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INNOVATION-BASED COMPETITIVENESS: THE CASE OF SERBIA*

Konkurentnost zasnovana na inovacijama: slučaj Srbije

Abstract

Innovation is certainly one of few issues whose relevance to social and economic development has been widely recognized. Innovation is a fundamental factor in economic growth and prosperity. This is particularly important in a knowledge-based economy. Taking into account the nature of innovation, this paper explores its role and importance in the process of creating competitive advantage. The first part analyzes typical aspects of innovation as the basis of competitive advantage. Since innovation can be seen as a tool for enabling changes, we start by examining the relationship between innovation and change. We then explore the relationship between innovation and sustainable competitive advantage and describe key innovation indicators. In a knowledge-based economy, intangible assets (intellectual capital) form the core of the value-creation process. Since innovativeness is often considered as a significant element of intangible assets, we also explore this issue. Finally, we analyze the innovation activities of Serbian companies, whose performance is unsatisfactory and results from low competitiveness level of the entire economy. This is especially important since economic crisis in Serbia is structural in its nature, which is why it is necessary to implement innovation-driven structural change.

Key words: *innovation, competitive advantage, intangible assets, intellectual capital, knowledge-based economy*

Sažetak

Malo je pitanja koja odlikuje tako velika saglasnost kao što je pitanje uloge inovacija u društvenom i ekonomskom razvoju. U pitanju je fundamentalni faktor ekonomskog rasta i prosperiteta koji dobija posebno na značaju u ekonomiji zasnovanoj na znanju. Imajući u vidu samu prirodu inovacija, u radu se razmatra uloga i značaj inovacija u procesu stvaranja konkurentske prednosti. Prvi deo je posvećen analizi karakterističnih aspekata inovativnosti kao faktora konkurentske prednosti. Budući da inovacije predstavljaju sredstvo za ostvarivanje promena, izlaganje otpočinje analizom odnosa inovacija i promena. Zatim sledi razmatranje značaja inovacija za stvaranje i održavanje konkurentske prednosti, kao i prikaz ključnih indikatora inovativnosti. Poseban deo rada je posvećen razmatranju nematerijalne aktive (intelektualnog kapitala) kao ključnog pokretača inovativnosti, pošto u ekonomiji zasnovanoj na znanju, ili inovacionoj ekonomiji, okosnicu procesa stvaranja vrednosti čini upravljanje nematerijalnom aktivom. Izlaganje završava sveobuhvatnom analizom inovativne aktivnosti Srbije čije su inovacione performanse nezadovoljavajuće i povezane su sa malim nivoom njene konkurentnosti. Ovo posebno dobija na značaju imajući u vidu da je ekonomska kriza u Srbiji strukturne prirode, a inovacije su pokretač strukturnih promena.

Ključne reči: *inovacije, konkurentska prednost, nematerijalna aktiva, intelektualni kapital, ekonomija zasnovana na znanju*

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Introduction

The modern age is referred to in a variety of ways. Some use terms such as the period of discontinuity, turbulence, uncertainty, future shock, or digital revolution, while others call it the post-industrial economy, information age, or innovation economy. The one thing that all these different definitions have in common is the understanding of the role played by knowledge and innovation in new economies. The creation and application of knowledge is a part of the innovation process. Knowledge-based activities result in the creation of new types of innovation. A great deal of evidence suggests that knowledge is a key factor influencing added value and GDP growth. In 2009, knowledge-intensive activities, where more than one third of the employees have a tertiary education degree, represented 35% of total employment in the EU with generally no large variation around this rate among EU Member States [16, p. 11]. Thanks to the influence of knowledge and innovation, the way in which products are made has become more important than the type of products. Innovation is a central element of the Lisbon Treaty that reflects the intention of the EU to strengthen the innovation-based economies of Member States. The post-industrial economy, information age or innovation economy would be better described as the knowledge-based economy. The term "knowledge-based economy" reflects the major component – knowledge – that is the key driver of value for the fastest-growing companies in our age [31].

The concept of organizational learning focuses on a company's ability to create and acquire new knowledge and new concepts and to successfully adapt those to its unique business environment. Organizational learning is a specific form of change and a vital aspect of a company's readiness for adapting to change in the environment. Organizational learning develops competencies that did not exist previously, which increase the value of the human capital of a company, and lead to competitive advantage. During the industrial era, there was a clear distinction between two categories of employees. The first category consisted of intellectual elite, managers, and engineers, who used their analytical skills to create products and processes, select and manage clients, and obtain daily insights into operations implementation. The second category entailed people who were directly involved in product manufacturing and service provision. The central factors of productivity were physical, rather than intellectual, abilities [27, p. 5]. During the information era, the role of many jobs has changed significantly. The manufacturing process has become automated, and each employee is directly engaged in product manufacturing and service provision, quality improvement, cost reduction, and shortening the production cycle. The ability to improve existing products and introduce new ones is achieved by innovation and learning process. Without adding extra value to products and services, it is not possible to achieve competitive advantage.

Innovation in a knowledge-based economy is diverse and pervasive [12]. The term "innovation" has been understood and interpreted in many different ways. The basic definition of innovation most widely accepted is that it represents a purposeful change to existing activities that improves economic performance. Various examples of products, services, processes, organizational structures, management styles, ideas, technologies, tasks, and behavior can be labeled as "innovation." By introducing new or modified products or services, which arise from innovations, existing customer needs are satisfied, future needs are anticipated, and new needs are generated. Innovations represent a complex set of activities, from the conceptualization of an idea to its practical implementation [52, p. 2]. *Hitt*, *Ireland* and *Lee* [24] suggest that innovation can be conceptualized as a learning process, and *Cavagnoli* [6, p. 111] defines innovation as "the creative application of knowledge in a new form to increase the set of techniques and products commercially available in the economy." *Tinnesand* [55] places innovations into six categories: 1) new idea; 2) introduction of a new idea; 3) invention; 4) introduction of an invention; 5) an idea different from existing ideas; and 6) introduction of an idea disrupting prevailing behavior. *Drucker* [11], for example, defines innovation as the process of equipping in new, improved capabilities or increased utility, and *Baregheh et al.* [2, pp. 1326-1327] analyzes numerous innovation definitions from various disciplinary perspectives: business and

management; economics; organization studies; innovation and entrepreneurship; technology, science, and engineering; knowledge management; and marketing. Some of the most important attributes in terms of defining innovation relate to the type of innovation, nature of innovation, means of innovation, innovation and people, stages of innovation, and aim of innovation. *Trott* [56, p. 15] suggests that "innovation is the management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new (or improved) product or manufacturing process or equipment." According to the *Oslo Manual* [37, p. 46], "an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations."

There are two types of innovation processes: pushed and pulled. The reasoning for this categorization is that a potential innovator, in the process of creating an idea for a new product or service, either starts from the market need and develops a product, or starts from the product and works toward market need. In other words, we have two concepts: "technology push" or "demand or market pull." Some innovations represent significant (radical) change in doing business, while others are incremental (evolutional) because they incorporate low levels of innovativeness. These two types of innovation represent two ends of the innovation continuum. "Innovation depends on technological, as well as on other critical capabilities in areas such as manufacturing, marketing and distribution, and human resource management" [4, p. 8]. *Schumpeter* [47] describes various types of innovation: new products, new methods of production, new sources of supply, the exploitation of new markets, and new ways to organize business. *Trott* [56, p. 17] makes the distinction between: product innovation, process innovation, organizational innovation, management innovation, production innovation, commercial/marketing innovation, and service innovation. According to the *Oslo Manual* [37, p. 91], "innovation activities are all those scientific, technological, organizational, financial, and commercial steps, including investment in new knowledge, which actually lead to, or are intended to lead to, the implementation of innovations." Four types of innovations most broadly used are product innovations, process innovations, marketing innovations, and organizational innovations [37, pp. 48-51].

Bearing in mind what has been said so far, the purpose of this paper is to analyze and identify the role and importance of innovation regarding building competitive advantage in the knowledge-based economy. The impact of innovation capacity on competitiveness can be viewed from the aspects of innovation characteristics, different innovation indicators, and innovation drivers. According to the identified research objective, the paper deals with following research questions:

- In what way are the innovation performances of certain economies associated with their competitiveness?
- Is there a significant relation between different innovation inputs and innovation outputs, on the one hand, and building the competitive advantage, on the other?
- Are the results of innovation activity related to the components of intellectual capital?

Given the defined research purpose and objective, as well as research questions imposed, the paper uses qualitative and quantitative research methodology and appropriate methods of the research. In the segment of research problem analysis, theoretic and empirical approaches were combined, while the use of analysis and synthesis of secondary data prevailed. The theoretic approach is based on applying the methods of analysis, synthesis, deduction, and induction, with special focus on the results of different studies undertaken so far, and on critical review of different theoretical standpoints. The comparative method was used for the purposes of analysis and presentation of the results obtained, as well as for the purposes of making adequate conclusions.

The paper is organized as follows. The first part analyzes typical aspects of innovativeness, as means of achieving competitive advantage: the role of innovation in the changes, the importance of innovation for competitive advantage, and key innovation indicators. Taking into account the value-creation potential of intangible assets and its components, the second part of the paper deals with intangible assets and innovation as one of its elements.

The final part of the paper presents the results of our research study regarding innovation activities in Serbia.

Innovativeness as factor of a company's competitive advantage

Innovation is critical for competitiveness. The World Economic Forum [50, p. 4] defines competitiveness as the set of institutions, policies, and factors that determine the level of productivity of a country. Innovativeness is a key pillar of competitiveness. Depending on the way in which competitiveness is achieved, there are three stages in developing national competitiveness: 1) factor-driven economy; 2) efficiency-driven economy; and 3) innovation-driven economy. Innovation-driven economies have an environment that encourages innovation and the capacity for innovation. A number of empirical studies [23], [26], [28], [36], [39] indicate a significant positive correlation in various industries between innovation input and innovation output and between innovation output and firm performance. One research study [1], which was carried out on a sample of over 800 organizations, revealed that innovation excellence can boost EBIT by 4%, and that top innovators have 2.5 times higher sales of new products, and get more than ten times higher returns from their innovation investments. The study also pointed out the importance of adequate innovation management. One of the key success factors is good link between strategy, on the one hand, and innovation-related objectives and innovation capability on the other.

Innovation and change

Innovations are the tool for implementing changes. In the modern business environment, the need to introduce changes is clear. Companies are under pressure of constant change, both in developed and in developing countries, private and public sectors, production and service industries, small and large companies, as well as profit and non-profit organizations. A successful company differs from an unsuccessful one by its ability to manage changes rather than the status quo. Of companies from the *Fortune* magazine list of the 500 largest in the world in 1970, around 40% had disappeared from the list by 1996. Only three out of ten of the largest companies in 1972 had sustained their position by the end of the 20th century [33, p. 3]. On a macro level, national economies change their relative position, industrial foundation, wealth, and power according to their ability to cope with changes.

The modern business environment alters the rules and logic of the contemporary business model. One of the most significant new trends of development is a consequence of the global economic crisis that started in 2008. This context creates numerous challenges, because of which there is a need to understand innovation as a source of sustainable growth and to use it in solving many social and global issues. Considering this, a large proportion of countries have introduced guidelines that formulate appropriate goals and create systematic conditions for nurturing innovativeness. A *European Commission* [14] document entitled "Europe 2020 – European Strategy for Smart, Sustainable, and Inclusive Growth" states that development based on knowledge and innovation must be a key pillar of future "smart" growth in EU Member States. A law on innovation activity was declared in Serbia in 2005, on the basis of which the government announced a strategy for scientific and technological development in Serbia from 2010 to 2015. This strategy determined the scientific and technological priorities of Serbia, as well as infrastructure projects that are vital for improving scientific work and research.

The OECD Innovation Strategy [38] is built around five priorities for government action, and together can underpin a strategic and broad-based approach to promoting innovation for the 21st century: empowering people to innovate, unleashing innovation potential in firms, creating and applying knowledge, applying innovation to address global and social challenges, and improving the governance and measurement of policies for innovation.

The importance of innovation for competitiveness

Competitiveness is at the core of a company's success or its failure. A company achieves competitive advantage when its long-term value exceeds total costs (including cost of capital), while a company's strategy identifies the way in which the competitive advantage will be achieved. Each competitive advantage is linked to certain competency. In

other words, thanks to available competencies, a company attains competitive advantage. Regardless of the manner in which the company achieves this, the key competency is the source of competitive advantage. A competency-based strategy in a knowledge-based economy generates value through knowledge, innovation, skills, talents, and employee expertise.

The ability to innovate determines GDP and productivity growth, positive change in economic structure, and improvement in quality of life. In addition, innovations are closely tied to processes of social, political, and economic change. *J. Schumpeter* [47] recognized the importance of innovation as the main driver of dynamic economic development as far back as the 1930s. In *Schumpeter*'s view, just as there are natural reasons for people to die, the natural reason for a company's failure is lack of innovation. He named the process in which new technologies replace the old "creative destruction." *Zahra* and *Covin* [59, pp. 183-184] suggest, "innovation should be widely considered as the life blood of corporate survival and growth." Although innovations represent the core renewal process in any organization, there is no universal formula that guarantees success when it comes to a process that has to be enabled through sophisticated and active management. Unless the company changes what it offers the world (product/service innovation) and the ways in which it creates and delivers those offerings (process innovation), it risks its survival and growth prospects [3, p. 1366].

Although there is little empirical evidence regarding the identification of a business model that inevitably leads to innovation success, the basic set of rules for efficient innovation management could be described as [58, pp. 68-69]: 1) successful innovators understand customer needs better than others do; 2) successful innovators pay more attention to marketing; 3) successful innovators are more efficient when it comes to development, which does not necessarily involve them developing innovations more quickly; 4) successful innovators possess more internal research and development (R&D); 5) the individuals responsible for successful innovations are usually higher in hierarchy and have more authority in decision-making processes.

Innovation management is a process that corresponds with the proactive search for new working methods, behaviors, values, and formulations and implementations of new strategies. It is a process of continuous creation of better organization, structures, and opportunities in order to secure competitive advantage. Competitiveness is achieved through a strategy that reflects a non-conventional and consistent idea that leads the company through turbulent times. The non-conventional character of a strategy is attained through innovativeness. Innovation is therefore a crucial component of a business strategy. At the same time, it should be understood that companies compete with unique strategies in the global market, where uncertainty, dynamism, and complexity rule. High added value expected by customers leads to a swift and mass take up of innovations. The trend of shortening the period of competitive advantage exploitation makes the risk of strategy execution in the modern era more complex.

The innovation process itself represents the process of creating and applying new knowledge. Innovation also depends on organizational, social, economic, marketing, and other knowledge. *Sullivan* [53, pp. 180-181] recognizes three types of knowledge from a value-added perspective: value-added knowledge, direct-support knowledge, and indirect-support knowledge. Value-added relates directly to the innovations and their product features or functions. It may be knowledge about manufacturing or distribution capabilities or about customers and their requirements. This type of knowledge often provides unique capabilities that differentiate the firm from competitors. Direct-support knowledge includes administrative knowledge, company plans, methods, and procedures. Indirect-support knowledge involves accounting, financial services, information systems, and corporate services.

Chesbrough [8] suggests new approach to innovation, which should be based on the model of *open innovation*. The concept of open innovation promotes the paradigm within which there is a systematic encouragement of innovation, research of the wide range of internal and external sources of innovation, integration of these researches with the abilities and resources of the company, as well as exploitation of different opportunities in various ways. When we consider the innovativeness, the borders

between a company and its environment become fluid because innovation can be easily transferred within and outside of the company. The open innovation model is based on the following assumptions that are completely opposite to the closed innovation model [8, p. 38]:

- Since not all of the smart people work in one company, management must find and tap into the knowledge and expertise of bright individuals outside their company.
- External R&D can create significant value and internal R&D is needed to claim some portion of that value.
- A company does not have to originate the research in order to profit from it.
- Building a better business model is better than getting to market first.
- If a company makes the best use of internal and external ideas, it will win.
- A company should profit from others' use of its intellectual property, and it should buy others' intellectual property whenever it advances that company's business model.

Knowledge is the result of the learning process. The human dimension of innovation involves knowledge creation, education, training, and workforce support. New competencies are developed through learning, and these new competencies should lead to the achievement of competitive advantage. The focus is on encouraging people to work as a team and to think systematically, to learn from each other, to understand what needs to be done in order to introduce and maintain change. This is why the learning process must be continuous, since it is a vital part of innovativeness. Transformational processes within a company create a further need for new and varied types of knowledge, and assume the existence of a dynamic organization able to adapt to new circumstances and challenges. The learning process itself involves numerous social interactions between members of the organization, which may result in new knowledge.

Innovativeness is measured by efforts toward finding new possibilities. Experience shows that companies that were successful in the past because of the introduction of new technologies cannot build their competitive advantage on a permanent basis by relying solely on that technology. A comparison of modern industrial leaders with those 20 or even 10 years ago illustrates that many successful companies lost their leadership position or even vanished from the scene. On the other hand, innovativeness is the most significant component in terms of entrepreneurial strategy. Entrepreneurial activity is based on starting new business ventures. An entrepreneur is a person who sees possibilities for new products or services when others do not. Innovativeness assumes the take up of new opportunities and the creation of new business ventures that leave behind existing ways of doing things. New business ventures are based on new business ideas, on new or improved products, services, or technologies, or on the penetration of new markets. Entrepreneurial firms are a natural way of instigating entrepreneurial activity. New products and services are not only drivers for starting new companies, but also drivers for the creation of entirely new industries.

Measuring innovative activities

Innovativeness can be measured at the national level and company level. Many countries have developed some form of indices to measure their innovation performance. The Innovation Index, devised by *Michael Porter* and *Scott Stern* [41], assesses the innovation performance of the USA and is a quantitative measure that captures three main contributors to a nation's overall innovative performance: the common innovation infrastructure that supports innovation in the economy as a whole (e.g., investment in basic science); the cluster-specific conditions that support innovation in particular groups of interconnected industries (e.g., automotive, information technology); and the strength of the links between them (e.g., the ability to connect basic research to companies and the contribution of corporate efforts to the overall pool of technology and skilled personnel). The central objective of the Innovation Index is to create a quantitative benchmark of national innovative capacity that highlights the resource commitments and policy choices that most affect innovative output in the long run.

The Global Innovation Index [9] represents one of the approaches in terms of innovativeness measurement.

The research for 2013 included 142 countries. Serbia was ranked 54th. The Global Innovation Index relies on two sub-indices – the Innovation Input Sub-Index and the Innovation Output Sub-Index – and ranges on the scale from 0 to 100. The Innovation Input Sub-Index is built around pillars that enable innovation activity: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. The Innovation Output Sub-Index relies on two pillars: (6) Knowledge and technology outputs and (7) Creative outputs. Each pillar consists of three sub-pillars, and each sub-pillar is composed of individual indicators with adequate weight, making a total of 84 indicators.

The European Innovation Scoreboard (EIS) is a methodology that monitors the innovation performance of EU-27 Member States, as well as that of Croatia, Iceland, the Republic of Macedonia, Norway, Serbia, Switzerland, and Turkey. It is the primary instrument for national innovation measurement at the EU level. EIS distinguishes between three main types of indicators and eight innovation dimensions, capturing in total twenty-five indicators. The most significant innovation indicators are enablers, company activities, and outputs. The enablers determine the main drivers of innovation performance external to the company and cover three innovation dimensions: human resources; open, excellent, and attractive research systems; and finance and support. Company activities capture the innovation efforts at the company level, grouped into three innovation dimensions: company investments; links and entrepreneurship; and intellectual assets. Outputs cover the effects of companies' innovation activities in two innovation dimensions: innovators and economic effects.

Kuczmarski [29] suggests a broad approach to measuring innovation at the corporate level. He divides innovation metrics into two types: 1) innovation performance metrics (those that measure growth); and 2) innovation program metrics (those that measure and reflect program management and control). Innovation performance metrics include return on innovation investment, new product success rate, new product survival rate, cumulative new product revenue and cumulative new product profit, and growth impact (Table 1). Program metrics include R&D innovation emphasis ratio, innovation-portfolio mix, process-pipeline flow, innovation revenues per employee, and speed to market (Table 2).

Quantitative metrics for measuring innovation results may be based on the following indicators (or measures from different perspectives):

- Revenue received from sales of new product
- Revenue obtained from introduction of products to new market segments
- Revenue received from sales of new products as compared to total revenue for the last several years
- Time span between submission of an innovative idea and start of innovative project

Table 1: Performance metrics

Metric	Components	Potential implications
Return on innovation investment (R2I)	Cumulative net profits generated from new products launched Research costs + development costs + incremental production costs + initial commercialization pre-launch costs	Single, standard measure for comparing performance between divisions, over time, and within industry
Cumulative profits	Cumulative (3-5 years) profits from new products	Impact on income statement
Cumulative revenues	Cumulative (3-5 years) revenues from new products	Impact on income statement
Growth impact	Revenues from new products over 3-5 years 3 year revenue growth	Contribution to firm growth
Success rate	Number of new products exceeding 3-year original forecasts Total number of new products commercialized in last 3 years	Indicates the quality of planning
New product survival rate	Number of new products remaining in the market (time period X) Total number of new products launched (time period X)	Provides insight about the demand of new product introductions relative to total new product efforts

Source: [29, p. 28]

Table 2: Program metrics

Metric	Category	Components	Potential implications
Speed-to-market	Speed	Time from idea generation to market launch for new products Total number of new products	Indicated efficiency of R&D process
R&D innovation emphasis	Amount	Cumulative (3-5 year) R&D expenditure allocated solely to new products Cumulative (3-5 year) R&D expenditure	Indicates strength of innovation focus within R&D Allows for simple check on R&D execution of innovation strategy
New product portfolio mix; New product types: New to world New to the company Line extensions/ improvements	Type	Number of new products of type X Total number of new products Revenues from new products of type X Total revenues from new products Expenditures for products of type X Total expenditure on new products	Indicates how well balanced new products portfolio is compared to strategic goal
Process pipeline flow	Amount	Number of new product concepts in each stage of development Sample product stages: Concept analysis Prototype development Market testing First year of launch	Quantities how full the pipeline is and helps with forecasting future revenues and expenses. Can also indicate at which stages there might be bottlenecks or glitches in the process
Innovation revenues/ employee	Success	Total annual revenues from commercialized new products Total number of full-time equivalent employees devoted solely to innovation initiatives	Provides insight about the effectiveness of additional resource allocations

Source: [29, p. 29]

- Number of innovative ideas that came from employees of the company during a certain period
- Number of patents
- Cost reduction
- Percentage of new customers
- Growth rate in number of customers
- Customer satisfaction with product/service feature
- Customer retention
- Number of new products, services, or processes introduced to new markets within last several years
- Growth of market share driven by innovations
- Number of innovation initiatives funded
- R&D spending as a percentage of revenue
- Return on investment for new products/services
- Ratio of total number of innovative ideas to number of implemented innovative ideas.

Innovativeness and intangible assets

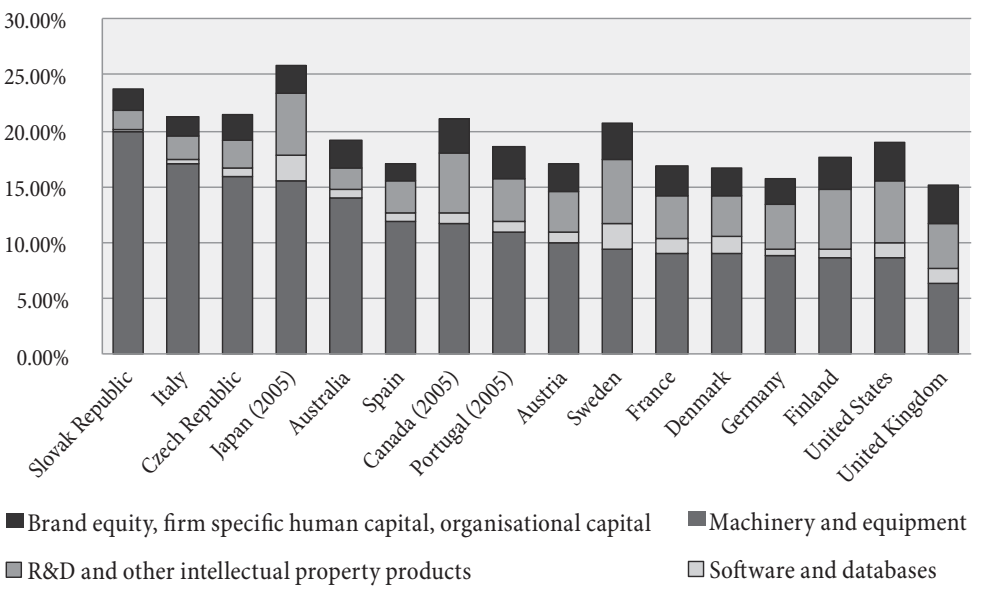
The nature of innovation is also changing in the knowledge-based economy. A knowledge-based economy stimulates the emergence of new forms of innovation, change in the innovation process, and reconfiguration of a company's value chain. One of the most important changes is the increasing significance of intangible assets (intellectual capital). In an innovation-based or knowledge-based economy, the essence of the value-creation process is reflected in intangible-assets management, since company value is dominated by intangibles. The substance of intangible assets is human, structural (internal), and relational (external) capital. The most vital elements of human capital are knowledge and innovativeness. Besides knowledge and innovativeness, human capital entails worker skills, creativity, learning ability, responsibility, dedication, enthusiasm, and motivation. Structural capital consists of management processes, business strategy and plans, software, databases, organizational structure, patents, trademarks, and all other organizational abilities that support employee productivity. Relational capital is in fact external capital, which comprises numerous relations with external stakeholders (customers, suppliers, creditors, investors), as well as their perception of the company. Examples of relational capital include brand, reputation, customer and supplier relations, various agreements, licenses, supply chains, capacities for negotiation, and a variety of networks. Figure 1 shows investment in 2006 in fixed and intangible assets of GDP in the most developed economies. Capital market places a high value on the

growth potential of companies that base their strategy on intangible assets. The ratio of the market to book value of a company is one measure of its intangible-assets value. The value of intangibles ranges between one-half and two-thirds of the total value of a modern successful company [30, p. 17].

Intangible assets are closely related to innovativeness. Innovation activity exploits and increases intangible assets. Certain authors in their classification of intangible assets distinguish innovation capital as a separate component. For instance, in Skandia reports on intellectual capital [51], innovation capital is treated as the part of organizational capital. On the other hand, *Mortensen et al.* [34] see innovation as a separate and main component of intangible assets in a company, along with structural capital, executive contracts, market capital, and goodwill. In addition, *Nazzari* and *Herremans* [35] analyze innovation capital as the part of structural capital. Forms of intangibles (expertise, innovative behavior, corporate culture, personal relations, databases, various applications of information capital, customer relations, and reputation) are the most important inputs of innovation activity. On the other hand, results achieved through innovation activities are related to particular components of intangible assets (technological knowledge, patents, new technologies, new or improved customer relations, and so on). Therefore, innovativeness, as an element of intangible assets, does not create value independently. It is also essential that innovativeness is connected to other elements of intangible and tangible assets. Changes resulting from new and different knowledge (such as technological, organizational, social, economic, marketing) are particularly important for innovativeness. Employees' knowledge, their innovativeness and creativity, determine the value of other forms of visible and invisible assets. Unlike physical assets, which are imitated easily, it is much harder to achieve competitiveness by copying innovative abilities.

Value created by knowledge, information, and innovation is contextual in nature. Created value reaches a maximum when all components of intangible assets are synchronized with strategy. Consequently, strategy is essential in order to increase value through innovations. The relationship between intangible assets and strategy is interactive, and the innovation-driven process of value creation should therefore be observed in the context of strategy. In other words, strategy enables effective use of innovations. The concept of the balanced scorecard [27] secures better insight into the role intangible assets play in the process of strategy formulation, and in terms of improving the relationship between strategy formulation and strategy execution. Financial perspective, customer perspective, internal perspective, and perspective of learning and growth may be related to forms of intangibles. The learning and growth perspective identifies intangibles that

Figure 1: Investment in fixed and intangible assets as a share of GDP, 2006



Source: [38]

are crucial for strategy. *Kaplan* and *Norton* [27] suggest that companies that intend to improve their intangible-assets management must integrate intangible-assets measurement in the management system.

Possibilities for innovation are a consequence of learning and development. Identifying new customers, new markets, and new needs of existing and new customers is a part of the innovation process. In general, performance improvement from the perspective of learning and growth enables business performance improvement within the perspective of internal business processes. This leads to fulfillment of the needs of customers and corporate owners. Poor performance from the customer and learning and growth perspective are leading indicators of future performance lag, even while the existing financial situation may be satisfactory. Through the following chain of cause-and-effect relationships, innovation impact on financial performance may be monitored:

- Competent human resources are prerequisite for successful innovation
- Successful innovation could result in process innovation, which improves the production process
- Innovated processes ensure higher product quality, which leads to customer satisfaction improvement
- Higher customer satisfaction leads to customer loyalty improvement
- Increased customer loyalty generates income and profit increase.

Innovation and competitiveness in the Serbian context

Serbia is an efficiency-driven economy and is at a stage in which its competitiveness gives it a GDP per capita of US 4,943. In case of Serbia, the transitional output curve is a perverse triple J-shaped curve, which never reaches its pre-transitional level. At the end of 2011, Serbia's transitional output gap was around 30% [10, p. 23]. Serbia entered the 2008 global economic crisis with an impotent economy, structural development problems, low competitiveness, and high systemic risk. Development goals include improving its competitiveness and the innovation performance of firms. The significant proportion of products that have low added value in terms of export and low ratio of export to import is a consequence of the economy's low level of competitiveness. In 2009, only 12.1% of firms exported products, where the majority of exporters were made up of large companies. The value of export as a percentage of GDP is 41%.

Many indicators point to the low level of competitiveness of the Serbian economy. Measured by the Global Competitive Index (GCI), the competitiveness level of the Serbian economy is very low (index value 3.77 on a scale of 1 to 7). The economy was ranked 101 (out of 148 countries analyzed) in 2013 according to the World Economic Forum. Compared to the previous year, the value of GCI for Serbia dropped by 0.1 points, which led to decline in ranking from 95 to 101. Serbia is the worst ranked country in Europe according to GCI. In 2010, Serbia was 96th (index value 3.84), in 2011 95th (3.88), and in 2012 the ranking was also 95th (3.87). Basic requirements, efficiency enhancers, and innovation factors are three fundamental components of the Global Competitiveness Index. Sub-index innovation factors include two competitiveness pillars: business sophistication (11th) and innovation (12th). From the standpoint of sub-index innovation factors, in 2013 Serbia was in 125th place with a score of 3.01, while in 2008 it took 91st place (Table 3). When we analyze sub pillar nature of competitive advantage (pillar: business sophistication) Serbia is ranked 145th.

In Serbia, around 5% of GDP is spent on education, which represents the average expenditure in the countries

Table 3: The Global Competitiveness Index and innovation factors

	2008		2009		2010		2011		2012		2013	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Global Competitiveness Index	85	3.9	93	3.77	96	3.84	95	3.88	95	3.87	101	3.77
Sub-index C: Innovation factor	91	3.3	94	3.21	107	3.04	118	2.99	124	2.96	125	3.01
11th pillar: Business sophistication	100	3.51	102	3.45	125	3.15	130	3.08	132	3.11	137	3.18
12th pillar: Innovation	70	3.09	80	2.98	88	2.93	97	2.90	111	2.81	112	2.85

Source: [48], [49], [50]

of Central and Eastern Europe. Public expenditure on education in the EU-27 in 2008 was equivalent to 5.1% of GDP, while the expenditure of public and private sources of funds on educational institutions amounted to 5.8% of GDP [17, p. 209]. In the EU in 2009, employment in knowledge-intensive activities as a percentage of total employment was 35.1%. Human resources are one of the most important drivers of innovation activity, and the education structure for Serbian population is currently inadequate. According to the World Economic Forum, in 2013 Serbia is ranked 83th in terms of quality of higher education and training. In 2008, Serbia was ranked 70th. Almost 50% of the adult population have elementary education or below. The ratio of adults with college degrees is also inadequate. Regarding Internet use, Serbia falls behind significantly compared to the EU-27 average. In 2012, only 48% of households in Serbia were using the Internet, which is far below the EU average at that time (76%), with only 34.2% of persons aged 15 and over that are computer literate. According to data from the Statistical Office of the Republic of Serbia in 2011, of the population above 15 years of age, 5.65% have high education, 10.59% possess higher education, 48.93% have secondary education, 20.76% have primary education, 11% have partially or incomplete primary education, and 2.68% have no educational attainment. Among the employed population in 2012, 7.2% have higher education, 15.3% possess a university degree, 56.9% hold a high-school degree, 15.1% have elementary education, and 5.5% have no educational attainment. Of people aged 30-34 years, 25.5% have a university degree, and 0.54 out of 1,000 received a PhD in 2009 [32, p. 111]. The Europe 2020 strategy has set a target of increasing the percentage of the population aged 30-34 with a university degree to 40%. Data for this age group was 34.6% in 2011. In South Korea, Japan, and the USA the figures for their equivalent population in 2009 were 57.9%, 55.1%, and 41.6% respectively [16, p. 23].

R&D activities take place at various stages of the innovation process. Innovation activities involve not just R&D, but R&D activities are the most important element of innovation activity. The proportion of GDP invested in R&D is a common statistical measure of countries' efforts toward R&D and essential prerequisite for innovativeness and industrial growth. The financial dimension of innovation can be viewed from the standpoint of R&D investment. In certain EU documents (e.g., Lisbon Treaty), there are plans for major growth in R&D investments, which should be at the level of 3% of GDP (2.03 % of GDP in 2011). Some EU countries already invest more than 3.3% of their GDP in R&D (e.g. Sweden and Finland). Business enterprise expenditure on R&D in EU as a percentage of GDP in 2011 was 1.26%, while in the USA it was 2.01%. Between 2000 and 2009, R&D intensity progressed in 24 EU Member States with acceleration in the period 2006-2009 in a majority of Member States. The global economic crisis that began in 2008 did not cause a decrease in the ratio of R&D to GDP in EU; on the contrary, it rose from 1.92% in 2008 to 2.03% in 2011. In addition, the data show that business R&D expenditure has been relatively resilient to the economic crisis. Total investment in R&D in 2009 in Japan was 3.36% of GDP, in the USA 2.87%, in China 1.7%, and in South Korea 4% (2010). Since 2000, China's share of global R&D investment has increased from 3.9% to above 10%. Serbia falls behind these numbers significantly, behind not only EU Member States but also newly accepted EU members, since investment in R&D in Serbia, as a percentage of GDP is only 0.4%. It is important to mention that these investments are financed almost in full by the public sector. Serbia is ranked 127th out of 147 measured by companies' expenditure on R&D [50]. In 2008 and 2009, there were budget cuts in science in Serbia, from 100 to 86.2 million Euros. In 2010, the government sector financed 34.6% of total R&D expenditure in the EU-27, while business enterprise sector financed 53.9%. In the USA, business enterprises financed 67% of total R&D expenditures [18, p. 26]. More than half (54%) of the researchers in the EU work in the public sector, and only 46% work in the business sector. The share of researchers employed by the private sector is much higher within our main economic competitors, e.g. 69% in China, 73% in Japan and 80% in the United States [16, p. 4].

According to data from the Statistical Office of the Republic of Serbia [44], during 2012, 259 organizations in Serbia were involved in R&D activities. The non-financial sector participated with 32%, state sector 25%, tertiary education 40% and non-profit organizations 3%. Some

19,646 employees were engaged in R&D activities (full- and part-time employees combined), among which there were 13,249 researchers. The percentage of all researchers who work in the non-financial sector is only 2.1%. In terms of employees, in R&D activities there were 17,730 employees, out of which 11,802 were researchers. In 2009, 1.68 % of total EU-27 employment was related to R&D activities, which was lower than in Japan and South Korea (1.84% and 1.99% respectively). Between 2005 and 2011, the total number of R&D personnel measured in FTEs grew by 2.9% per year on average in the EU-27. In the business enterprise sector, manufacturing accounted for the highest shares of researchers in most European countries [18, p. 40].

EIS methodology categorizes countries into four broad groups (based on the value of innovation indicator): innovation leaders, innovation followers, moderate innovators, and modest innovators. The average value for the Innovation Index for EU-27 in 2011 was 0.539, where the values are on a scale of 0–1. Sweden has the best score (0.755) and Latvia the worst (0.230). The performance of innovation leaders is 20% or more above that of the EU-27; of innovation followers it is less than 20% above but more than 10% below that of the EU-27; of moderate innovators it is less than 10% below but more than 50% below that of the EU-27; and for modest innovators it is below 50% that of the EU-27.

Serbia displays poor innovation performance compared to EU Member States (67.1% of EU-27 average) and belongs to the group of moderate innovators, with the value on the Innovation Index 0.365. Table 4 presents the Innovation Index of Serbia from 2008 to 2012, compared to the EU-27 average and to neighboring countries. Figure 2 analyzes performance scores per dimension (human resources, research systems, finance and support, company investments, links and entrepreneurship, intellectual assets, innovators, and economic effects). The intellectual assets score is particularly low (0.017), chiefly because of the low level of intellectual property rights protection. Therefore, intangible assets are a limiting factor in growth of innovativeness.

Table 4: Innovation performance, 2008-2012 (Serbia vs. neighboring countries and EU-27)

Country	Summary Innovation Index				
	2008	2009	2010	2011	2012
Slovenia	0.448	0.473	0.489	0.517	0.508
Hungary	0.301	0.301	0.329	0.335	0.323
Romania	0.234	0.250	0.233	0.252	0.221
Croatia	0.275	0.286	0.308	0.317	0.302
Bulgaria	0.187	0.198	0.231	0.234	0.188
Macedonia, FYR	0.191	0.216	0.219	0.220	0.238
EU27	0.504	0.516	0.532	0.531	0.544
Serbia	**0.255**	**0.248**	**0.290**	**0.279**	**0.365**

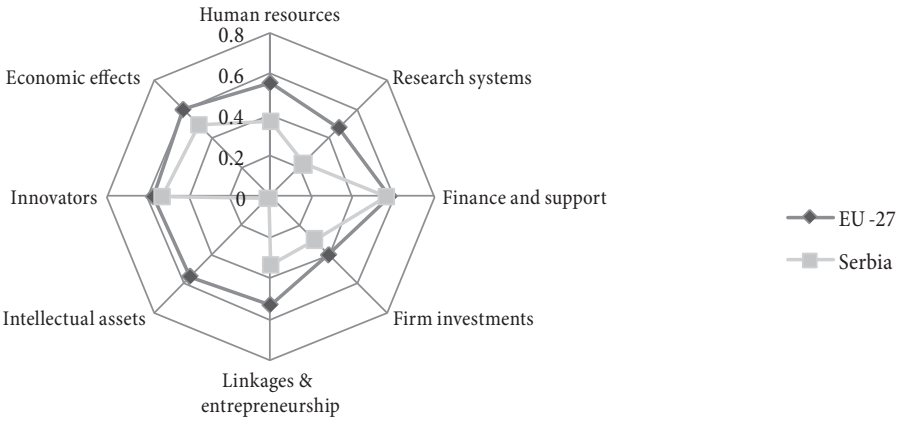
Source: [19]

In the previous section, "Innovativeness and intangible assets," we analyzed intangible assets as the most important input of innovation activity, and the connection between the results of innovation activities and certain components of intangible assets. Data from S&P 500 companies from the mid-1980s reveal a significant growth in intangibles' book value in terms of total book value and market value of companies. In 1975 to 2005, the percentage of total book value of assets that comprised intangible assets rose from 1.9% to 43.2%, while in the same period, the percentage of market capitalization that constituted intangible-assets' book value also increased, from 1.6% to 15.5% (every ten years the percentage doubled) [5, p. 4]. Data on 100 companies from the industrial sector in Serbia that achieved the highest level of net profit in 2010 show that the percentage of total assets' book value attributed to intangible assets was only 3.04% [25].

Janošević and *Dženopoljac* [25] show that intellectual capital and its components had a small or insignificant impact on financial performance. Their findings lead to the disappointing conclusion that the corporate success of companies with the highest profit in Serbia is in no way determined by the elements of intellectual capital. In fact, their business success is determined by factors that are not components of the modern business model. Instead, corporate success in Serbia is influenced mostly by capitalization of tangible assets. The majority of empirical studies undertook so far [7], [21], [22], [54] point to a positive correlation between intellectual capital and its elements, and the financial performance of companies.

Research carried out in the period from 2010 to 2012 by the Statistical Office of the Republic of Serbia [45], which

Figure 2: Country groups: Innovation performance per dimension in 2012



	Human resources	Research systems	Finance and support	Firm investments	Linkages & entrepreneurship	Intellectual assets	Innovators	Economic effects
EU27	0.557	0.478	0.585	0.406	0.532	0.555	0.571	0.603
Serbia	0.367	0.223	0.563	0.302	0.336	0.017	0.530	0.494

Source: [18]

involved 3,500 firms, found that 45% of firms made at least one innovation. Firm size is the crucial factor in innovation activity. Among large firms, over 66% are innovative. Among middle-sized companies in Serbia, more than 50% are innovative, and among small enterprises more than 40% are innovation-oriented. When we look at differing forms of innovation, 31.4% are related to organizational innovations, 29.7% of innovations are in the area of marketing, product/service innovations comprise 21% of all innovations, and innovation of processes make up 19.1% of all innovations in Serbian companies. Abandoned innovations and ongoing innovations make up 7.9% of all innovations. Based on effect of introduced technological innovations, which innovators estimated as significant, in the period of 2008-2010, the most significant ones are: improvement of product/service quality (38.4%), increase of product/service assortment (31.1%), and replacement of obsolete product/processes (25.9%) [46].

In the EU-27 Member States (excluding Greece) 52.9% of enterprises from industry and services reported innovation activity between 2008 and 2010. In Germany 79.3% of enterprises are innovation-oriented. In 2010, 39.7% of enterprises in the EU-27 (excluding Greece and the United Kingdom) were considered active in terms of product and process innovation, the same percentage as in 2008 [19, p. 68]. In the EU-27, over 80% of companies report that they introduced at least one type of innovation in 2006-2008. About half (45% to 50%) of companies stated that they have made innovations of all of the above types. Similarly, for EU enterprises, innovation as a primary or significant source of income does not vary according to company size. Since 2006, 49% of surveyed enterprises have introduced new or significantly improved organizational solutions (e.g. in knowledge management, workplace organization, external relations). In addition, since 2006, 46% of EU firms have introduced new or significantly improved business processes (e.g. in production, distribution, supports). A similar number of companies in the EU (45%) have been engaged in the introduction of new or significantly improved marketing strategies (Table 5) [13, p. 6]. According to one research study [20, p. 53] more than four out of ten (42%) EU-27 enterprises introduced new or significantly improved products, services or processes, 28% introduced new or significantly improved organizational structures and management methods, while 27% introduced new or significantly improved marketing strategies or distribution methods.

Income from the sale of unchanged or slightly changed products dominates total sales by innovators in the Serbian economy (37%). Sales of products/services that are new to the company make up 9.1%, while products/services new to the market account for 3.8% of total sales (Figure 3). Non-innovators are companies that have introduced no innovation whatsoever. We can obtain a good understanding of innovativeness levels in Serbia if we analyze data on sales in the innovator market. The majority of innovators

Table 5: Forms of innovation implemented in enterprises by country and EU-27

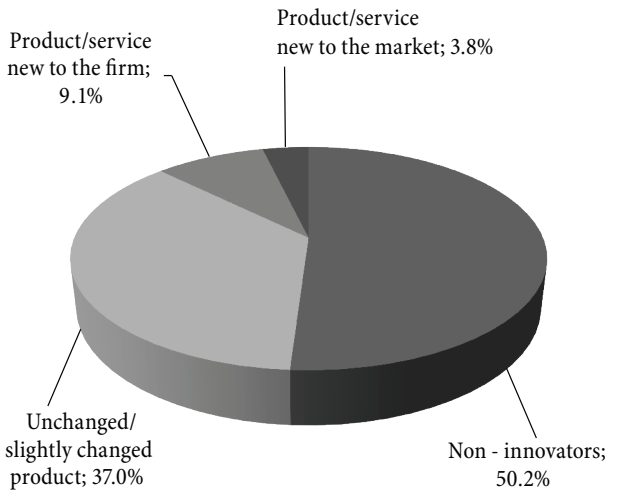
Country	Forms of innovation				
	New or significantly improved products	New or significantly improved services	New or significantly improved processes (e.g. production processes, distribution methods, support activities)	New or significantly improved marketing strategies	New or significantly improved organizational structures (e.g. knowledge management, workplace organization or external relations)
Slovenia	45.1	61.4	59.3	50.1	61.5
Hungary	22.5	21.1	11.9	17.1	15.9
Romania	56.7	55.7	45.4	47.9	61.5
Bulgaria	40.3	33.9	36.2	35.8	33.5
Italy	49.0	41.2	40.5	47.2	44.3
Czech Republic	51.8	60.4	49.9	49.1	47.9
Germany	35.2	61.5	47.1	47.8	53.4
EU27	45.3	50.1	45.8	45.1	49.2

Source: [13, p. 103]

consist of those who sell products/services in the local/regional market (49.1%), followed by companies that sell at the national level (40.7%), and finally innovators selling in the EU and European Free Trade Association region (sales of which are one-third those at the national level) and other markets in the world with the least sales activity (7.1%), while other markets make up only 3.1%. In 2006-2008 in the EU-27, innovation expenditure activity as a percentage of turnover was 2.21% (Sweden 4.45%). Of total innovation expenditures in Serbian companies, the majority was made up of the acquisition of machinery, equipment, or software (Figure 4 and accounted for 80% of all innovation costs, which is close to the EU-27 average (76%) [13, p. 7], [13, p. 318].

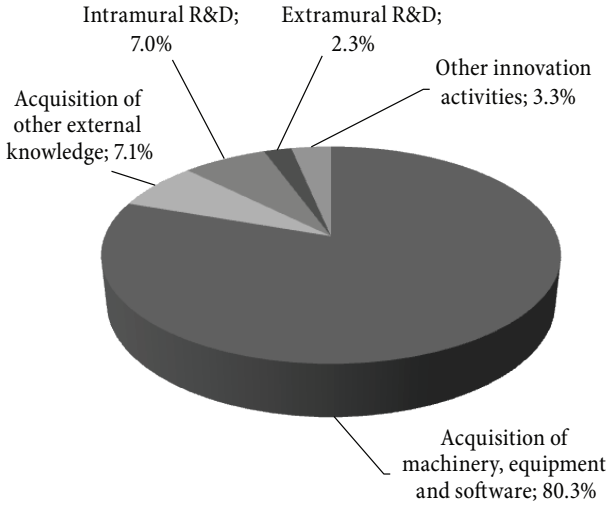
New products and services form the basis for new ventures creation. In other words, founding small and medium-sized enterprises (SMEs) aids the commercialization of inventions. European SMEs are innovative. Of those with activities in innovation, 27% introduced in 2008 new or improved products to the market. Over the last 35 years the USA has displayed a much better capacity to create and grow new companies in research-intensive sectors. SMEs dedicate more than 45% of their innovation expenditure to machinery, equipment, and software. SMEs in advanced economies invest more heavily in the production and acquisition of new knowledge [16, p. 9], [16, pp. 316-317]. An analysis of the development level in 2010 of SMEs and entrepreneurial ventures shows that this sector is lagging behind the EU average and most of the comparable

Figure 3: Income structure of innovators in Serbia



Source: [45, p. 3]

Figure 4: Innovation expenditure structure in Serbia



Source: [45, p. 4]

economies (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovenia) [32]. Comparative analysis of SMEs and entrepreneurial sector development between Serbia and the EU reveals a significant falling behind of Serbia in terms of turnover per employee, gross added value per employee, and net profit per employee. If we compare investments per employee and total investments per firm, we find that Serbia invests 3,400 Euros per employee on average (EU average is 7,400 Euros) and 8,700 Euros per firm (EU average is 33,400 Euros annually).

The number of patents represents another important indicator of innovation activity. In the course of 2012, the Intellectual Property Office of the Republic of Serbia received 224 patent applications, out of which domestic applicants made 191. If we analyze the number of patent applications per million people, in Serbia that value in 2012 is 31. If we look at EU-27 score in 2010, the ratio of patents per million inhabitants was 109. In terms of patent applications per million inhabitants, Sweden was at the top (308), followed by Germany (267) and Denmark (244).

Conclusion

Innovations are the most significant source of competitive advantage and economic growth. Our knowledge-based economy alters the very nature of the innovation process and affects the creation of new types of innovation. The innovation process itself is a process of creation of new knowledge and the application of that knowledge. In a knowledge-based economy, innovations therefore increase in significance because they represent the core renewal process in any organization. Innovation is a tool for undertaking changes and entails a broad spectrum of various changes. Very often, these changes involve the creation of new competitive advantages at the expense of the old ones. Some innovations are purely a reaction to external threats, while others are a proactive attempt to seize opportunities on the market. Businesses should therefore aim to reach and maintain harmony between their environment, values, and resources, by introducing innovations as the result of either external factors or internal possibilities. The period needed for innovation introduction and diffusion is no longer measured in decades. Instead, that period has shortened significantly and nowadays it can be measured in years, sometimes months. The process and role of innovation should be observed in the context of a contemporary business environment that is characterized by frequent, wide, and mutually encouraged changes. Entrepreneurial and proactive behavior is no longer a choice, but a necessity, since it demands the creation of new relations with the business environment. Success is measured by the ability to survive and to prosper through innovation. We are witnessing the impact of innovations on creating new economic, political, and social relationships that have a global influence on uncertainties in the business environment.

The conclusions and results presented in this paper should enable a better understanding of the role and importance of innovation in the process of creating competitive advantage by companies operating in a knowledge-based economy. By doing this, we may find a theoretical framework that explains and models the innovation process management. On the practical side, the objective of the paper is to provide a broad analysis of innovation-based competitiveness in Serbia, by using available data on indicators of innovativeness. Comprehending innovativeness aims to enhance the existing managerial practice since ability to manage innovations represents the basis for competitiveness. Therefore, the paper emphasizes the importance of the formulation and implementation of various innovation strategies because the chosen strategy represents desired path of change. Further research in this field should focus on a more detailed analysis of relevant processes and interactions in the process of managing innovations. Knowing the nature of innovations is vital for their appropriate use. This is important since innovation is not limited to the technological field. Another important issue is the fact that Serbia's economic crisis is not cyclical, but structural, and innovations are the drivers of positive structural change.

Competitiveness is ensured through a strategy that represents a non-standardized and consistent idea that navigates a business through turbulent times. The non-standardized character of this is the basis for innovation. Although the significance of innovation is undisputed, there is no universal formula for innovation success. It is a

process that has to be enabled through sophisticated and active management. In a knowledge-based or innovation-based economy, at the core of the value-creation process is intangible-assets management, and intangible assets are closely connected to innovativeness. Various forms of intangible assets (training, expertise, innovativeness, corporate culture, personal links, databases, information capital, customer relations, reputation, and so on) are the most significant inputs of innovation activity. On the other hand, the results of innovation activity are related to certain components of intangible assets (technological knowledge, patents, new technologies, new or improved customer relations, etc). Different quantitative measures can be applied for measuring innovative capacity at the national, corporate, and business level (Innovation Index).

The most developed market economies base their competitiveness on knowledge, company innovations, strategies, and sophistication of their business model, and far less on natural resources and cheap labor. All EU countries tend to strengthen their competitiveness by passing adequate action plans that stimulate enterprises' innovativeness. Our research shows that there is a low level of domestic competitiveness in the Serbian economy. Serbia is lagging behind significantly in terms of innovation performance compared to neighboring countries and the EU (67.1% average of EU-27). Development of the SME sector is a good measure of an economy's innovativeness, since SMEs commercialize inventions. This sector in Serbia is also behind the EU average and some comparable economies (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovenia). Firm size in Serbia is a key factor in its innovation activity, where large companies tend to be more innovative. In the EU, however, firm size does not influence the level of innovativeness. The current structure of education for Serbians and investments in knowledge acquisition are unsatisfactory. Serbia belongs to a group of countries that invest poorly in R&D, measured as a share of GDP, suggesting that these investments are made largely by the public sector.

In an innovation-based economy, company value is predominantly determined by intangible assets, which represent the most important input for innovation activity. The ratio of market to book value of a company is one measure of its intangible-assets value. Intangibles are between one-half and two-thirds the total value of a modern company. For most successful companies around the world, the percentage of book value of total assets that are intangibles is around 50%; for Serbian companies, the figure is around 3%. Empirical researches show that the corporate success of the most profitable Serbian companies is in no way determined by the efficient exploitation of intellectual capital. When we analyze the income structure of Serbian innovators, the income from selling unchanged/slightly-changed products dominates. In addition, these companies primarily focus on selling their products/services in the local/regional market. In addition, when we look the structure of different forms of innovation in the innovation portfolio, Serbian enterprises fall behind and relate to poor level of domestic economy competitiveness.

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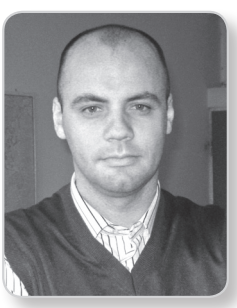

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