UDC: 005.311.121:005.591.6
005.521:334.7(497.11)
JEL: O33, M1
COBISS.SR-ID: 228332812

PRELIMINARY REPORT

Statistical Monitoring of Innovation Capacities of the Serbian Firms as Decision- Making Tool

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ABSTRACT *– The subject of this paper is to underline the importance of using data obtained via the official statistical reports that is based on Oslo manual methodology manual (Community Innovation Survey) for strategic decision making both at the national level as well as at the level of the company. These data enable monitoring and evaluating the innovation capacity of the firms with the aim of improving it. The paper, also, points out the importance of the firm's innovation capacity assessment as an impeller of economic development based on knowledge. By the data obtained by presented methodology, national decision makers can clearly comprehend and improve the direction of innovation policy and its integration into the wider policy framework that encourage economic development based on innovation. At the firm level, the use of data implies development of professional management of the innovative firm that will be able to respond to problem situations of the modern economy through the formulation of appropriate strategies.*

The paper analyzed data from three statistical periods during which the Oslo manual methodology had been applied in Serbia. Analysis has shown that the data obtained in this way are not sufficiently used by decision-makers an occasion rating innovation capacity of enterprises.

KEY WORDS*: Innovation capacity of the firms, Innovation activities, Oslo Manual, Community Innovation Survey, Strategic decision.*

Introduction

The importance of innovation is not possible to ignore. They are incorporated into everyday life. Innovation could not be seen only in a narrow sense as a driver for increasing the wealth of the nation and prosperity, but also in a more fundamental sense- as a tool that enables individuals to do things that they had never done.

Innovation is not only significant in terms of sustainable economic growth, but also in terms of changes of direction of economic progress and ultimately increases the quality of life (Freeman, 1988).

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Observation of the firms innovation capacity in a certain period may provide insight into the dynamics of the inventiveness of a certain economic activity which provides a space for comparing the development of certain sectors and determine the technological leader (Suarez- Villa , 1990). Some of them are based on developed practices of cooperation between the various innovation stakeholders, knowledge capital development, and some are related to organization design and human resources management.

In accordance with that, various databases can represent a source of information which can be used for determining the innovation capacity of the firms. This work particularly emphasized the importance of the data obtained using the methodology Oslo Manual, which represents the methodological framework for the creation of Community Innovation Survey (CIS) - a questionnaire that investigates innovation activities within the firms. This methodology provides a better understanding of the innovative behavior of firms through the definition of indicators of firms' innovation capacity. In that way, the influence of innovation on employment, competitiveness, economic growth, trade, etc ., could be determined. Also, the obtained data can be used, by applying appropriate statistical programs and techniques, for constructing different models for further investigating of specified dimensions of firms' innovation capacity.

Analysis and assessment of the impact of the firms' innovation capacity on the firms' competitiveness are equally important for the macro and the micro level of decision making. At the macro level, a competitive advantage based on the technology development has been influenced by the development of system variables of the national economy, i.e. the elements of the national innovation system. The level of development of infrastructure, political and other institution which determine the function of creation of transfer technology and diffusion indicate the development of National Innovation System (Author).

At the company level, the importance of technology is analyzed functionally: exploring how technology can influence the business activities that lead to increasing market share of the company, both on domestic and foreign markets. Besides, the company can gain a competitive advantage in innovation, through efficient use of technology developed within the company or the market (Aralica & Račić, 2007).

Understanding of the firm's innovation capacity at the national level can provide insights into how the innovation of the nation has been changed over the time, besides that, the relationship between national innovation stakeholders can be monitored.

Firm's innovation capacity

The importance of innovation for improving the functioning of national economies has been recognized in the literature. Many authors believe that the innovation capacity could be seen as the driving force for economic growth and development and competitive advantage. In the literature, there is a consensus that innovation has significant implications on the performance of national economies, the region and beyond (Arrow, 1962; Freeman, 1988; Romer, 1990, van Tunzelmann, 1995; Mervar, 1999; Radošević, 2004; OECD, 2005; Knell, 2006; Lentz&Mortensen, 2006; Courvisans & Mackenzie, 2014; Melinkas, 2014;), etc.

National innovation capacity in the narrowest sense is the *"country's ability to produce, commercialize and enable the smooth flow of innovation over a longer period of time"* (Furman et al., 2002).

The success of innovative companies can be measured not only through the consideration of innovation and/or the economic performance of the firms but also includes activities which are related to the performance evaluation during the implementation of the innovation process. These activities, beside evaluation of a technological aspect of innovation, include the evaluation of non-technological dimension of the innovation process such as the mechanisms for diffusion and transfer of technology, the strength of interaction between all national innovation stakeholders as well as organizational design components. Through measuring of innovation capacity of the firms over some period, it is possible to gain insight not only of the economic activity of the firms, but also in the economic activity of the nation, and even the region. The decline in innovation capacity in some sectors certainly can identify the future problems and can be used as an indicator for taking corrective actions (Lukjanska, 2014).

The firm's innovation capacity assessment reinforces and improves the competence of all relevant individuals and institutions, including the complete system environment. At the national level through the improvement of the innovation capacities, the competitiveness of the firms, specific industries, as well as the national economy at the whole, can be enhanced. Thus increased competitiveness is based on better utilization of knowledge. At the regional level, increasing innovation capacity improves the potential for innovative cooperation, clustering, and regional development.

At the firm level, assessment of innovation capacity is important for the management of the firms and includes the identification of the current situation, through the assessment of innovation performance, and to the anticipation of the desired state. Through defining action plans with the aim to overcome the identified variations, the strategic management at the firm level can be improved. Innovation management at national level is a complicated and complex process that includes mechanisms for the establishment of the effective fitting of innovation capacity with needs of the economy. Successful innovators can be determined by their capacity for fitting research and development with knowledge of market demands (Freeman, 1982). Peter Drucker (2003) believes that the success of innovation is in close connection with the specific systematic approach in analyzing all sources of innovation. He also underlined that for successful innovation, it is necessary that there is a recognized need for it. Its findings also indicate that innovation is not linked only to companies with high technology, but also for the companies with lower technological level.

For a successful understanding of the firm's innovation capacity, the indicators of innovation input and innovation output should be explored which is possible by using various databases.

Statistical sources for innovation capacity indicators

For investigating of innovation activities of the firms with the intention of assessing their innovation capacity, there is no precisely defined set of indicators. The number and type of indicators varies according to the objectives and tasks of the analysis. Basic statistical sources

for indicators of innovation capacity of firms can be different databases (Maroulis & Tsipouro, 2011):

- Eurostat provides data for all European Union member states, as well as certain which are not yet. Using this database comparison between the countries and region make easier.
- OECD provides data for quality analysis and between countries that are not members of the European Union.
- National Statistical offices provide statistical data at national level. Data obtained from these sources can be internationally comparable if the common methodology is used. These institutions provide data to the international statistical organizations.
- Innovation Union Scoreboard provides data that enable assessment of innovation performance of European Union member states and beyond to identify the strengths and weaknesses of their systems of research, development and innovation.
- Different specialized databases of patent activities (European Patent Office- EPO; World Intellectual Property Organization- WIPO, etc.); bibliometric data (Web of Science, Scopus, KOBSON), etc.
- Periodic and/or one-time research- collection and processing of qualitative and quantitative data.

In recent years, the great efforts have been made to develop indicators for monitoring the performance of innovative firms. There are various initiatives related to the development of innovation indicators that originated from different areas: education, based on developed practices of cooperation between the various innovation stakeholders of data relating to the organization and management of human resources. However, the most prominent source of information for measuring innovation performance of enterprises is the Community Innovation Survey.

Information about research and development costs, patents and bibliometric data can be obtained from periodic reports relating to the research and development of citation indexes and other sources. But, the information obtained in this manner, observe only certain aspects of the innovation capacity of the firms. This paper points out the importance of using data gathered using the Oslo manual methodology for decision makers. Firms continually develop their products and processes and establish new knowledge. It can be seen as a dynamic process rather than static. Only adequate use of knowledge could improve competitiveness at the firm level.

Oslo Manual is a comprehensive guide for collection, processing and analysis of data that can describe the innovation process (eg. innovation activities, expenditures for the performance of innovation activity, as well as the connection of the company with other actors of the national innovation system), the implementation of significant improvements in products and processes in the company (different types of innovation), and to obtain information about the factors that affect the performance of innovation activities and their effects. All this information is very important for researching firm's innovation capacity. The distinguishing of four types of innovation: innovation of products/services, innovation

process, innovation in organization and innovation in marketing makes this approach useful for the understanding of innovation from various aspects. Data, which are obtained from Community Innovation Survey, are used for the creation of indicators that describe firm's innovation capacity. The specific indicator may refer to only one question from the questionnaire, although often it is an analytical framework for few questions (OECD, 2005). Based on the study of indicators it is possible to make a different kind of comparison regarding innovation performance of the firms in other to assess and follow the dynamics of changing their innovation capacity at all levels of observation.

Data obtained by using this methodological framework can be used further for creating the different analytical models depending on the aim and users of the analysis. The Oslo Manuel methodology has evolved over time so its development could be followed through several periods (OECD, 2005):

- The first stage covers the period of the eighties and nineties of the last century when different models for monitoring innovation activities in the firms have been developed;
- At the beginning of the nineties, exactly in 1992, when the first edition of Oslo Manual was published, stared the new stage of methodology development for firm's innovation capacity assessment. By this manual, it is enabled tracking of innovation activities in the manufacturing sector with the main focus on technological innovation;
- Disadvantages of the first edition of the Oslo Manual were overcome with the second edition, which was published in 1997. This edition was included some methodological improvements. The service sector was also covered;
- The last, the third edition of the Oslo Manual is improved in accordance with the recommendations of users and represents a major step forward compared with previous editions. Improvements can be seen primarily through the complex approach of monitoring firms innovation capacity, which includes beside technological dimensions , the non-technological dimension of the innovative behavior of firms. The main advantage of this edition is the comprehensive methodological framework of analysis.

Statistical monitoring of innovation activities of the firms were conducted in Serbia during the four three-year cycle using Oslo Manuel methodology. This paper presents a comparative analysis of some indicators of innovation capacity of Serbian firms in the last three cycles. Information obtained by using this methodology which is applied through Community Innovation Survey are input for a design of a framework for analyzing the innovation capacity of enterprises that were investigated. This information enables the creation of a large number of indicators that make up the national innovation capacity internationally comparable.

Indicators of innovation capacity in the Serbian firms

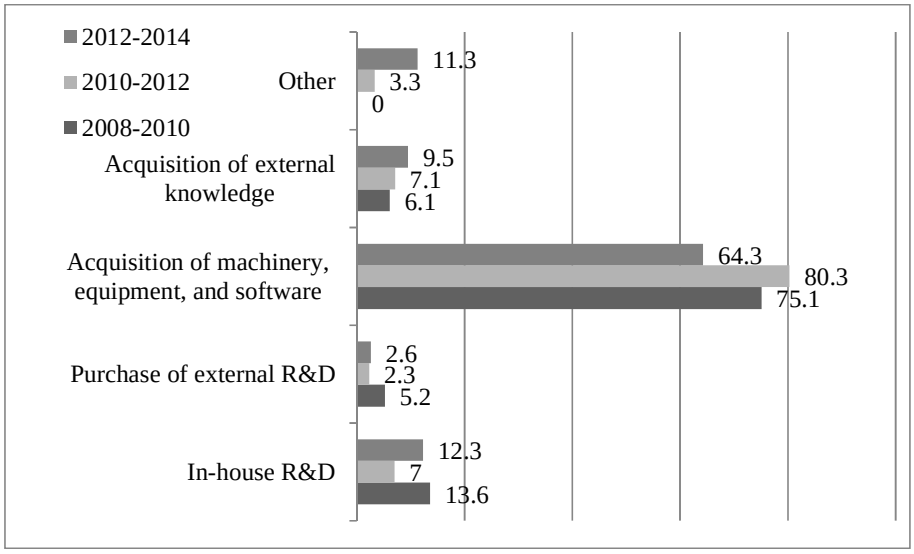
Assessment of the innovation capacity of the Serbian firms in a narrow sense means the mechanism for an understanding of creating and development of product innovation, process innovation, innovation in marketing and organizational innovations. This

information is available on the basis of the Community Innovation Survey, by which is possible to collect a lot of different information for creating a large number of indicators that could describe innovation inputs and innovation outputs (Mohnen et al., 2006; Knell, 2006; Aralica et. al., 2008).

In this part of the paper indicators that could describe some dimension of the innovation capacity of the Serbian firms will be presented: investment in innovation activities, sources of financing innovation activities, the share of revenues from the implementation of innovation activities in the total income of the company. For the analysis, official statistical data of the Statistical Office of the Republic of Serbia will be used. The data are collected by applying the methodological tool of Oslo manual. In this way, it will be possible to follow the dynamics of individual indicators of innovation capacity of firms in Serbia during three three-year periods during which the official Community Innovation Survey was conducted in Serbia.

Investing in innovation activities is one of the most important indicators of innovation capacity of the firms. As soon as the company realizes the importance of these kinds of expenses, its chances for success are greater. Figure 1 shows the dynamics of expenditure on innovation activities during the observed periods.

Figure 1. Expenditure for innovation activities in Serbian firms (%) during the periods 2008-2010, 2010-2012; 2012-2014



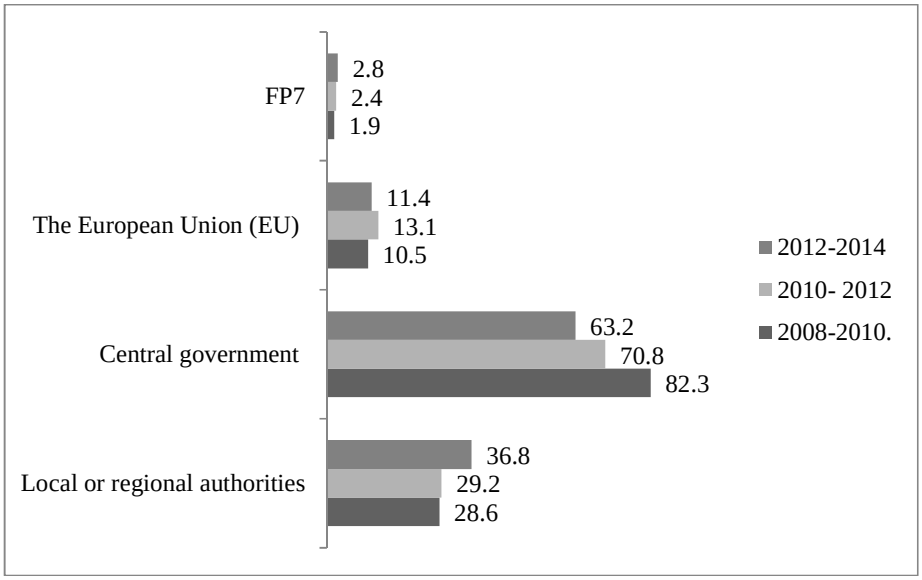
Source: Statistical Office of the Republic of Serbia, authors' calculations.

During the observed three-year statistical period, the companies in Serbia invested in their own research capacity the most, through the provision of necessary equipment and the implementation of internal research and development activities without any significant variations during the period that was considered.

Beside the mentioned types of innovation activities, the firms may implement and other types such as preparation of feasibility studies, testing, routine software development and industrial engineering. Innovation activities cannot be observed separated because conducting the one doesn't exclude the others. They are almost always carried out

simultaneously. For example, internal research and development activities often involve the purchase of new machinery and equipment and/or purchase of certain forms of intellectual property rights as well as providing education and acquiring new knowledge and skills. Companies recognize the need to undertake research and development activities in order to survive in business. Most of the companies, especially in less developed economies play a less risky role of imitators (contrary to technology leaders) or technology followers. This means that most innovation expenditures will be connected with purchasing equipment, software and rights to use someone else's intellectual property rights (patents and non-patented inventions, licenses, trademarks). There is increasing tendency in these expenditures in Serbia within observed periods: (9.5%) in the period 2012-2014 compared to the previous periods observed (Figure 1. 7.1% and 6.1%). External financial support for conducting innovation activities is mainly provided from government funds in Serbia, but there is decreasing tendency in funding from this kind of sources in the last reporting period (63.2%) compared to the previous two periods (70.8% and 63.2%). It is encouraging that the importance of investment in innovation activities is recognized at the local level. However, in order to establish a functional link between results of innovation activities and the economy needs, firms should turn out to market in order to find additional financial sources. Figure 2 shows that the firms in Serbia identified the importance of applying for the framework programs (FP) of the European Union. These programs are with the aim to establish the better efficiency of research and development in order to improve the economy of the European Union as the most dynamic, competitive global economy based on knowledge.

Figure 2. The structure of public financial support for innovation activities in Serbian firms (%) during the periods 2008-2010, 2010-2012; 2012-2014



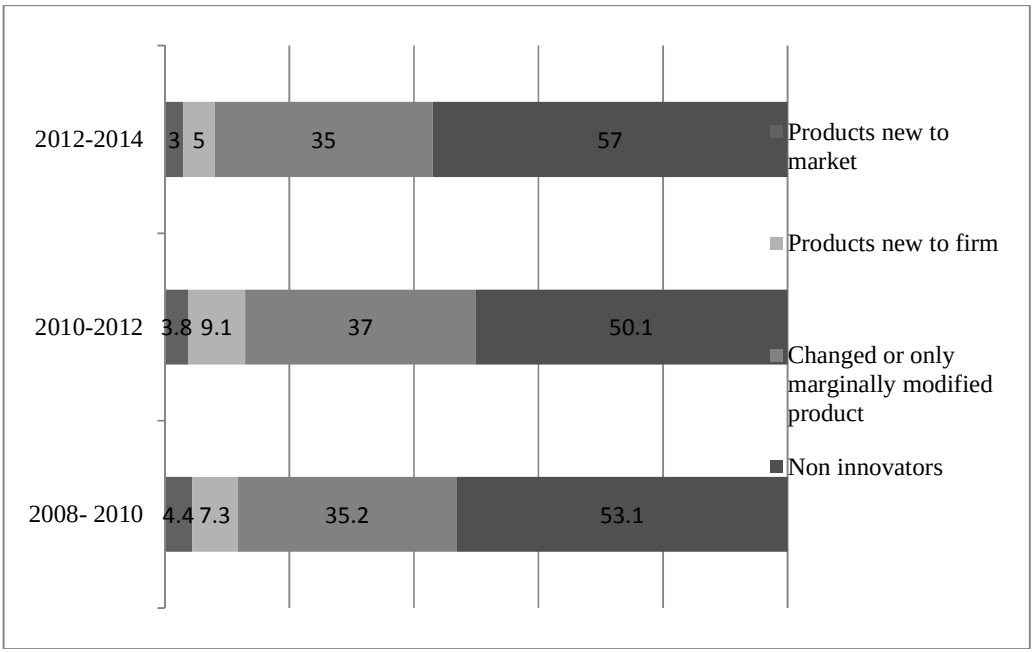
Source: Statistical Office of the Republic of Serbia, authors' calculations.

Technological innovation can occur through the introduction of new products and processes (radical innovation), which substantially change the dynamics of the sector, or as a

small improvement in existing products and processes (incremental innovation). In the public, the term innovation is mainly related to radical innovation, but, one should have in mind that the higher profits could be achieved through conducting less risky, incremental innovation. It is especially important for countries that do not have the large financial capacity. According to Schumpeter, "radical" innovations shaping the great economic changes, while incremental enable this process to take place continuously.

The structure of the percentage of firm's total turnover over observed periods is shown in Figure 3. Innovative enterprises in Serbia mostly obtain the income from products that have undergone minor changes or were only new for the company (OECD, 2005).

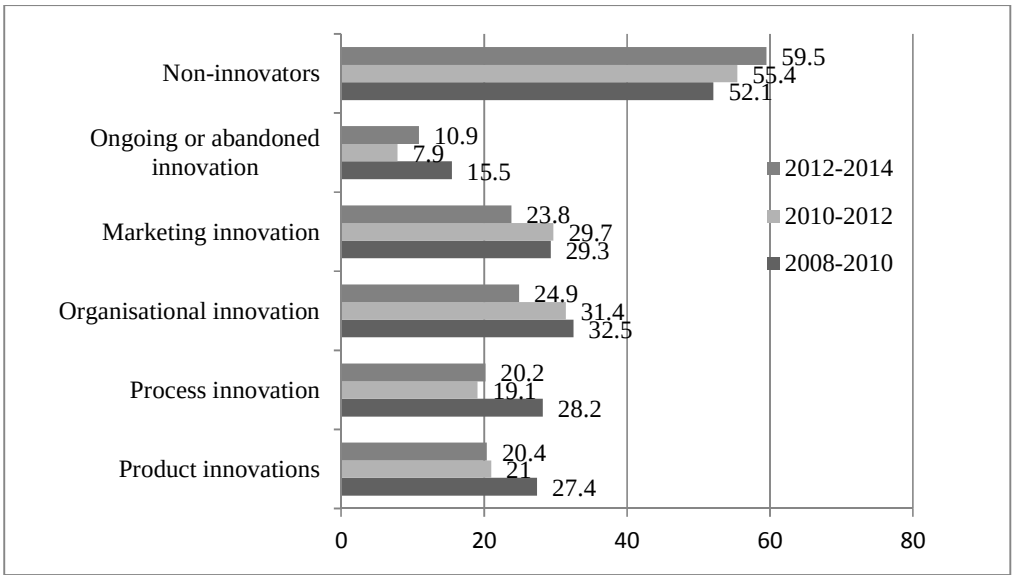
Figure 3. The structure of total turnover of innovative activity in Serbian firms (%) during the periods 2008-2010, 2010-2012; 2012-2014



Source: Statistical Office of the Republic of Serbia, authors' calculations.

The results of performing innovation activities usually can be seen as a number of generated innovation. The firm could also be considered as innovative if during underperforming period conduct innovation activities regardless of whether scientific results achieved during the period or not. Inclusion and abandoned and innovation in progress are covered by definition (OECD, 2005). On the basis of the Oslo manual methodologies results of performing innovation activities can be expressed as the product/ service innovation, innovation in organization and marketing innovation (Figure 4).

Figure 4. Innovation activities by type in Serbian firms (%) during the periods 2008-2010, 2010-2012; 2012-2014



Source: Statistical Office of the Republic of Serbia, authors' calculations.

The data presented in Table 4. shows that the highest number of innovative firms were identified within the period 2008- 2010. A slight decreasing tendency in the number of innovative firms in Serbia is also presented especially in the last period of observation. This fact influences the results of innovation activities. Perhaps the topics of some research in the future should be an investigation of the causes that led to a decline in the number of companies that have performed innovation activities in the last three-year period under review.

Conclusion

Firms' innovation capacity assessment is very important for making strategic decisions at the firm's level, but also in decision-making at the national level through the creation of different policies. There is the unquestionable role of assessment of the innovation capacity of firms for their management. Strengthening the innovation capacity of enterprises leads to improving the competence of all relevant individuals and institutions, including the complete system environment. Innovation management and building innovation capacity implies a strong and complex interaction between the national research base, decision-makers in this field. Developing capacities, skills, and innovation management skills, as well as the creation of a friendly environment for innovation, are the key things that could be advised to decision makers at all levels for improving the innovation capacity of firms in Serbia. Changes in technology and market requirements, "force" the innovative firms in their effort in the implementation of different strategies, depending on available resources, the general attitude of management and ultimately "lucky" circumstances (Freeman, 1982).

Innovation strategy of the firm should be an integral part of the general strategy of every company that conducts research and development activities. Strategic management of the company should continuously monitor and investigate the relationship of innovation input and innovation output of firms in contexts of overall firm s performance. There is the need for the existence of highly skilled management of innovative firms that can respond to problem situations of the modern economy through the formulation of appropriate business strategies.

The role of government in fostering innovation of enterprises is seen through the creation and implementation of a set of interrelated measures and incentive mechanisms, which include the provision of a large amount of financial resources (from the budget and allocations within the framework of encouraging the business sector), as well as the creation of an adequate economic environment for efficient function of national innovation system. In order to ensure efficiency funding, there is a need for focusing research and development efforts on a certain set of priority areas. Determining the strategic priorities should be a systematic by applying bottom-up rather than top-down approach (Smart specialization, foresight, etc.). Innovation policy should be addressed towards the problems of practitioners and synchronize the activities of all actors of the national innovation system. This can be achieved in best way through a horizontal approach to the innovation policy that overcome the scope of work of one ministry- coordination of innovation policy with the policy of economic development. Only in that way, it will be possible to develop a model of economic growth that will lay on the effective use of innovation as well as the transfer of innovation in the economy. The main characteristics of the model should be (Fabris, 2014): increase in export demand, import substitution, more emphasis on the manufacturing sector as a generator of economic growth, competitiveness based on- knowledge-transfer technology.

The work presented here points out the importance of innovation capacity of firms assessment by using the methodological framework developed by the OECD, Oslo Manual, which is widely recognized as the strategic decision-making tool in developed countries. Data obtained through Community Innovation Survey are very descriptive for analysis, monitoring assessment of innovation capacity of firms, in spite of the survey limits, which are listed below: (OECD, 2005; Knell& Nas & 2006):

- Detailed analysis of the innovation capacity of firms in some cases requires data that that are not covered by Community Innovation Survey;
- It is very hard to understand innovation expenditures from the classical financial report. In order to interpret these data in the proper way, it is necessary to analyze the data from other various business-related reports, particularly financial;
- It is difficult to determine the timeframe of the analysis. Period covered by the questionnaire refers to three years, but the results of innovation activities are often known only in a future period;
- Do not provide enough information about the general institutional environment, such as the education system, labor market, and financial system.

This paper presents that the assessment of the innovation capacities of companies providing quality information to improve the innovative performance in the future, both at

the level of individual companies, and the level of national economies. Analysis of certain indicators of innovation capacity in Serbia during the three three-year periods has shown that their value has not changed significantly over time. A slight decline in the values of certain indicators is even noticed in the last reporting period. This information suggests that decision-makers at all levels of decision-making do not use enough information provided by Community Innovation Survey. It should be considered as a potential area for investigation in the future.

Acknowledgment: *The paper is a part of the research done within the projects III47005 and TR36025, funded by Ministry of Education, Science and Technology development for the period 2011-2016.*

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Article history: Received: 10 November, 2016
Accepted: 25 November, 2016