service or process. According to the OECD's Oslo Manual (OECD, 2005), innovation refers to the implementation of "technologically new products and processes and significant technological improvements in products and processes". Software innovation can be seen as a process leading to: development of a novel aspect, feature or application of an existing software product or process; introduction of a new software product, service or process or an improvement in the previous generation of the software product or process; and entry to an existing market or the creation of a new market (OECD, 2009a)

Serbian CP companies are mainly doing incremental innovations for existing technologies i.e. iterative improvement of an existing solution, not entirely new, but a new way to use existing technology.
The most of companies operating in this sector do not deal with the intellectual property rights. In the case of software contracts, generally, there is no comprehensive understanding of the intellectual assets generated in software development outsourcing and the related IPR involved and the contingency factors that determine when vendors are more likely to obtain IPR from clients (Chen et al., 2017).
General explanation for this trend is that new software solutions are rapidly developing and applying, which makes difficult to protect them in the form of patents. At the same time, it prevents the competition from copying them completely. In addition, for the realization of the projects, it is not enough to have software; the basic problem is its practical application in real control centres, its integration with the existing components, its adjustment to the specific requirements of users and maintenance.

Software innovation is often driven by user need and expectations, and at times in the development process, software designers often solicit users feedback. According to the respondents' observations, **key drivers for innovation** in Serbian CP sector could be summarised into the following:

- Market needs and market opportunities simultaneously taking into account "science push" and "market pull" factors. The need for innovation comes from analysis of the existing market and potential needs and necessity to adapt to market changes.
- Client's needs and requests - Rising customer expectations regarding service and quality. Recognizing the needs that users have and solving these needs on innovative ways are the important drivers for innovation. Clients have a problemor they are looking for small changes in existing solutions, Software companies usually identify technology that can be a solution for the client's problem.
- Internal capacities within the companies and innovative ideas come from workers.Idea forinnovations happens within the company very often by fostering internal competitions for new innovative solutions.
- Increased competition. Keeping pace with key competitors on the market.
- Participation in EU projects, cooperation with international partners.
- Internal estimation of business trends and technological development, world trends, examples of good practice, legislation etc.

[1]CP is name according to statistical classification of sectors; SwE is name widely adopted among software professionals

On the other side, **key barriers for innovation** in CP sector in Serbia are:

- The lack of investments, potential investors are still not active enough on the market.
- Small market and low demand on domestic market
- Modest R&D funding in Serbia. Scientific research system is completely separated from the economy.
- Slow and expensive patenting process
- Society is conservative, especially state administration - poor organization
- Adoption rate – the market slowly sets out the requirements for new solutions
- Lack of incentives for innovation from the government funds
- Lack of capacity and high-quality personnel. Education system does not provide a sufficient number of quality personnel in the sector
- The lack of staff
- Insufficient cooperation with universities
- Risk aversion

2.3. The main strengths and weaknesses of the CP sector in Serbia for international competition

Replies on the questions within online survey have provided number of factors that are important for positioning Serbian CP companies on international market: good quality of the products and services is the most important factor for creating competitive advantage; specialized expertise; previously acquired reputation and programming skills. Although the average score of importance is not on the same level in the statistical regions in Serbia, results of One-Way Anova statistical test showed no significant difference in the sources of competitive advantage between the regions by most of the indicators (Table 2). The significant difference exists only between Belgrade and Šumadija and West Serbia in the indicator Programming Skills. In contrast to Belgrade, programming skills are not competitive advantage on the international market for companies from Šumadija and West Serbia (Kutlačaet al., 2018).

Table 2: Average score of sources of competitive advantage per regions and statistical test of differences

Sources of competitive advantage	Belgrade	Vojvodina	South and East Serbia	Šumadija and West Serbia	One-way Anowa Sig.
Ability to design software	3,81	3,11	3,25	2	0,233
Programming skills	4,19	3,44	3,25	1,5	0,016*
Competitive price of products / services	3,81	2,78	2,5	2,75	0,171
Good quality	4,25	3,67	3,25	3	0,435
Prompt (Fast) Delivery	3,75	2,67	3,25	2,75	0,270
Specialized expertise in the field	3,87	3,56	3,75	3	0,809
Diversification - expanding range of products / services	2,75	2,11	2,5	2,25	0,651
Access to foreign partners and contacts	3,38	2,22	3,5	2,5	0,254
Diversification - expanding the range of products / services	2,47	2,35	2,61	2,21	0,655
A smaller distance from the market than the key competition	1,97	1,98	2,04	1,82	0,540
Access to local clients and contacts	1,88	1,95	1,96	1,78	0,325

Sources of competitive disadvantages on international market are presented in Table 3, with lack of qualified labour and weak marketing as the most important limiting factors (Kutlača et al., 2018).

Table 3: Importance of sources of competitive disadvantages on the international market

Sources of competitive disadvantage	Average score on the scale from 1 to 5
Lack of developers and designers	2,67
Weak marketing	2,60
Limited (low) expertise in specific areas	2,30
High price	2,17
Low quality	2,03
Limited programming capabilities	1,97
Poor designer skills	1,97

2.4. Factors that make CP sector in Serbia competitive on the international market

In search for answers to the question: "*What are the main strengths of the ICT sector in Serbia that could potentially be successful at the international (niche) market?*", number of interviews were conducted with all major stakeholders relevant for CP sector in Serbia. Interviewed participants have provided information for deeper understanding of two major factors that make CP sector in Serbia competitive on the international market:

1. Education and Human Resources; and
2. Performance.

Factor "Education and Human Resources" has been stressed by all interviewed stakeholders with particular attention on the following attributes (Kutlačaet al., 2018):

- well educated researchers and ICT professionals,
- relatively good education (with a lot of room and necessity for improvement),
- relatively well-developed human resources in younger generations, as well as language knowledge,
- existence of research institutes with long tradition in R&D,
- readiness to learn,
- courage and self-confidence to appear on the international market as competitors,
- highly qualified, motivated and innovative workforce,
- good engineering skills and mind set,
- cultural similarity with Western countries,
- lower labour costs compared to western countries,

Factor "Performance" has been stressed by all interviewed stakeholders like previous one, with particular attention on the following attributes (Kutlača et al., 2018):

- exceptional and prolonged growth of Serbia's ICT sector (10-20% annual growth over a period of 10 years) makes this sector the absolute leader in Serbia's economy,
- relatively lower price of doing business in Serbia as compared to EU member states,
- relatively smaller size of our ICT companies should allow them to have easier transition into agile/collaborative mode of support to their end users,
- market potential for expansion (realistic potential of higher education sector and leading research institutions to substantially increase production of engineers in sought after areas of expertise, particularly at University of Belgrade, in a relatively short time frame),
- substantial support of Government of Serbia for this process at the highest level (both political and financial support),
- political stability and economic growth of Serbia as a country in the final phases of accession to EU,
- Belgrade's position as the de-facto centre of a wider market of around 50 million consumers with strong cultural and language ties located in countries that are already EU member states or are in some phase of the accession process
- niche markets that can grow around existing expertise:
    - gaming, entertainment and media,
    - efficient management of large infrastructure networks (big data, distributed data systems),
    - supercomputing (modelling of complex systems, visualization),
    - smart printing,
    - development of next-generation encryption technologies,
    - sector-wide integration built around data acquisition and management (particularly in agriculture, health and environmental applications),
    - robotics,
- potential for growth - Serbian ICT sector is still far from the saturation point,
- there are fewer intermediates in business cooperation,
- proximity and time zone with the whole EU,
- capability of producing the top-quality and highly innovative software solutions, as well as all necessary services, know-how, and applied research outcomes, that will follow such solutions, for a relatively lower costs, than well-developed economies.

2.5. Strategic partnership and cooperation with international partners

The level of internalization is generally high, since the vast majority of companies operating in this sector in Serbia are either branch offices of foreign companies, of domestic companies that use outsourcing business models i.e. develop solutions for foreign clients. More that half of the companies from the sample have formal contractual relationship with their partners from abroad. Joint venture and Licence agreement are the most common forms of cooperation with foreign partners (Table 4).

Table 4: Contractual form of cooperation with foreign partners

Form of cooperation	Total (%)
Joint venture	14,71%
License Agreement	14,71%
Manufacturer	11,76%
Authorized distributor	11,76%
Completely owned by a foreign partner	8,82%
A seller who provides significant technical support before selling	8,82%
Joint product development	8,82%
System partner	8,82%
Authorized reseller system	5,88%
Agreement on system integration	2,94%
Research and Development Agreement	0,00%
Agreement on joint production	0,00%

Individuals and enterprises from Serbia are still not purchasing knowledge on the global market and investing it into local economy. The opposite process is slowly becoming visible - the world is starting to identify and buy existing local knowledge and expertise. Foreign ICT companies usually establish their branches in Serbia attracted by highly qualified and well educated young personnel. Some of the most common forms of connection between Serbian and foreign companies include establishment of development centers by big well-known companies (e.g. Microsoft), acquisition of domestic company by foreign companies (e.g. DMS) etc. There are examples of fast growing companies that are influential abroad in its area of competence (e.g. Nordeus, ProSense) as well as number of companies and even individuals included in software and hardware outsourcing business. The quality of services offered is most important factor in the process of forming partnership with partners from abroad.

2.6.Framework conditions for maintaining fast growth and strong international position of CP sector

Observing two major factors that make CP sector in Serbia competitive on the international market, described in the section 2.3, interview stakeholders are asked to provide additional information concerning conditions which should be provided to companies in CP sector in order to maintain fast growth and strong international position. Collected answers could be grouped into three categories – first two representing mentioned factors, and supplemented with actions which should be launched by the government and regulatory institutions (Kutlača et al., 2018):

1. Education and Human Resources
    - significantly enlarge quotas for software engineering at public universities (particularly Faculty of Electrical Engineering - University of Belgrade, Faculty of Sciences - University of Novi Sad, Faculty of Organizational Sciences – University of Belgrade),
    - introduce more advanced university programs for cutting edge technologies (big data, AI),
    - finding solution for high school education and rising lack of teachers (e.g. petlja.org and their programming courses which are in curriculum sound like a good solution for elementary schools),
    - further investments in education system and stronger support to start-up and SME community, especially among young people,
    - organization of practical internships for students on a higher scale; developing sponsorship and recruitment programs,
    - develop a growing number of infrastructure organizations to support innovation,
    - better quality assurance,
    - the law on higher education which allows people from practice to influence changes in the curriculum,
    - more people - increase the number of students who will become IT professionals through support of formal and non-formal education,
    - work on the culture of entrepreneurship.
2. Performance
    - On business side: IT-SwE companies need to evolve from IT outsourcing to development of complete products, and expand range of services they offer to their clients – from IT development to product development with possible marketing support,
    - Reorientation from user-vendor approach to team work in agile structures,

- A “yeast-growth” process of Serbia’s ICT sector has already started, one needs to feed it adequately and consistently in the next 5-10 years by:
    - institutionalizing and strengthening existing support for ICT of top level decision makers and building similar types of support at municipality levels,
    - building on successes and continuing the overall process of increasing the ease of doing business in Serbia,
    - strengthening financial instruments available to new business, particularly to new business such as ICT with high added value for a society,
    - substantially strengthening the innovation process (venture capital, angel investors, use of EU structural funds, joint projects of foreign and domestic ICT companies with leading research institutions in Serbia, setting up of strategic public-private partnerships)
- Promotion of the start-up concept, especially among young people

3. Governance and Regulation
    - a sound and long-life strategy of the Republic of Serbia, how to further motivate development of ICT sector in Serbia:
        - not to have just the lowest paid programmers here, working in outsourcing companies, but to really support development of a competitive R&D sector in ICT
        - smart specialisation strategy should span all government sectors, including all education levels, economy environment and constraints, industry, etc,
        - create a society of the digital economy
    - improvement of the regulatory framework, removing blocks from the legislative point of view.

3. CONCLUSION AND RECOMMENDATIONS

Presented analysis of the key issues relating to international competitiveness of CP sector in Serbia could lead to conclusion as answer on the first question *“What are the main strengths of the ICT sector in Serbia that could potentially be successful at an international (niche) market?*”. It is important who is doing (*Human resources*) and how they doing this job (*Performance*). Therefore, answers on the second question “*What needs to be done to further develop these strengths?*” should be read as recommendations what should be done in the area of education and employment (considering *Human resources*), as well as in the area of business organisation (considering *Performance*).

The general conclusion is that Serbia is a very attractive partner on the international market in the CP sector. The key factors of the international competitiveness of Serbian CP sector could be summarized as follows: cost-effectiveness, great quality, high reliability, rapid delivery and state-of-the-art technologies in software development.

In addition, there are actions, measures and interventions which should be initiated, launched and maintained by the government and regulatory institutions under the common denominator: *Digitalisation of the economy and society of Serbia*. Although this process is in decades long delay, understanding that digitalisation is precondition for development of country is starting point and concluding finding for entire case study and this paper as well. Transformation capability of this sector on the Serbian economy has been the focus of attention in recent years. However, much of it depends on how this sector, especially the exports enables itself to innovate and face competition in highly dynamic society.

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INNOVATION ACTIVITY IN SERBIAN ENTERPRISES

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Abstract: *The purpose of this paper is to identify patterns of innovation activity in Serbian enterprises in terms of their innovation expenditure, innovation turnover and typology of innovation.The data provided in this research are collected through the Community Innovation Survey (CIS) conducted by the Statistical Office of the Republic of Serbia. Innovative activity of Serbian enterprises is presented in a comparative perspective for periods 2012-2014 and 2014-2016. The most important findings are related to the relatively stable share of total innovative companies; increase of product and process innovation and decrease of marketing and organizational innovation; and unfavorable structure of innovation expenditure and innovation turnover. Research results could be considered as a starting point for further investigation and decision making.*

Keywords*: Innovation activity, innovation survey, enterprise, Serbia.*

1. INTRODUCTION

Concept of innovation has received a tremendous attention in the last few decades. The ability to introduce new technologies or processes is considered as the essential element of (re)industrialisation of modern economies.

Terms innovation and innovativeness are used in theory and practice to explain novelties on the level of organisation, sector or economy which improve their performances. The word itself has Latin origin; it comes from the word "*innovare*" which means "making something new". Majority of authors consider innovation as a process of turningopportunity into new ideas and of putting these into widely used practice (Tidd, Bessant & Pavitt, 2005).

Schumpeter is considered as a "founding father" of innovation theory. In the first half of the twentieth century he emphasized that innovation is the driving force of economic development through a dynamic process in which new technologies replace the old ones, and this process is called "creative destruction".

According to Schumpeter, the process of technological change has three phases. The first stage is the invention process, encompassing the generation of new ideas. Invention is forming a new thought having a potential to apply in economy. The second stage is the innovation process which includes development of new ideas into marketable products and processes. Innovation is the first commercial application stage of invention. Developing innovations is determined by the technological and economic conditions of the concrete firm. The third stage is the diffusion stage, in which the new products and processes spread across the potential market (Kaya, 2015).

The most famous definition of innovation is developed by the Organisation for economic cooperation and development (OECD) in Oslo Manual: "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organization or external relations" (OECD, 2005, p. 46). This implies that there are several types of innovation: product innovations, processinnovations, marketing innovations and organizational innovations. Therefore, besides technological innovations, there are non-technological innovations which are not result of R&D, but still can be important for performances of business entities.

Innovation are usually assessed as complex activities, or as a "process through which the nation creates and transforms new knowledge and technologies into useful products, services and processes for national and global markets – leading to both value creation for stakeholders and higher standards of living" (Milbergs & Vonortas, 2004, p. 2). Therefore, innovation includes more activities than pure technology creation. It covers various resources related to product distribution or offering services.

Innovation comprises a number of activities that are not included in R&D, such as later phases of development for preproduction, production and distribution, development activities with a lesser degree of novelty, support activities such as training and market preparation, and development and implementation

activities for innovations such as new marketing methods or new organisational methods which are not product and process innovations. Innovation activities may also include acquisition of external knowledge orcapital goods that is not part of R&D (OECD, 2005).

It is useful to make distinction between terms “research and development” and “innovation” on one side and “technology” and “innovation” on another. R&D is a process of searching for new knowledge or new applications. It includes investments which might be successful or not. On the other hand, innovation means introducing new or improvement of existing products, services or processes. They can be the result of R&D, but not necessarily - can arise as a result of the intellectual process of an individual. Hence, innovation does not necessarily involve the investment of specific financial resources.

In contrast to innovations that represent the introduction of new methods, ideas, products or services, technology is a set of methods and techniques used in the production of goods and services. It usually relates to the development of technique and equipment based on the possessed knowledge. Therefore, innovations involve more activities than the creation of technology. They include a range of resources and activities related to placing products and services on the market.

2. INNOVATION AND ECONOMIC GROWTH

One of the most stable findings in macroeconomics is that innovations are an engine of economic growth. Innovations result in new technologies, products and services which boost productivity, create new market opportunities and improve standard of living.

The neoclassical growth model, also known as the “Solow-Swan” model, was probably the first modern model of economic growth to explicitly recognize the role of technology as a central driver of economic growth (Feige, 2015). Solow’s starting point was production function and main conclusion that the basic growth factors are: labour increase (population growth), capital increase (savings and investment) and improvements in technology. In his model, technology is produced exogenously and it is crucial for sustainable economic growth.

The assumption of neoclassical growth models that technology is created outside the model was criticized starting form 1970s since it was not in line with the fact that innovation activities are very much determined by the decisions of companies and individuals. One of the endogenous growth theories is Romer’s model which addresses technological spill overs (inwhich one firm or industry’s productivity gains lead to productivity gains in other firms or industries) that may be present in the process of industrialization (Todaro & Smith, 2012).

Different approaches have been used for exploring the relationship between technological change and economic growth starting from the historical perspective of Abramovitz (1986) to the neoclassical framework of Keller (2004), from the industrialization-focussed theory by Lall (1992) to the Evolutionary and Neo-Schumpeterian theories by Freeman and Louça (2001), Perez (2002)and Nelson (2006). The general consensus of these approaches is that the source of the development process is productivity growth which emerges as a result of technological progress (Bogliacino, Perani, Pianta, & Supino, 2009).

Relationship between innovation and economic growth can be investigated through a production function in which economic growth is result of growth in increase in labour and capital inputs, as well as increase in multifactor productivity (MFP). In such framework, contribution of innovation to growth can be found in three processes (Figure 1):

- a contribution resulting from technological progress embodied in physical capital; for example, investment in more advanced machinery or in new computers.
- a contribution resulting from investment in intangible capital, or knowledge-based capital, such as R&D, software, design, data, firm-specific skills or organisational capital.
- a contribution linked to increased MFP growth, reflecting increased efficiency in the use of labour and capital, a substantial part of which can be attributed to innovation, including social and organisational innovations as well as the spill over effects of investments in technology or knowledge-based capital, including at the global level (OECD, 2015).

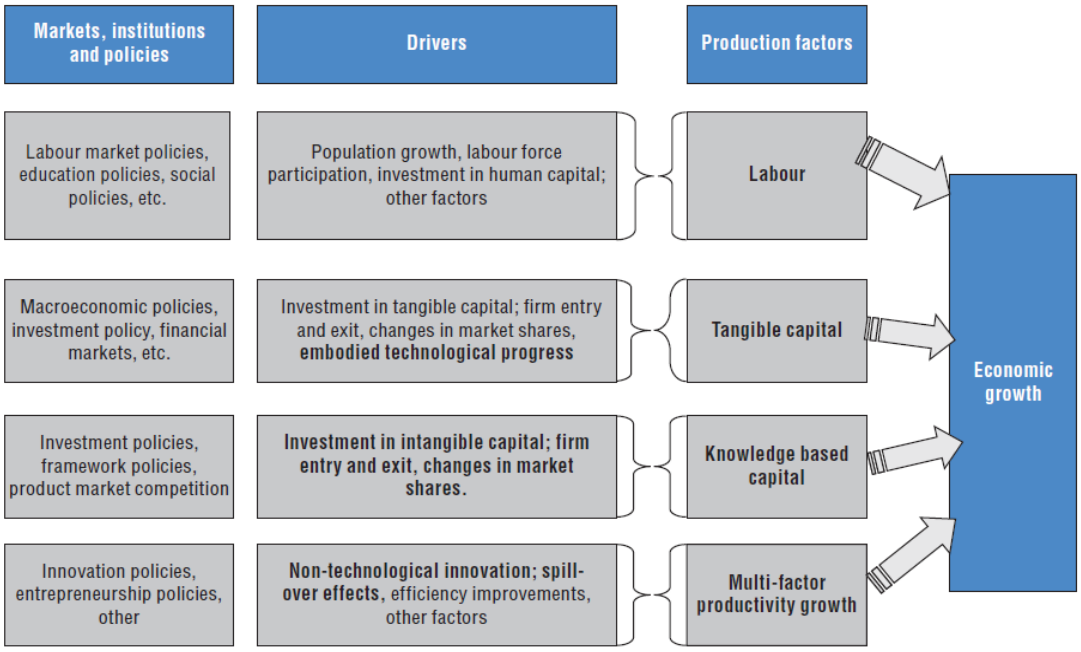

Figure 1: A simplified framework to analyse economic growth

Source: OECD (2015).The Innovation Imperative: Contributing to Productivity, Growth and Well-Being,OECD Publishing, Paris.DOI: http://dx.doi.org/10.1787/9789264239814-en, p. 18.

The innovative performance of a firm or a national economy very much depends on the overall framework in which innovative process is being conducted, i.e. on relationships and cooperation between different actors in a society. These actors are from business sector, academic institutions and government sector. The complex linkages between these sectors can be in forms of joint projects, staff exchange, cross patenting, co-publishing and may other. The network of these institutions and relationship between them is defined in literature as a national innovation system (NIS).

National innovation system in Serbia has many disadvantages. On a strategic level, Serbian NIS lacks the following: vision of technological development, national development priorities, relevant innovation policy and strategy, evaluation of programs, projects and organisations. There are also limitations of the Law on innovation activity which hamper innovation activity of the firms (Kutlača & Semenčenko, 2015).

There are significant differences between innovative activity in developed and developing countries. Bogliacino, et al. (2009) have summarized several stylized facts on innovation in developing countries:

- developing countries have distinct patterns of innovation from countries at the technology frontier,
- innovation needs both resources and integration of national systems,
- innovation is pushed by industrialisation and pulled by growth of markets,
- large firms are more likely to engage in innovation or spend for it,
- being exposed to international competition spurs innovation,
- in multinational corporations there is more innovation,
- the main obstacle to innovation is its economic cost and the lack of finance,
- the evidence of effects of innovation on productivity is weak.

These “stylized facts” explain the main difficulties in innovation activities in developing countries but also highlight the areas in which innovation policy could make improvements.

3. MEASURING INNOVATION ACTIVITY

Measuring technological change and innovation is important in term of calculating its effects on economic growth. The need for better understanding processes related to innovation activities and technology are also relevant for planning, implementation and evaluation of policies and programmes in this field. For example, decision makers should have information on the results in this area in order to make decision on the resources which will be invested in certain fields of science and technology.

Organisation for economic cooperation and development has developed a set of manuals which enabled international standardisation of methodology for measuring innovation activity on micro and macro level. Relevant publications are presented in Table 1.

Table 1: Standards for measuring scientific and technological activities

Scope	Publication title
Research and development	Frascati Manual: Proposed Standard Practice for Surveys of Research and Experimental Development, OECD, 2002. R&D Statistics and Output Measurement in the Higher Education Sector. "Frascati Manual Supplement", OECD, 1989.
Innovation	Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, OECD, 2005.
Patents	Using Patent Data as Science and Technology Indicators –Patent Manual, OECD, 1994
Human resources in R&D	The Measurement of Human Resources Devoted to Science and Technology – Canberra Manual, OECD, 1995.
Technology balance of payments	"Proposed Standard Method of Compiling and Interpreting of Technology Balance of Payments Data –TBP Manual", OECD, 1990.
Classification of industry per technological level	"Revision of the High-Technology Sector and Product Classification", OECD Science, Technology and Industry Working Papers, 1997/02.
Globalisation	OECD EconomicGlobalisation Indicators, 2010.
Bibliometrics	"Bibliometric Indicators and Analysis of Research Systems: Methods and Examples", OECD Science, Technology and Industry Working Papers, 1997/01.

Source: Authors.

The purpose of innovation metrics is to explain complex processes in modern economy based on knowledge and new technologies. The ways for measuring technological change and innovation process can be classified in three broad groups: innovation surveys, individual innovation and technological indicators and composite indicators.

Innovation surveys are a new source of information on technical change. It was realised some time ago that R&D do not tell the whole story about technical change as innovation is essentially an interactive process which involves a variety of types and sources of knowledge (Radošević, 1999). The most famous survey for measuring innovation is "Community Innovation Survey" (CIS) which represents the main statistical instrument for assessing innovation in the European Union (EU). CIS survey collects data on innovation activity in enterprises, i.e. on product, process, marketing and organizational innovation. The survey collects data on innovativeness per types of companies, types of innovation, innovation expenditures, cooperation in innovation activity, limiting factors, etc. Community innovation survey is launched every two years in all EU member states and countries members of European statistical system (Including Serbia).

Community innovation survey is a very broad research which includes various data sources: 1) internal (within the firm or within the enterprise group), 2) market (suppliers, clients, competitors, consultants and commercial labs, 3) education and research institutions (universities and other higher education institutions, government, public and private research institutes) 4) other sources (conferences, fairs, exhibitions, scientific journals and technical publications, professional and industrial associations) (Biagi,Pesole&Stancik,2016).

Community innovation survey in Serbia is conducted by the national Statistical Office since 2006 under the title „Research on innovation activity of business entities in Serbia". Companies which participate in this research have the legal obligation to provide accurate, complete and updated data, with the content and form corresponding to the demand of the official statistics. Also, there are penalties for the respondent if they fail to timely provide the requested data of if they supply incorrect data (Official statistics law,2009).

Interpretation of innovation surveys results should always take into account limitations of innovation statistics. For example, within the CIS the most used indicator is the average ratio of innovative companies. However, this indicator does not completely explain the scope of innovative activities of the company. If some company introduced only one new product it is counted equal with another firm introduced more innovations. Also, this survey collects only little information on the impact of innovation. It would be important to know how information affects productivity and profit of the companies (Szunyogh, 2009).

The connection between science, technology and innovation is reflected, among other things, through the existence of science, technology and innovation indicators. Individual innovation and technology indicators

are generally grouped into two broad categories: inputs and outputs. Inputs include indicators such as expenditures on R&D, human resources, while outputs include results such as publications, patents or innovations.

In addition to the basic division of scientific and technological indicators into inputs and outputs, there are also further classifications. One of them is division into inputs, outputs, results, and impact (Danish Agency for Science, Technology and Innovation, 2014).Inputs represent investments in an innovation process such as human and financial resources engaged in R&D. Outputs include activities that arise from the aggregation of inputs and other resources. Examples of output are scientific publications and international co-publications. Results are the consequences of research and innovation activities such as patents and citations. Impact indicators measure the economic and non-economic effects that research and innovation creates for the society as a whole. Examples of impact indicators are improving the quality of life and life expectancy, increasing total factor productivity and return on investment in R&D.

Individual indicators of scientific and technological development are used to a large extent for the creation of composite indicators that allow perception of the country's position in terms of the technological and innovative level achieved. There are a number of international initiatives to create aggregate indicators in this area. Some of them are: Summary Innovation Index, Knowledge Economy Index, Global Innovation Index, Global Competitiveness Index.

4. INNOVATIVE ACTIVITIES

Research of the Statistical Office of the Republic of Serbia on the innovation activity is carried out on the basis of a representative sample. The sample covers around 3500 small, medium and large enterprises. The obtained results are weighted and calculated at the level of the population of business entities.

4.1. Structure of innovation expenditures and innovation turnover

Survey on innovation activities of enterprises in Serbia covers innovation expenditure which are grouped in several categories: in-house R&D (current and capital expenditures for R&D only); external R&D; acquisition of machinery, equipment, software & buildings (R&D expenditures excluded); adoption of external knowledge from other business entities or organizations focused on innovation (know-how, patents, licenses); other innovative activities (design, training, marketing and all other expenditures).

The majority of innovation expenditures in Serbian enterprises are related to the acquisition of machinery, equipment, software and buildings in both observed periods (Table 2). Furthermore, the percentage of this type of innovation expenditures increased from 64,3% in the first observed period to 71,4% in the second observed period. This implies that Serbian companies are focused on purchase of already developed machinery and not on technology transfer processes which is in line with general trends in developing countries identified in literature.

Table 2: Structure of innovation expenditures

	Structure of innovation expenditures	
	2012-2014	**2014-2016**
Acquisition of machinery, equipment, software & buildings	64,30%	71,40%
In-house R&D	12,30%	18,90%
Other	11,30%	6,30%
External R&D	2,60%	1,80%
Acquisition of existing knowledge from other enterprises or organisations	9,50%	1,70%

Source: Statistical Office of the Republic of Serbia (2015). Indicators of Innovative Activities in the Republic of Serbia, 2012-2014, Release number 276;Statistical Office of the Republic of Serbia (2017). Indicators of Innovative Activities of the republic of Serbia, 2014-2016, Release number 197.

Consequently, only 12,3% (in period 2012-2014) and 18,9% (in period 2014-2016) of innovation expenditures are related to in-house R&D. External R&D has decreased in the second observed period and

in 2014-2016 it included only 1,8% of total innovation expenditures. This indicates a very low cooperation between business and research sector, which has been explored in various reports and studies.

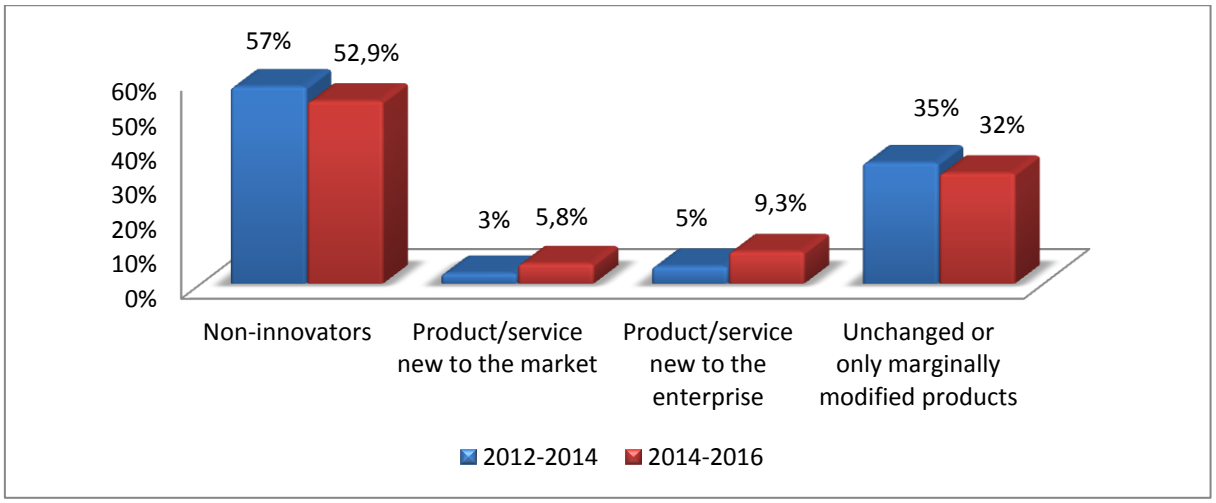

Figure 2: Structure of innovation turnover in Serbian enterprises

The data on the structure of innovation turnover show that the share of turnover from sales of unchanged or marginally modified products is dominant in both observed periods (Figure 2). However, it is visible that the share of turnover generated from product/service new to the market and new to the enterprise has improved in period 2014-2016. Namely, it has increased from 8,8% to 14,3%. Therefore, there is a slight improvement in the structure of innovation turnover in the second period, but these figures are still on a low level.

4.2. Types of innovations

The percentage of companies that have introduced new or significantly improved products in period 2012-2014 was 20,4%, while in period 2014-2016 it was 26,9% (Figure 3). Percentage of product and process innovation show increase between the two periods, while organisational and marketing innovation show decrease. The percentage of product and process innovation seems fairly highand can be partially explained as bias towards innovative firms which are more likely to respond to the survey.

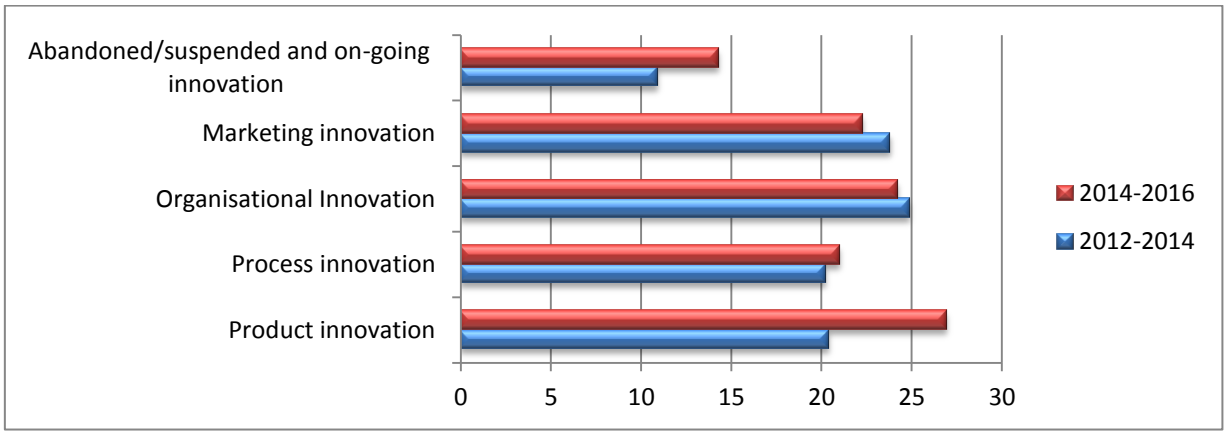

Figure 3: Types of innovation (in %)

In total, in period 2014-2016 around 41,2% of Serbian companies have introduced some type of innovation, while in the previous observed period this was 40,5%. Manufacturing enterprises were more innovative than services companies in both observed periods (Figure 4).

Relationship between the firm size and innovative activities is positive, i.e. large firms are more innovative. Percentage of innovative small companies is around 38% in both periods, while around 68% of large firms are innovative. This result is in accordance with many empirical studies which explore relationship between firm size and innovation activity.

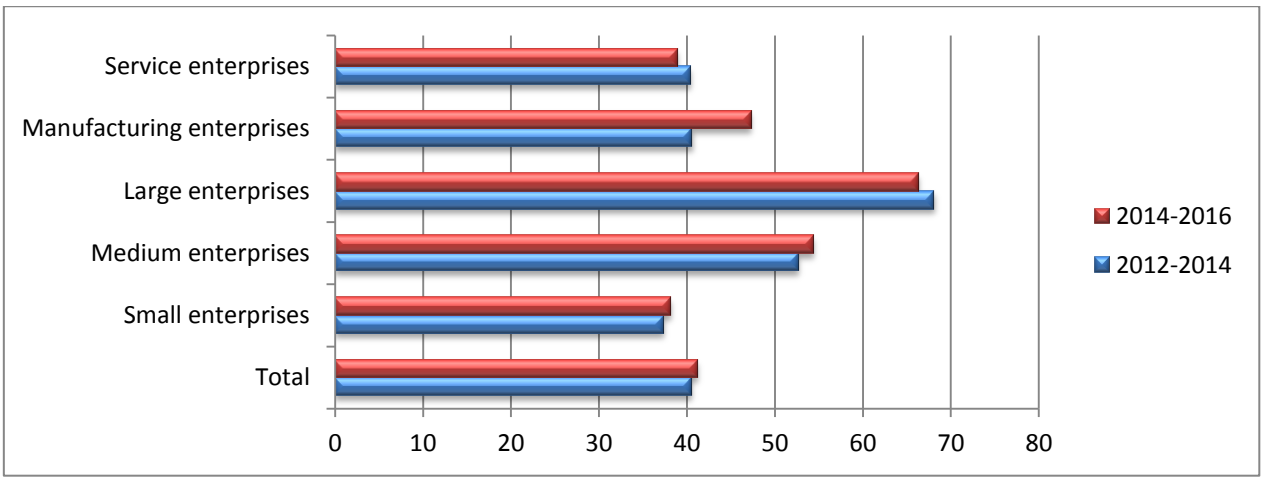

Figure 4: Structure of innovation per company size and type

When observed per NACE sections, in almost all economic activities there was an increase in the share of technological innovation (product and process innovation). The highest percentages of technological innovators are in the following economic activities: Administrative and support service activities; Professional, scientific and technical activities; Manufacturing and Electricity, gas, steam and air conditioning supply (Table 3).

Table 3: Share of product and process innovators by NACE sections

	Share of product and process innovators	
	2012-2014	**2014-2016**
Agriculture, forestry and fishing	18,7	32,2
Mining and quarrying	12,3	18,6
Manufacturing	34,2	**40,7**
Electricity, gas, steam and air conditioning supply	36,7	**40,3**
Water supply; sewerage, waste management and remediation activities	22,3	24,2
Construction	23,1	31,7
Wholesale and retail trade; repair of motor vehicles and motorcycles	23,4	21,5
Transportation and storage	23,3	25,2
Accommodation and food service activities	34,8	26,9
Information and communication	30,5	32,1
Financial and insurance activities	25,4	25,4
Real estate activities	9,6	5,1
Professional, scientific and technical activities	30,4	**41**
Administrative and support service activities	29,7	**43,8**

Source: Statistical Office of the Republic of Serbia (2015). Indicators of Innovative Activities in the Republic of Serbia, 2012-2014, Release number 276;Statistical Office of the Republic of Serbia (2017). Indicators of Innovative Activities of the republic of Serbia, 2014-2016, Release number 197.

5. CONCLUSION

There are theoretical and practical proofs that innovation boosts productivity, leads to higher economic growth and improves well-being of nations. The core of innovation policy agenda includes exploring various measures for assessing innovation activity on different level of economic system.

This paper elaborates only part of the results of two last Community Innovation Surveys in Serbia.Although there are various limitations of innovation surveys as a method of collecting data, the results of this research can serve as a good starting point for decision makers and creators of economic and innovation policies.

In general terms, innovation activity in period 2014-2016 is more favourable than in the previous observed period (2012-2014). However, the structure of innovation expenditure in both periods indicates: 1) strong focus on purchase of already developed machinery and not on technology transfer processesand 2) low cooperation between companies and research institutions in Serbia. The share of turnover from sales of unchanged or marginally modified products is dominant in both observed periods. Positive trend is increase of the share of turnover generated from product/service new to the market and new to the enterprise has increased for 5,5% in period 2014-2016 in comparison with the period 2012-2104.

In both observed periods, percentage of companies that have introduced some type of innovation was around 40%. Manufacturing companies are more innovative than companies from the service sector. Also, the percentage of innovative enterprises increases with firm size.Share of product and process innovation recorded increase between the two periods, while organisational and marketing innovation have decreased.

Acknowledgment

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THE IMPORTANCE OF USING DIGITAL COMMUNICATIONS WITHIN CREATIVE INDUSTRY

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Abstract: *Creative industries are winning industry and there is no question about whether they should be developed. For many cities in the world, creative industries were a new discovery and the best solution for revitalization and achieving greater recognition. Creative industries include a wider range of activities involving cultural industries, based on knowledge and skills, the capacity to convert knowledge into new competitions and ideas that affect innovation and application of knowledge. Thus they are defined as industries whose origin is based on individual creativity, skills and talent, and have the potential to create profits and new jobs. The purpose of the paper is to provide a better understanding of the importance of using digital communications within the CI. Empirical work was related to the analysis of the data of surveyed entrepreneurs on the use of digital communications corrosive use of social networks on the example of the city of Trebinje.*

Keywords*: creative industries, development frameworks, digital communications, social networks, enterprises*

1. INTRODUCTION

The creative industries in the last ten years have become a popular direction for the local development of cities. Many cities use them as a tool to stimulate economic development and to achieve greater visibility in a wider environment. Creativity is the driving force of the global economy. Countries that are able to develop and support an environment where the creative talents of the population are encouraged and successful are countries with high economic and social development. Creative sectors create large amounts of added value and support and enhance other sectors within the economy, such as production, tourism, and others, while at the same time forming a vibrant and innovative environment in the sectors where they are developed.

On a global scale, the creative industries sector faces a constantly changing characterized by the speed of the development and deployment of digital information systems and Information Communications Technologies. As the result of digital disruption, it has had significant impact on the whole value chain of the sector: consumption of cultural goods and services, discovery and distribution, creation and production. For sustainability of IC sector, enterprises must evolve business and operational models and practices. It involves new products, operational practices, and business models. Creative organizations have struggled to maximize the opportunities of digital technologies because of a piecemeal approach to their operational integration. Because of fragmented funding and investment landscape, this situation developed over the long-term. “Creative organizations also suffer reticent reaction to digital technologies’ importance and impact, especially on (Rudman et al., 2015):

- audience behaviors (e.g. altering perceptions of proximity and intimacy);
- artistic practices (e.g. on conventions and practices which are socially embedded rituals of experience);
- business models and practices (e.g. ownership, IP and contracts, new digital production methods, and digital distribution channels and consumption mechanisms).”

2. SOCIAL AND ECONOMIC IMPORTANCE OF CREATIVE INDUSTRY

Governments throughout the world are increasingly recognizing the importance of creative industries as a generator of employment and economic development. In addition to this, researchers have also contributed to the impact of creative industries on economic development in which creative industries, in addition to being the generator of economic growth and employment, have the potential to become the primary factor for the development of the entire economy, but also that some of its branches (architecture, design and etc.) can provide a secondary expansion of economic activities. Creative industries generate a series of overflowing effects on the rest of the economy in terms of increasing competitive advantage, improving innovation and improving social well-being (Kisić, 2011). Creative industries are mostly the privilege of the developed countries, because they require a high degree of innovation, expertise and used of the latest technologies.

With the global power of a particular state, the potential for their distribution and development is growing. They demand very innovative approaches when it comes to politics and legal incentives, because they exceed the competencies of only one of the policies, cultural, economic, urban, etc. At the local level, the sector of creative industries is mostly dependent on entrepreneurs in culture.

At a time when sophisticated technologies replace human beings, creative industries affirm human capital. The economic need for creativity has registered itself in the rise of new class, which is called the Creative Class….all mebers of Creatice Class – whether they are artists or engineers, musicians or computer scientists, writers or entrepreneurs – share a common ethos that values creativity, individuality, difference, and merit (Florida, 2012). Creativity is the ability to solve problems and create new knowledge. This is in fact the experience of thinking, reacting, and acting in a way characterized by a high level of innovation, originality and risk. Basically, creativity refers to creating new ideas or combining old ideas in a unique way and it is a prerequisite for innovation (Jovičić & Mikić, 2006). It is a natural resource with which all countries are equally endowed. However, not all countries are equally creative and successful in creating and applying knowledge. As an immanent human resource, creativity is evenly distributed in all countries, but this is not the case with knowledge. It is concentrated in only a few highly developed countries. Modern knowledge is very complex and for their development specific conditions are needed - primarily specialized personnel, then high technology and financing - which many countries cannot afford. Therefore, in the global economy, poor countries export creativity or educated human resources, while in developed countries knowledge becomes a value on the market. Finally, the underdeveloped countries are importing products and services of developed countries. As creativity lies in the essence of creative industries, which is by nature characteristic of a non-material (spiritual, intellectual) nature, then it is quite logical to conclude that within the creative industries, the largest part is the production of products and the provision of services related to intangible goods that are protected by copyright and related rights . This is because the notion of creativity, integrating human creation, spiritual content, determining form and originality, creates a common essential thread between creative industries and intellectual property rights.

On the macroeconomic plan, the direct impact of creative industries can be seen through the direct and indirect economic effects that cultural industries have on the development of the economy at the local, regional and national levels. “In the context of indirect economic effects, it is possible to speak about the impact they have on (Jovičić and Mikić, 2006):

- the development of the image of space and cities that is crucial for attracting investment and concentration of business activities;
- strengthening of identity in local, regional and national frameworks;
- strengthening of social capital;
- improvement of human development strategy;
- regeneration of deprived urban and rural environments;
- promoting social integration;
- improving the competitiveness of the region;
- adding creative and innovative elements to the concepts of urban development;
- strengthening endogenous regional potentials”.

Prerequisites for exporting creative products to the EU market are: copyrights, intellectual property, tracking world trends and using the Internet. Marketing innovations, generally observed, become an increasingly important determinant of sustainable competitive advantage, but particularly important over the last few years, are getting innovations in the field of internet marketing (Ilić & Marković, 2014).

3. INTERNATIONAL AND NATIONAL FRAMEWORKS FOR THE DEVELOPMENT OF CREATIVE INDUSTRIES

The international frameworks for the development of creative industries comprise numerous interconnected strategic documents, among which the Essen Declaration, the UNESCO Universal Declaration on Cultural Diversity, the UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions, the European Parliament Resolution on Cultural Industries and the Opinion of the European Committee on Economic and Social Issues on European Creative Industries (Convention on the protection and promotion of the diversity of cultural expressions, 2005). In addition to these documents, development frameworks are created by global and European organizations such as the Council of Europe, the European Investment Bank, the World Intellectual Property Organization (WIPO), the United Nations Conference on Trade and Development (UNCTD) and others (United Nations Conference on Trade and Development UNCTD, 2004).
The UNESCO Symposium on Culture Industries Development was held in Warsaw a year after the international congress of experts from the European Cultural Industry - a comparison of development concepts that resulted in practically the first European document on cultural industries - the Essen

Declaration (Universal Declaration on Cultural Diversity, UNESCO, 2001). It has been reiterated that the support and protection of artistic creativity is important for the cultural industries in Europe and the need for creating sustainable markets for cultural goods is emphasized. It is also necessary to develop regional cooperation, create structures for mutual support of neighboring countries, finance research and enable exchange of information on cultural and media policies and industries.

Advocating systemic approach to cultural policy as well as the importance of its implementation in Bosnia and Herzegovina started in 2002 by the project of the Council of Europe and an evaluation report on cultural policy in Bosnia and Herzegovina by Charles Landry (Landry, 2002). Then in June 2006, on the initiative of the Commission of the Council of Ministers to create a cultural strategy of Bosnia and Herzegovina, the cultural sector for the first time included in the revised Medium Term Development Strategy 2004-2007, which is only created the possibility that the cultural policy is considered as one of strategic policy development sociality which is adopted in 2008, with presented strategic goals, measures and conditions for implementation of the strategic framework for the development of the cultural sector in Bosnia and Herzegovina (Vijeće ministara BiH – Ministarstvo civilnih poslova, 2008). From the perspective of operational discourse, cultural policy of Bosnia and Herzegovina is based on the principles of cross-sectoral integration, in order to ensure effective links with other sectors and other components of the development process.

In Bosnia and Herzegovina:
The Federal Ministry of Culture and Sports performs tasks within the Federation's jurisdiction relating to different cultural domains (cultural heritage, museums, archives, libraries, publishing, performing arts, filmmaking, civil initiatives in the field of culture, etc.) and sport. The Ministry is divided into three sectors: cultural and historical heritage and culture (including the Institute for the Protection of Monuments), sport and youth center, while in other sectors legal and administrative and financial affairs are carried out. Support to programs through competitions is another activity that is being implemented by this Ministry (Mikić, 2012). *The Ministry of Education and Culture of Republika Srpska* is responsible for the implementation of cultural and educational policies in the Republic of Srpska. The Ministry is responsible for the protection and use of cultural heritage, museum, archive, library, publishing, theater, music, visual, film and estuarial activities, preparation of programs and agreements on cultural cooperation at the level of Republika Srpska, keeping a register of public media and performing other tasks importance for the development of culture in the territory of Republika Srpska. Within the Ministry are the Republic Institute for the Protection of Cultural, Historical and Natural Heritage and the Archives of the Republic of Srpska, and is also responsible for another eight institutions of importance for the development of culture on the territory of the Republic of Srpska (National and University Library of Republika Srpska, Museum of Republika Srpska, Museum Contemporary Art of Republika Srpska, National Theater of Republic of Srpska, Children's Theater of Republika Srpska, Public Film Company of Republika Srpska "Srna Film", Public institution "Književna zadruga").

No administrative authority recognizes the creative industry as its competence, nor does it have departments, functions, etc. in that sense which systematically deals with the issues of their development. Similarly, as in countries in the region (eg Croatia, Montenegro, Macedonia), no state authority, as the subject of its competences, does not have cultural or creative industries, and even less implementation of strategic projects for the development of these activities. The traditional structures of state government, which access creative industries through the sectoral or branch principle, are still dominant, that is, through recognizing certain branches such as publishing, film production and production.

4. ANALYSIS OF THE USE OF DIGITAL COMMUNICATIONS THROUGH THE USE OF SOCIAL NETWORKS IN THE FRAMEWORK OF CREATIVE INDUSTRIES ON THE EXAMPLE OF CITY OF TREBINJE

The empirical research was done on the example of the city of Trebinje and it was aimed at checking how many entrepreneurs from the creative sector use digital communications through the use of social networks. Paper (Ilić and Marković, 2014) has served as an inspiration to explore this issue, because in their research they showed that the growth of the share of internet social networks in total communication with consumers corresponds to the advantages that this form of communication leaves out in relation to other forms of communication. The authors of this paper conducted an empirical research on the use of new forms of internet marketing, and in particular marketing through social internet networks. Within this research, 27 companies were involved (approximately 30% from the creative sector). The survey was conducted through a questionnaire in September-October 2017. The survey was conducted through a questionnaire and involved 27 respondents (approximately 30% from the creative sector) in September-October 2017. The structure of the various social networks used by the companies in Trebinje as well as the results of the research conducted by the authors are shown through the following tables and diagrams, the importance of

using social networks is analyzed. In the diagram below (Figure 1), the percentage of companies that use social networks in business and those who do not use them.

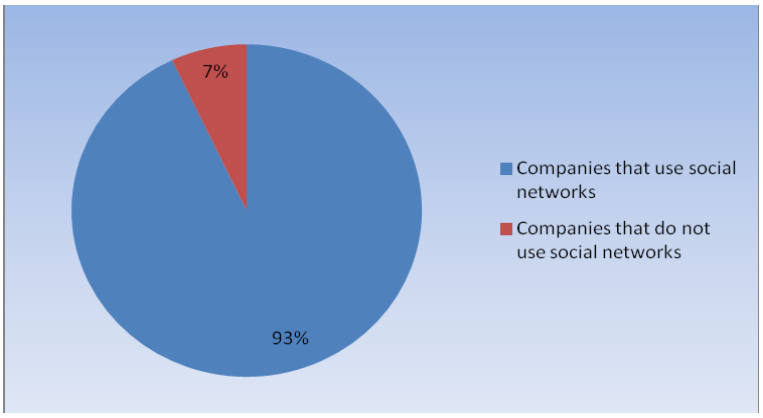

Figure 1: The percentage ratio of enterprises to the use of social networks in their business

Further analyzes include only those companies that use social networks in their business. In the following table (Table 1), the social networks that companies use the most in their business are shown.

Table 1: Social networks that businesses use the most

Most used social network	**Number of companies that used social network**
Facebook	25
Twitter	1
LinkedIn	0
YouTube	12
Instagram	14

The previous table shows that businesses use Facebook the most. Even all respondents use this social network. Next comes Instagram with 14 users, YouTube with 12 and others. The time period of using social networks among the surveyed companies is shown in the table below (Table 2).

Table 2: Time period of using social networks

Most used social network	**Number of companies that used social network**
Less than 6 months	-
6-12 months	-
1-2 years	7
2-3 years	8
More than 3 years	15

The percentage ratio of the use of social networks indicates that 40% of companies use social networks for more than 3 years, 40% of them from 2-3 years, and 28% of social network uses in the period of 1-2 years.

From (Figure 2) it can be seen that a large percentage (40%) of companies find that the use of social networks positively influences their business and a competitive advantage; a smaller percentage of them (20%) think that their business do not have changed significantly due to the use of social networks, or social networks have little impact on the competitive advantage of the company, while 40% of respondents did not give the answer.

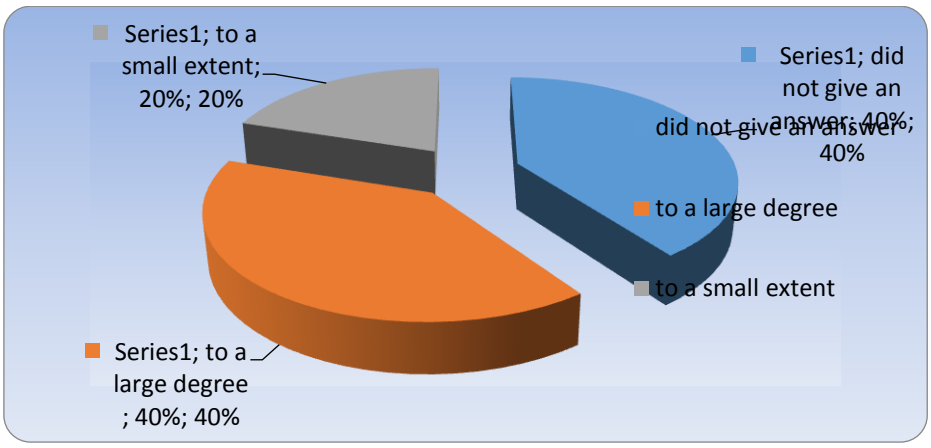

Figure 2: The influence of the social network on a competitive advantage

In the following diagram (Figure 3), the company answers the question about the effects of the use of social networks.

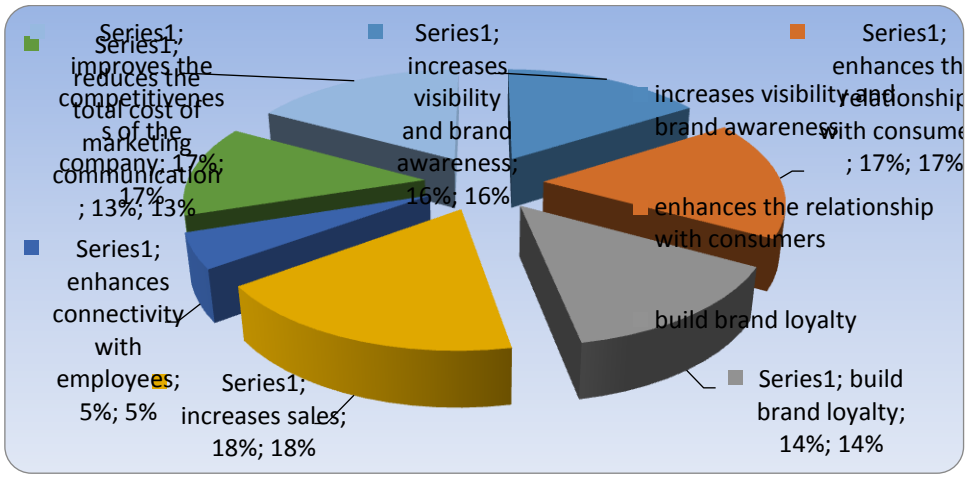

Figure 3: Effects of using social networks

The majority of companies consider that social networks have an effect on sales increase (18%), then improving the company's competitiveness (17%) and that social networks improve customer relationships (17%). 16% of companies consider that social networks increase visibility and brand awareness, build brand loyalty (14%) and reduce marketing communications costs (13%).

4. CONCLUSION

Creative industries are important for the development of modern economic flows and therefore open up opportunities for developing new forms of consumption and distribution; offer opportunities for employment (with non-standard forms and high flexibility of work) and widening and expansion of the market. Also, the creative industries are characterized by a high degree of propensity to innovate in business ventures and new projects that stimulate economic development. The fact is that cities are centers of culture and industrial growth, but in recent years we are surprised and motivated by new facts about the importance of creative industries for the city economy, employment and cultural diversity. Priority is given to those cultural professions that make profits and participate significantly in the development of the city economy (attracting experts, investments, infrastructure, tourism, etc.). It is necessary to systematically manage a cultural policy that is part of the general developmental city policy. Through this paper, the importance of using digital communications within the creative industries is highlighted. Participation in social networks enables companies to obtain reliable information about products and services, as well as to initiate two-way communication with the customer in order to create a strong link and buyer's trust in the brand. In order to achieve this, it is important to regularly update the latest news about events and new products, customer support areas, organize promotions as well as use social networks as a channel for finding new customers as well as employees. The aim of this part of the research was to examine the attitudes of domestic enterprises towards the use of social networks, as well as the impact of the same on the business of

companies. The conducted research included 27 companies of different sizes, levels of business (local, national, regional, international level), length of business and activities (service, production and service and production). In a survey conducted for the purpose of preparing this paper, in 2017 it was found that 93% of companies in Trebinje use social networks in business. The majority of companies use Facebook, because it is a network that has the largest number of users. Also, if companies use multiple social networks, this network is the most common and dominant in their business.

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THE EFFECTS OF BUSINESS CASE STUDY COMPETITIONS AS A TEACHING METHOD

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Abstract: *Case study competitions have been widely accepted and used as an efficient educational tool in business education in last few decades. They are based on an outstanding experiential learning process and provide a grounded, reasonable and desirable learning for business students. Even though case competitions might not be a novel research topic, global international case study competitions have hitherto been out of the research radars. The aim of this study is to examine the effects of mentoring on the development of practical knowledge and skills, and leadership potential of case competitors. The results indicate high positive relationship between the examined variables and the high level of predictability of practical knowledge and skills and both mentoring activities and leadership potential of case competitors.*

Keywords*: case study (teaching method), case competition, business school, overview*

1. INTRODUCTION

Business and management are considered as one of the most evolving fields, as the technology and globalization tend to profoundly reshape their practice (Farashahi & Tajeddin, 2018). Business education, on the other side, is developing at a much slower pace than the practice (Moratis, Hoff & Reul, 2006). Therefore, a great emphasize has been put recently on business and management majors for more relevant skills and escalating challenges for educators to close the gap between the knowledge and skills needed for the real world and the offering of business schools (Ungaretti, Thompson, Miller & Peterson, 2015). Most important questions are related to the need for more practically applicable tools (Greiner, Bhambri & Cummings, 2003) and their future use at the workplace (Jarzabkowski, Gulietti, Oliveira and Amoo, 2013). Consequently, business and management majors should get more problem-based and experiential learning.

For this purpose, both scholars and practitioners advocate for case study as the most appropriate teaching method, as it provides authentic, active and pragmatic application of theory to school practices (Sudzina, 1997). A specific form of active learning with case studies are case study competitions. Corner et al. (2006) infer that competitions are reasonable and desirable for grounded business learning. Case competitions are aimed at providing business students with practical skills and knowledge needed for their future jobs. Even though the stakes are high, this phenomenon has been out of the scholarly radars.

This paper aims to fill the lacuna in the present body of knowledge by examining the main factors affecting the development of practical skills and knowledge of case competitors. To answer this question, we hypothesized that mentoring and leadership potential are the main driving forces of the development of phronetic skills among students.

The remainder of the paper is organized as follows. Section 2 elaborates on the theoretical foundations of a case competition as a learning method in business schools. Section 3 depicts the quantitative method used in the study. Section 4 deals with the results of the study. Section 4 discusses these results in terms of the main findings, contributions, managerial and research implications, limitations and further recommendations. This section also deals with the concluding remarks.

2. RELATED WORKS

Traditional learning paradigm relies on a “spoon-feeding” pedagogy, where students are supposed to listen, memorize and reproduce the knowledge presented at classroom lectures. This approach is limited in terms of developing critical thinking skills which are highly important for solving future real world problems and tasks. As opposed to this paradigm, a constructivist approach-driven experiential learning centers around the preparation of students for unstructured problems which reflect to their future actualization at the workplace (Cavaleri & Fearon, 2000). Constructivists advocate for the use of active learning methods. These methods

include case studies, debates, discussions, experiments, role plays and Socratic questioning (Popil, 2011). Among them, case studies are the most broadly used in management education. Business schools use this method for more than 100 years (Mesny, 2013) and there is little evidence that this teaching method will disappear or diminish as the centerpiece of management education.

A broad body of evidence has been growing around the advantages and disadvantages of using case method in the classroom. On the upside, Farashahi & Tajeddin (2018) state that "case studies help students to integrate theories with business situations and develop alternative solutions for management and/or organizational problems". Also, case studies develop judgment and the ability to make business decision in highly competitive markets (Simons, 2013). An important benefit garnered from the use of case-based instructions are centered around the view of management as a multifaceted practice which may not always be reduced to generalized theoretical principles and concepts (Mesny, 2013). This refers not only to questioning operational issues that businesses face day-to-day, but "a critical questioning of business-as-usual capitalism from the perspective of multiple stakeholders, including managers, employees, unions, not-for-profit organizations, government, and the natural environment" (Bridgman, McLaughlin & Cummings, 2018). Accordingly, students learn how to formulate readings and to discriminate among them and learn how to frame and resolve business issues in accordance with the prevailing values (Greenhalgh, 2007).

On the downside, even after a century of usage, cases still lack of fully conclusive evidence on the effectiveness. One of the reasons for this is very broad usage of the term "case-method". When put in context, the term may broadly encapsulate benchmarking and evaluative cases (Mesny, 2013). Most of our colleagues will to some extant claim that they use case-method in the classroom. However, specific aspects of case-method teaching – educational objectives, instructors' preparation strategies, students' roles, structure of the feedback etc. – are rarely thoroughly developed.

A specific form of case-method learning is a case study competition. They emerged from the need to 'actionalize' management education and to 'expand teaching beyond classroom experimentation to live action learning' (Raelin, 2009). Presently, a handful of business schools use case competition as a teaching method. The method originated in the United States where the participation was restricted to national schools, but the phenomenon has diverged around the globe in the last two decades (Damnjanovic, Proud & Ruangwanit, 2017). There is still a paucity of evidence on the effectiveness of this learning concept. Scarce studies on case competitions indicate that students who participate at case study competitions are better prepared for future career: job or internship possibility based on their preparation and experience at international level (Damnjanovic and Mijatovic, 2017).

The concept is generally based on organizing students into teams which are supposed to act as consultants to businesses (Desai, Tippins & Arbaugh, 2014). Some indicative recommendations for the adequate usage of case study competitions is given in Gamble & Jelley (2014). It is highly beneficial to provide continuous training and coaching to the teams to achieve superior performance (Karagozoglu, 2017). Accordingly, mentors play a vital role in the process of the student preparation for the competition (Proud et al, 2017). Following this, we hypothesize that:
H1: Mentoring positively affects the development of practical skills and knowledge of business students.

Students (competitors) are exposed to decision-making in various industries, challenged by different experiences of team work, they learn by doing rather than reading and listening, and get feedback for their work from a jury panel combined from experts from both academia and practice. However, not all the competitors will acquire practical knowledge and skills at case competitions. Hedlund et al. (2003) infer that practical (tacit) knowledge is highly affected by the leadership potential. Although this study was conducted for the military purposes, we will use the analogy with the business students and hypothesize that:
H2: Leadership potential positively affects the development of practical skills and knowledge of business students.

3. RESEARCH METHODS

3.1. Research approach

This study used was based on primary data and employed questionnaire as a research tool. Quantitative approaches are steadily gaining importance in business and management studies (Cameron & Molina-Azorin, 2011). The questionnaire was distributed to mentors at global international case study competitions. Since the aim of the study was to collect the data from the most important global case competitions, we used the list of competitions compiled by the Auckland University from New Zealand (the Champion Trophy

compilation). The questionnaire was distributed in both paper-and-pencil and e-version to the mentors of competing teams.

3.2. Research variables and measures

The questionnaire was divided into four sections. The first section examined the demographics of the examinees.

The second section (mentoring) was developed according to Dlacic, Damnjanovic & Ribaric (2016). This part included the inquires on Encouraging contact between students and faculty, Developing reciprocity and cooperation among students, Encouraging active learning, Giving prompt feedback, Emphasizing time on task, Communicating high expectations, and Respecting diverse talents and ways of knowing.

The third section (leadership potential) was based on Greenhalgh (2007) and the operationalizion from Higgs and Aitken (2003). It included the inquires on: Strategic leadership, Leading capability building, Leading political/stakeholder interface, Leading change, Intellectual leadership, Leading culture building, Building relationships and reputation, and Building personal learning.

Final section (practical skills and knowledge) was built upon the Jerrard (2005) and encompassed the following inquires: Critical and strategic thinking, Systematic industrial and labor related thinking, Analyzing the complex industrial and labor relations environment, Demonstrating an understanding of theory covered in the subject, Understanding specific roles in managerial practice, Demonstrating appropriate communication skills with other team members, Present material in a format appropriate to the role, the task, the audience, Improving Learning and Performance, Information Computer Technology (ICT) skills, Leadership skills, Interpersonal skills -Working with others (Team building), Conceptual skills (Problem solving and decision-making), and Functional skills (for example, strategic management). All the items were measured on a Likert-type scale (responds were coded from 1 – strongly disagree, to 7 – strongly agree).

3.3. Sampling procedure, data collection and processing

As aforementioned, the questionnaire was distributed to the mentors at global business case study competitions. The questionnaire was distributed to a total of 55 examinees. The sample was created as a referral chain, following Bodin, et al. (2016). Most of the examinees are affiliated in Europe and Middle East (33%) and North America (31%). The other regions covered were Asia-Pacific (22%) and Australia and Oceania (15%). The main field of interest of the examinees was management and strategy, followed bu finance and accounting (which jointly make 52.7% of the sample).

Data was collected in the second half of 2017 as a part of a larger project aimed to provide an insight into the development of case competitions as a teaching method. The authors collected the data and after the collection was completed the data was entered in SPSS (Statistical Package for Social Sciences). Quantitative data was analyzed with descriptive statistics: percentages, means and standard deviations. Interdependence of determinants (independent variables) and contract management efficiency (dependent variable) was determined by correlation (Pearson moments two tailed correlation coefficient analysis) and multiple regression.

4. RESULTS

4.1. Pre-analysis

Firstly, we conducted descriptive statistics, internal reliability analysis and correlation analysis. The results are presented in Table 1. The average means are relatively high with a relatively low standard deviation. Since the scores are composite, we examined Cronbach's Alpha as an internal reliability test. This results are particularly noteworthy as they range from .69 to .87 indicating high internal consistency (Lance, Butts & Michels, 2006). A strong and statistically significant relationship was found between all the examined variables. Particularly high relationship was found between mentoring and knowledge and skills of case competitors (r=.65) and leadership potential and knowledge and skills (r=.63).

Table 1 Descriptive statistics, internal reliability and correlations

	Mean	SD	CA	1	2
Mentoring	5.90	.68	.69		
Leadership Potential	5.75	.66	.79	.48**	
Knowledge and Skills	5.75	.62	.87	.65**	.63**

4.2. Main analysis

Since the study found a number of significant positive correlations, the next step was the examination of the influence and intensity of variables seen as independent to Knowledge and Skills. The results of the regression analysis indicated that the research model predicted 51% (R^2=.51) of the variance which is displayed in Table 2. As Durbin-Watson was d=1.876 (between two critical values 1.5<d<2.5), it could be assumed that there is no first order linear autocorrelation in the multiple linear regression data. Multicollinearity was further examined with the variance inflation factor, and we have not found high values for VIF.

Table 2 Regression model for Knowledge and Skills as a dependent variable

Variable	Coefficient	Std Error	t-statistic	Prob
Constant	1.12	.63	1.78	.08
Mentoring	.44	.11	4.13	.00
Leadership potential	.35	.10	3.36	.00
R square	.53	F		27.21
Adj R square	.51	Sig		.000
SE of regression	.423	Dependent variable: Knowledge and Skills		

The results indicate that mentoring has an immense impact on the development of practical knowledge and skills of case competitors. Nearly a half of the variability in the development of dependent variable is explained with the changes in mentoring. The leadership potential, also, significantly affects the development of business majors in case competitions.

5. DISCUSSION AND CONCLUSIONS

5.1. Key findings, implications and further recommendations

The aim of this study was to examine the relationship between mentoring activities and leadership potential of case competitors (business majors) on one side and the development of practical knowledge and skills. The study was focused on a 'premier league' of business case competitions. The findings indicate that mentoring plays an important role in the development of phronetic skills among students. This finding is in line with some previous studies. For instance, Spence (2015) reports that mentees appreciate the enhancement of self-confidence, employability skills and networks. Not only that practical knowledge gets facilitated through the mentoring at case competitions, but it ultimately drives the workforce readiness (Hartnett, 2016).

The study also confirms the hypothesized influence of leadership potential to the development of practical knowledge and skills among business graduates. One possible explanation for this result is that student-perceived developing leadership behavior is positively and significantly related to affective organizational commitment (similar to Marescaux, et al., 2016), which ultimately leads to more effective learning and acceptance of new skills.Still, empirical results from other studies infer that unstructured curricula and teaching methods do not improve leadership self-efficacy – or at least not the perceived one (Caza, Brower & Wayne, 2015).

In general, our results support the argument that case study competitions is a versatile and adaptable learning method, as it evolves at a much faster pace that lecture-based learning. Cases provided at global case study competitions are up to date and require proactive and problem-based thinking. Thus, as an experiential way of learning, it is highly effective in gaining tacit knowledge (Armstrong & Mahmud, 2008). It should be speculative to infer that case competitions should replace traditional learning methods. Traditional learning is more efficient in transferring large number of ideas to a large number of students (Ardalan, 2006). The idea is not to replace lecturing, but to extend by implementing extracurricular activities to gifted business majors.

This paper provides several implications for both scholars and practitioners. First, the study adds to a current body of knowledge related to the teaching philosophy. Not only that case studies can bring a 'spark' of real world to the classroom, but competition in case studies can dissect the way in which business majors will compete in future marketplace. Moreover, competing feature of the aforementioned phenomenon stretch out to business schools. Case competition, in a specific way, reflects the strength of a competing business school and builds its brand. The study also acknowledges that the support from the mentors plays a vital role in the actual development of competences among students. It could, however, be speculated that even unguided preparations for business case competitions might reflect to the development of knowledge and skills. Nonetheless, mentoring catalyzes and facilitates this process.

Being a quantitative by nature, this study has certain flaws. First, the size of the sample raises the question of the generalizability of study findings. Although the sample included the majority of mentors leading the student teams at premier global business case competitions, this cohort is relatively small and may not reflect the concepts and the effects of mentoring students at other case competitions (i.e. national or regional ones). Second, the study only analyzed two possible predictors of the developments of practice-needed knowledge and skills. An avenue for further studies is the inclusion of other possible variables into the model.

5.2. Conclusions

Case competitions are receiving more attention lately as a grounded method of learning in the business and management education. Business schools that compete at case competitions usually apply case studies in various courses: finance, strategy, marketing which helps students to develop problem solving skills and be familiar with using the case methods. Working with students in the classroom is not sufficient to prepare a team for a case competition. The case competitors usually have additional – extracurricular coaching needed to develop their practical and problem-solving skills. Being a close-to-the-real-world simulation of consulting practice, business case competitions are an utter way of providing a glance of the real business problem to be cracked in the classroom. This study finds that as undergraduates interact with professionals from the practice, and network and friend up with their peers from different cultures, they create a body of phronetic skills and develop leadership potentials.

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