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Innovations in Enlarged European Union from the Point of Innovation Diffusion Theory

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The article analyzes the main possible dynamics of innovation system in enlarged European Union (EU). The governance of the EU innovation policies, underlining the cooperation and emergence of national innovation cultures and governance structures are shown by presenting three possible scenarios. The main issues concerned in the article are: the challenges and opportunities in the innovation and science research fields of enlarged EU; the European Research Area (ERA) creation, highlighting three components of knowledge management: production, dissemination and exploitation of knowledge. Also the article informs about the Sixth Framework Programme (FP-6) and its implementation instruments that are focused on research and technology activities and innovation. Based on theoretical assumptions, were examined factors explaining the differences of innovation diffusion process in different countries, analyzing the impact of country, culture and time to innovation diffusion. This study emphasizes that the ERA is the broad heading for a range of connected policies that attempt to ensure the development of European research and facilitate the research policies of Member States in order to improve the efficiency of European research capabilities. The final issue identified was to encourage R&D and innovation as part of corporate strategies and management policies so that they were fully integrated into the government, education and business sectors across the whole EU.

Keywords: *innovation, innovation diffusion, enlarged European Union, European Research Area.*

Introduction

In the resent years, knowledge and innovation became the impellent in all spheres of economic and social life. Innovation development, use and diffusion become an important research issue not just at country national level, but also at international scale (Dekimpe et.al., 2002; Sundqvist et. al., 2002). Studies of the innovation development and diffusion in particular region or state took new order and much wider extent. The main reasons for this is technological progress, changes of business environment and the enlargement of EU. Last year EU has extended its membership from 15 to 25 countries and EU market has reached over the 450 million consumers. This enlargement is one of the most important opportunities to compete in global economy, but also one of the greatest challenges to unite national innovation systems and create solid knowledge-based economy of the EU. Due to the enlargement, grows the divergence and the competition between the local and international innovation systems. European political system on the one hand aims to strengthen the competitiveness of an economy or of selected sectors in order to increase societal welfare through economic success and on the other hand stimulate cooperation between diverse national or regional innovation cultures (Kuhlmann, Edler, 2003). Research and Technological Development (RTD) are an essential element in the functioning of innovation system in the EU Member States. Organising co-operation at different levels both within Europe and internationally, co-ordinating national or European policies, networking teams and increasing the mobility of individuals and ideas is therefore a requirement resulting from the development of modern research in a global environment. But the current situation in this area is not satisfactory. There are very few individual research teams or laboratories or companies that could possess high level research activities. Even entire countries find it increasingly difficult to be active and play a leading role in the many important areas of scientific and technological progress.

The main objective of the EU government is to reduce economic inequality among the members of the EU and to improve innovation-based competitiveness and economic dynamism by embracing knowledge and innovation, not only to scientific research, but turning that knowledge into new and profitable business fields. European Commission, Member States and the European Parliament, the scientific community and industry are committed to work jointly towards the creation of an ERA and its international dimension. The Sixth Framework Programme is the main financial and legal instrument of the European Commission to implement the ERA, together with national efforts and other European co-operative research activities. This framework programme will support collaboration in research and innovation fields promote mobility and investment in mobilising research in support of other EU policies.

Historically, innovation policy grew out of science and technology policy, but it has subsequently absorbed aspects of enterprise policy too. Initially, technological progress was assumed to be achieved through a linear process starting with basic scientific research and progressing through more applied levels of research into areas such as marketing and the final launch of a new product or process. Science was seen as the driver of innovation and, as a result, governments concentrated on science policy. Community-wide policy interest in the subject of innovation took off in the mid-1990s. Since this date, numbers of models have been proposed to achieve such tasks as repro-

ducing a life-cycle sales curve, sales forecasting, helping management to choose the price and advertising strategies that give the firm the best expected returns (Mahajan, Muller, Bass, 1990; Rogers, 1995). An understanding of how an innovation gets adopted and diffuses in particular culture and why there are differences in the innovation diffusion process among countries can shed light on this important aspect of international science research.

Research aim – to evaluate the tendencies of enlarged EU innovation policy development and highlight the main components of the innovation diffusion process, from the point of diffusion theory.

Research object – development of innovation policy in the enlarged EU and new member states aimed to create united European Research Area.

Research methods – analysis and synthesis of scientific literature, statistical data analysis and theoretical forecast.

Background

The innovations that have been studied in diffusion research have mainly been technological innovation. Whenever there was an innovation in the history of man (e.g. gunpowder, cars, computers, mobile phones) we could have described the diffusion of this innovation. Diffusion (derived from the Latin word "diffundere"–"to spread") is described by Rogers (1995), as the process by which an innovation, that is a new idea, is communicated through certain channels over time among the members of a social system. The innovation diffusion process consists of four key elements (Mahajan, Muller, Bass 1990):

1. Innovation creation.
2. Communication channels.
3. Social system.
4. Time.

1. Innovation – is an idea, practice or object that is perceived to be new by a person or adopting entity (Rogers, 1995). The idea of innovation encompasses new products, services, new production process technology, new plan, program or even ideas that entail modifying an existing entity. But for example, dictionary definitions of innovation are usually centered on the development and successive refinement of inventions into usable products (product innovation) or techniques (process innovation) that are deemed worthy of being launched on a market or used internally within an enterprises.

Following on other scientists seminal research Robertson (1971) introduced three kinds of innovations:

- *discontinuous* (supplanting transparencies with PowerPoint as the medium of visual communication).
- *dynamically continuous* (moving from a traditional chalkboard to transparencies).
- *continuous* (using colored chalk to supplement white chalk).

Some innovations diffuse relativly slower and other diffuse faster. To explain this statement, Rogers (1995) suggest five major attributes of innovation that influence the rate of their adoption. These attributes are selected as the only independent variables under consideration in the current effort, because prior research has found that these antecedents tend to be the most consistent and strongest predictors of innovation adoption rate.

- *Relative advantage.* This factor is defined as a degree to which innovation is perceived as being better than that which precedes it (Chakravarty, Dubinsky 2004). To be considered superior than its predecessor, the innovation must be perceived by the target group as providing benefits that are truly advantageous (technological, economic, physical improvement).
- *Complexity.* This attribute represents the extent to which an innovation is difficult to understand or use (Robertson, 1971; Rogers, 1995). If an innovation is complex, individuals will have inadequate knowledge, skill and experience to use it. These circumstances will likely impede the innovation adoption rate. To deal with an innovation that is complex, potential adopters may need to be educated about it, thus acquiring new knowledge about it (Gatignon, Robertson, 1985).
- *Compatibility.* Compatibility is defined as a degree to which innovation is consistent with existing values, past experience and current audience needs (Rogers, 1995). When an innovation seems to complement individual present situation, they possess less uncertainty about the successor, when it fits in with their present circumstances and may require little new learning or behavior change, then adoption of innovation can be facilitated.
- *Observability. T*his factor is defined as a degree to which an operations and results of innovation are observable, visible or readily communicated to others (Chakravarty, Dubinsky 2004). An innovation that is manifested to others gains rapid awareness and recognition among the targeted group, and even ultimate acceptance. Current adopters legitimize the innovation through adopting it, thus providing endorsement of the innovation, and thus fostering faster adoption. Basically, because the innovation can be seen clearly by others, information about the innovation is revealed and it makes the rate of adoption higher.
- *Trialability.* It is a degree to which an innovation can be tried on a limited scale (Robertson 1971; Rogers, 1995). Those innovations that can be used on a trial basis with minimal investment of time, money, or effort have an advantage over their counterparts that do not possess this attribute. Trialability allows individuals to do "try and buy''. If tryout the innovative idea, practice, or product seems to satisfy individuals' needs, then they are likely to adopt it; if not, they will probably reject the innovation.

These five foregoing attributes influence the innovation adoption process, as well as attitudes and intentions thus they are pertinent for examining their impact on consumers trading reactions. Although somewhat empirically related, they also are conceptually distinct (Rogers 1995).

2. Communication channels. Diffusion theory's main focus is on communication channels, which are the means by which information about an innovation is transmitted to the social system (Mahajan, Muller, Bass, 1990). The na-

ture of information exchange relation determines the conditions under which a source will or will not transmit the information to the receiver. There are two main communication channels:

- *Mass-media* – external influence, most efficient way to create awareness knowledge of an innovation.
- *Interpersonal channels* – internal influence, more effective in persuading in individual acceptance of a new idea.

Members of social system have different propensities for relying on mass media or interpersonal channels when seeking information about innovation. Most individuals evaluate an innovation, not on the basis of scientific research, or experts opinion, but through the subjective evaluation of peers who already have adopted the innovation. Interpersonal communication, including nonverbal observation, is important influence in determining the speed and shape of the innovation diffusion process in a social system.

3. Social system. The social system constitutes a boundary within which innovations diffuse. The members or units of a social system may be individuals, informal groups or organizations. The innovation diffusion-adoption process in a social system was identified by Rogers (1995) who has classified members of a social system on the basis of their innovativeness (Figure 1):

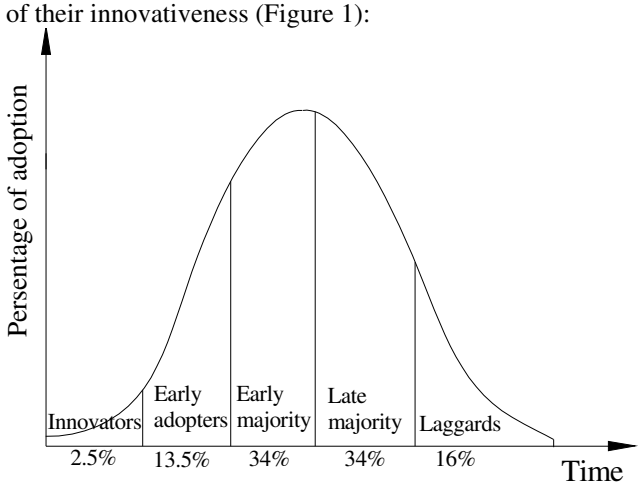

Figure 1. Innovation diffusion – adoption curve.

Source: Rogers (1995)

- *Pioneers (Innovators).* The innovators play an important role in the diffusion process, launching the new idea in the social system by importing the innovation from outside of the system's boundaries.
- *Early adopters (Visionaries).* Members of this group are more integrated in the local system than innovators. Early adopters have the greatest degree of opinion leadership. This category is as a local missionary for speeding the diffusion process.
- *Early majority (Pragmatics).* The unique position between the early and late adoption, makes this category an important link in the diffusion process. The early majority is one of the two most numerous adopter groups, making up one – third of the members in a social system.
- *Late majority (Conservatives).* This group adopts innovation relatively late. They adopt more for economic or peer pressure reasons, not for usefulness. Because of scarce resources, late adopters try to avoid uncertainty and secure from the possible failure.
- *Laggards (Skeptics).* They possess almost no opinion leadership. Laggards are the most locative in their outlook and decisions are often made in terms of what has been done previously. Their resources are limited and they must be certain that a new idea will not fail before they can adopt.

Innovation diffusion-adoption curve as an analytical tool can be used in two main ways. First it can be used to understand the stage at which customers are in adoption of innovation. For example, the Internet is now a well-established tool and in many developed countries we are into the late majority phase of adoption with large numbers of users of services. But if we look at WAP technology it can be seen that we are in the innovator phase, so investment now may be wasted since it is not clear how many will adopt this product. Secondly it can be used to look at adoption of innovation by other business – from an organizational perspective.

4. Time. This fourth element is concurrent in innovation diffusion process. The time before new product attains major sales is divided in four main stages: product development time, incubation time and mass diffusion time of the new product. This part is focused on the third, diffusion time stage. It is the time through which an individual or other unit passes from first knowledge of an innovation to forming an attitude towards the innovation, to a decision to adopt or to reject, to implementation of new idea and to confirmation of this decision.

Diffusion process usually follows the S-curve. But also, there are possible variations in this curve. As is shown in (Figure 2), some innovations diffuse relatively rapidly and S-curve is quite steep (1 curve), other innovations have a slower rate of adoption and the S-curve is more gradual (2 curve). For example, chemical products, crude steel or automobiles are slow diffusing products, while electric appliances like microwave oven or color TV belong to the category of fast diffusing products (Hirooka, 2003).

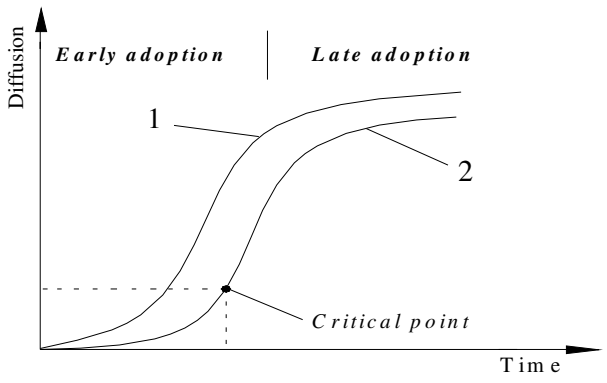

Figure 2. The innovation diffusion process (S – curve).

Source: Mahler & Rogers (1999)

Rate of adoption is slowly diffused in the early stage of diffusion, and that the rate of adoption increases fast

after the critical point (critical mass) is reached (Figure 2). The critical mass is defined as the minimal number of adopters of an interactive innovation for the further rate of adoption to be self-sustaining (Schoder, 2000). Before the point of critical mass is reached, the number of customers adopting the innovation is growing very slowly and it is not yet sure if the innovation will be successful. When the critical mass is reached and the critical point is passed, this mean there are many customers already adopted the innovation, so the innovation diffusion process becomes fast.

Because of different innovation nature and different consumers attitude to the innovations, diffusion can follow different trajectories. Also the diffusion of innovation is easily disturbed by economic turbulences, such as recessions or wars. Sometimes the demand for products in periods of turbulence is greatly decreased and the curve diverges from the locus of the S-shape. After the recession, the diffusion of the innovation resumes and takes the same slope of S-curve as before the recession (Hirooka, 2003). It strongly supports the fact, that the diffusion of new product has its own inherent trajectory with a definite diffusion coefficient.

International innovation diffusion

To transform global challenges into new opportunities, multinational firms are realizing that the key to growth and survival is the continuous development and introduction of the new ideas, new products, which are sensitive to market needs, competition and company resources on the international scale. To compete effectively in the international markets, managers require insight into how a product gets adopted in different countries. For example, can international marketers identify specific cultural traits that may help them to forecast how quickly a new product will be adopted in a particular country or in a group of somehow related countries?

The diffusion of an innovation is a culture specific phenomenon and the differences in the adoption process can be explained to a great extent by country – specific factors. The factors explaining international diffusion may be grouped in three main blocks:

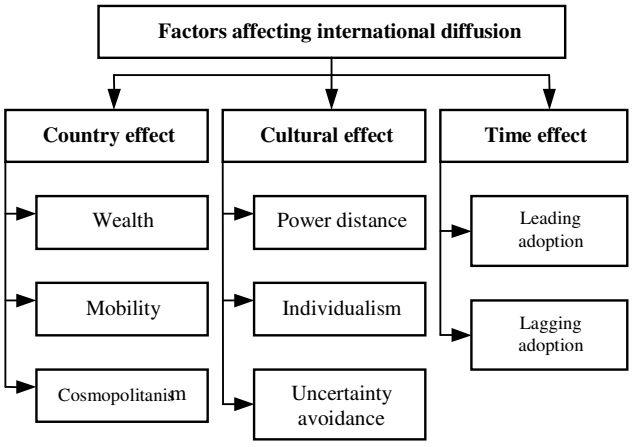

Figure 3. Factors of international innovation diffusion process.

Country effect. Wealth is the most often applied variable representing country effect, positively affects the diffusion by reducing the county's adoption time and speeding the diffusion within the country. The findings of international diffusion studies, have confirmed, that wealthier countries adopt earlier (Dekimpe et al., 2000). Also these countries have a significantly larger potential for the diffusion of innovation (Sundqist et al., 2004). Standard of living, education level, network infrastructure and cosmopolitanism in particular country have a positive impact in the innovation diffusion rate.

Cultural effect. Measuring culture on a global scale is a difficult issue. Most widely applied measures in this field are Hofstede's indices. He labeled the dimensions of culture as:

- *Power distance.* The higher is the power distance, the slower is diffusion of innovations. (lowest is in Austria, highest in Philippines).
- *Individualism.* According to Sundqist (2004), more individualistic countries are more innovative. (USA is most individualistic, Venezuela is most collectivistic).
- *Uncertainty avoidance.* Adoption of innovation always is associated with risk and uncertainty. To avoid the risk, countries with higher uncertainty avoidance adopt innovation by imitation. (highest in Greece, lowest in Singapore).
- *Masculinity.* The more masculine country, the faster the diffusion of innovation. (Scandinavia is most feminine, Japan is most masculine).

Time effect. Consistent findings in international diffusion studies, maintain that a later adopting countries have faster domestic diffusion patterns (Sundqist et al., 2004). Late adopters benefit from the experiences of earlier adopters. A country adopting an innovation later seems to have a faster diffusion as consumers in lagging markets have an opportunity to learn from consumers in leading markets. Innovations generally occur in developed countries, while imitations occur mostly in the poorer countries (Glass, 2003). According to the economic study new technology is spread rapidly, as it often pays innovators to share their knowledge, rather than to hoard it to themselves. While innovation might spread across the economy as a result of financial inducement paid to innovators, other economists argue that the only way to motivate innovation is by offering protection from imitation.

To support these theoretical statements, as an example, we analyzed the diffusion of Internet in some European countries (Figure 4):

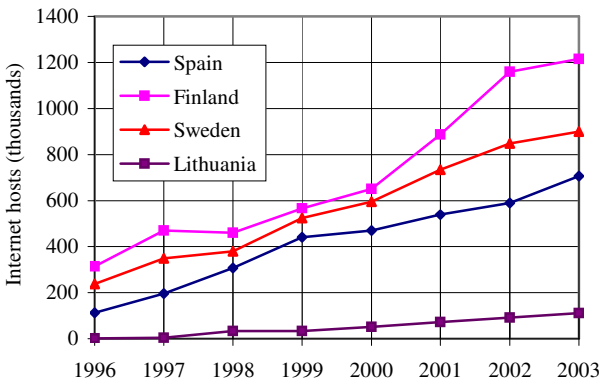

Figure 4. Internet hosts (thousands) in EU countries.

According to Dekimpe (2000) economic, regulatory and cultural issues are among the factors affecting use and diffusion of Internet in different countries. Results of statistical analysis of Internet diffusion confirm, that highly innovative, economically successful and wealthier countries adopt innovation faster and earlier. The Internet using in leading members of EU, like Sweden and Finland is much higher than in Lithuania or other new member states. In 2003 there were over 1200 thousand Internet hosts in Finland, over 900 thousand hosts in Sweden and just over 100 thousand in Lithuania.

Government is also implicated in the innovation diffusion process. There are two main policy tools that are used to stimulate innovation performance. On the one hand, government provides direct funding to enterprises that fulfill certain criteria to stimulate innovation. This is most common in areas of basic research, where government effectively takes on the responsibility for providing innovation as a public good. The second option for government is to introduce protection for intellectual property rights, in the form of patents, copyrights and trademarks that prevent innovations being copied. This approach is sometimes criticized as it blocks the diffusion of innovation for a number of years before they can be generically copied. On the other hand, many writers argue that if such guarantees of exclusivity did not exist, then enterprises would not have enough significant incentives to innovate in the first place. On the basis of these theoretical assumptions we come to the innovation processes in EU. Especially now, then EU has extended its area, international innovation policy is one of the most important issues for the government of EU.

Patterns of the European Union innovation policy

Enlargement of the EU is both a huge challenge and an unprecedented economic opportunity. The challenge lies in a reduction of economical inequality across the EU and managing a European Single Market. EU of 25 Member States has to deal with a large gap in income and productivity. The new Members States have a within country income distribution relatively similar to old 15 Member States, but their average income is considerably lower. Moreover, new Member States represent 20% of the population of the 15 Member States, but only 5% of their GDP. This means that total inequality is bound to rise by about 20%. Economical and social inequality also causes difficulties in European scientific research and innovation systems. To foster growth in the new Member States and reduce these disparities over time will be formidable challenge to EU government. But the near history of European integration shows many examples of successful economic convergence. Italy, Spain and especially Ireland have all enjoyed a period of sustained economical growth. On the other hand, the opportunity lies in the establishment of a larger European Single Market encompassing around 450 million consumers. With the extension of EU economical area, especially arise the industrial and commercial opportunities.

Enlargement of the EU and the growing challenges of economic and technological globalization, functionally leads the innovation policy approach in Europe. With the enlarged EU, have expanded innovation policy areas and governance structure. The dynamics of economic internationalization, the present and upcoming technological regimes, controlling the competition and related patterns of specialization of national, regional or sectorial innovation systems, become the main discussion issues. Kuhlmann and Edler (2003) had presented three different scenarios, describing the future development of EU innovation policy:

1. Concentration and integration of European innovation policies in transnational areas. European institutions and the commission as the government at its core, governing major shares of public budgets, would be implemented and controlled by presumably centralized transnational bureaucracies. Following this scenario the political autonomy of the national innovation systems would decrease. An increasingly centralized and dominating transnational innovation policy area would emerge. The shape of national, regional or sectorial innovation infrastructures would depend to a considerable extent regulatory and investment decisions negotiated in transnational arenas and taken by strong transnational bodies.
2. Decentralization and rationalization of innovation policy arenas. The governance of the EU and its commission would progressively be retreating and its transnational institutions would be shrinking, concentrating now on the maintenance of the common European market and related regulation, supported by a certain concentration of foreign policies. The competition among various national or regional innovation policies would increase. Economically strong regions and related innovation systems may survive and thrive, even with relatively weak political systems at the national and European transnational levels.
3. Centrally mixture of competition and cooperation in integrated multilevel innovation policy areas. The third scenario ranges somewhere between the previous two. Political power and decision-making competencies would not crystallize around one central European institutional core (like in the first scenario), nor would they slip away to some strong but scattered regional domains. Instead, power and policymaking competencies would now be distributed throughout the European political system, consistently following the subsidiarity principle in terms of political agenda setting of decision making, regulation and implementation. Innovation policies would be based on a mixture of competition and cooperation between diverse but integrated regional or sectorial innovation systems and related policymaking areas.

The first scenario – strong centralization of innovation policy governance, will quite probably fail for many reasons, not just because of the enlarged number of member states and the resistance of the remaining more or less strong elements of national political and innovation systems, but also as a consequence of an overload of policy complexity. It is more probable that the second scenario – decentralization, increased competition of regional actors

and finally even disintegration of political and innovation systems could come true. This scenario bears the strong risk that regions or nations with less-developed innovation capabilities will fall behind, thus widening existing socio-economic gaps. The envisaged enlargement of the EU may support such a development as long as no mechanisms of shared responsibilities have been established, such as depicted in the third scenario. Although there is no immediate evidence yet, there is some degree of probability that some variation of the third scenario co- evolution of post-national political and innovation systems will come into existence. The EU Commission's recent attempt to facilitate the creation of an integrated ERA can be interpreted as a step in this direction. Given the institutional diversity across the present regional and national innovation systems, the prospects of this initiative might be better, the more it will be embedded in a governance of shared responsibilities among various types of actors and levels of aggregation and hierarchy. Whether such a new governance structure will be robust and sustainable or weak will depend, not least, on the consciousness and openness of the involved participants and the flexibility of the related institutions of the political systems.

Creation of European Research Area (ERA)

The main goal of enlarged EU government is to improve the competitiveness and economic dynamism by embracing knowledge and innovation and by ensuring environmental and social sustainability in the long run. This meant supporting the EU macro-economic framework with a coordinated strategy of micro-economic and social reforms including a regular monitoring of their implementation. The EU innovation strategy encompasses a wide range of policy measures, but the central planks are the supply side of innovation (knowledge production) and demand side of innovation (dissemination and transfer of innovative products). The orientation of European Community RTD policies seek to develop a systematic view of the innovation process, to become more demand oriented and, therefore, to give more attention to the application and diffusion of innovation. Diffusion of innovation often relates to other core areas, such as R&D, information and communications technology networks or enterprises entrepreneurship. But firstly, knowledge and innovation creation means support foremost of research and technology development field. EU government aims to strengthen EU scientific and technological bases by establishing a united European Research Area in which scientific knowledge and technology diffuse and circulate freely. The idea of a ERA grew out of the recognition that research in Europe suffers from three weaknesses: insufficient funding, lack of an environment to stimulate research and exploit results, and the fragmented nature of activities and the dispersal of resources. Recently, scientific research and technological development more particularly are at the heart of what makes society tick. More and more, activities undertaken in this domain are for the express purpose of meeting a social demand and satisfying social needs, especially in connection with the evolution of work and the emergence of new ways of life and activities. By creating new products, processes research and technology provide one of the principal driving forces of economic growth, competitiveness and employment. It is the best way of modernizing European companies, which Europe must do to improve its competitive position. In overall terms, both directly and indirectly, they help to maintain and develop employment. In line with the concept of ERA, a strong coupling is needs between the three components of knowledge management: production, dissemination and exploitation of knowledge. There are three main sectors of stakeholders, interested in Community research, either on the demand or on the supply side of knowledge:

- Governmental sector (politico-administrative, intermediary authorities, governmental research organization).
- Education and science sector (universities, research institutions).
- Private sector (industrial enterprises, engineering companies).

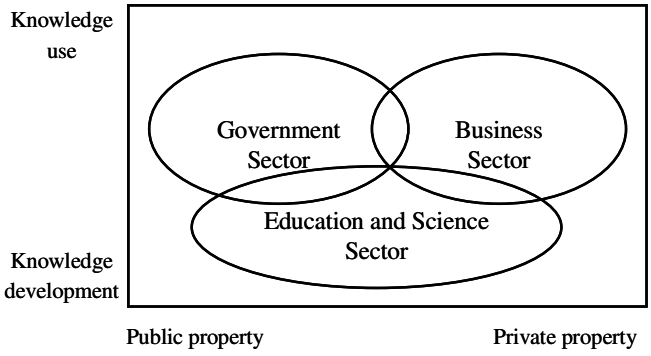

Figure 5. The role of knowledge in the society sectors.

The governmental and business sectors are more interested in exploitation of research results (focusing on demand of knowledge) and education and science sector focuses on dissemination and transfer of knowledge. As a consequence, all three sectors are independent; each sector has its own strategy and has developed its own practice, for example: patent protection, R&D tax credits, production subsidies for firms bringing new technologies to market (government sector); teaching and training, codification and development of technical knowledge (education and science sector); technical standard setting, technology and industrial extension services, persuasion and consumer information (business sector). These corporate strategies have to course a direct impact on the decisions for research and technology development activities. The EU has to encourage the development of harmonious relations between science and society and the opening-up of innovation in Europe, as well as contributing to scientists critical thinking and responsiveness to societal concerns, as a result of the establishment of new relations and an informed dialogue between researchers, industrialists, political decision-makers and citizens should encourage and support the cooperation of industrial (including small and medium-size) enterprises, research institutions and universities. In order that researchers could freely cooperate and exchange their findings across borders and industrial enterprises could freely exploit European Market potential.

For this reason, European Councils of Barcelona 2002 and Brussels 2003 has set the goal of raising EU invest-

ment in R&D to 3% of GDP by 2010 (2% coming from private sector and 1% from the public budget). Sweden (4,27%) and Finland (3,51%) are the only two countries whose R&D intensity exceeded the 3% level. But for other Member States to reach these objectives will be big challenge, especially to the new Members of EU, including the Lithuania and other Baltic countries. The current investment in R&D in Lithuania is around 0,7% from the budget and around 0,3% from the private sector. Moreover, the Barcelona target stipulates that two thirds of R&D investment should be made by the private sector. This balance is evident just in three countries of EU: again Sweden (71,9%), Finland (69,5 %) and Ireland (67.2 %). Luxembourg (90,7%) appears at the extreme end of the scale, while in other countries (Lithuania, Hungary, Poland and the others mostly new Members State) R&D expenditures represent less than 40% of the business sector investment (Statistics in focus: Science and technology, 2005) (see Figure 6).

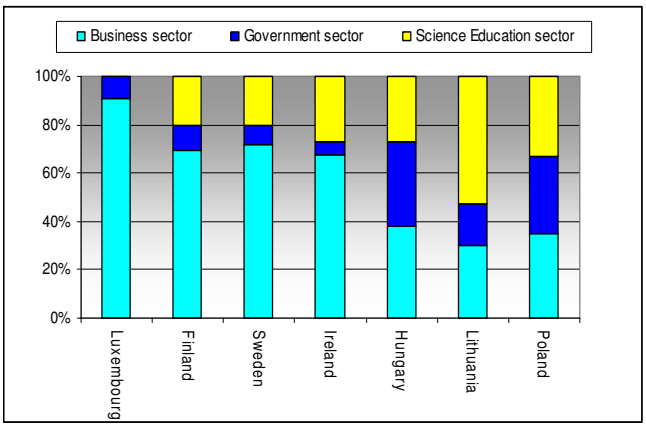

Figure 6. R&D expenditure by institutional sector of performance in the EU countries (2003).

Many difficulties stand on the way of ERA creation, not least the fact that new member states GDP per capita is some 2,5 times lower that the EU average, and the country's research and innovation system is only now being rebuilt. For these countries a priority should be given to the prospects of the research development of their innovation potential. So, EC has urged new Member States to take concrete actions on the basis of the Commission's proposed R&D Action Plan and encouraged Member States to speed up the implementation of the ERA by the application of the new framework programme FP-6 implementation instruments.

Since 1984, EU Community research has been organized in framework programmes (FP) of 4 years duration. Each subsequent FP has been broader than its predecessor in its scope of technologies and research themes, with correspondingly higher expectations of its impact on the economy and society. FP has become increasingly heterogeneous, covering the fundamental, empirical research and the implementation, realization of the results in social and industrial fields. The current FP-6 research program extends over period 2002 – 2006. This programme has to serve two main strategic objectives: strengthening the scientific and technological bases of industry and encourage its international competitiveness. On an annual basis, the total FP-6 research budget (EUR 17,5 milliard) represents 5% of the public civilian research budget of the EU Member Countries and 4% of EC budget (Fernandez-Ruiz et.al., 2005).

The EU principal research funding tools had also played an important part in correcting some of the deficiencies in European R&D and bridging the gap between research and innovation in EU member states. The different types of projects and actions to implement FP-6 are also known as the instruments. There are a number of different instruments for multipartner research activities, individual and host-driven mobility schemes, special types of projects for SMEs, support for utilizing and developing large scale research infrastructures etc. Under FP-6 three new instruments have been developed for the implementation of Community research programmes:

1. **Networks of excellence (NoE) –** are multipartner projects aimed at strengthening scientific and technological excellence on a particular research topic by integrating at European level the critical mass of resources and expertise needed to provide European leadership. The main result should be a durable restructuring and reshaping of the way research is carried out in Europe in a given area.
2. **Integrated projects (IP) –** are multipartner projects to support objective-driven research, where the primary deliverable is generating the knowledge required to implement the thematic priorities. IPs should bring together a critical mass of resources to reach ambitious goals aimed either at increasing Europe's competitiveness or at addressing major societal needs.

These two new FP-6 implementation instruments are focused on space and time of European research. "Space" refers to the stakeholders groups whereas "time" refers to the transition between one programme (national or international) and the next one. The main difference between an IP and others international research projects lie in the ambition of the "space" dimension of the desired structuring effect. The main focus of an IP is thus on the production of knowledge, through RTD with emphasis on innovation. The main difference between a NoE and other international research projects lies in the ambition of the "time" dimension of the desired structuring effect. The priorities of NoE are dissemination and transfer of knowledge: each project is given the mission to speed excellence beyond the consortium, for example, through training.

There are more FP-6 implementation instruments that are focused on RTD and innovation: Specific Targeted Research Projects (STRP) and Specific Targeted Innovation Projects (STIP). These instruments are multipartner research, demonstration or innovation projects. They are an evolved form of the shared-cost RTD projects and demonstration projects used in FP6. Their purpose is to support research, technological development and demonstration or innovation activities of a more limited scope and ambition than IPs. STREPs are used in implementing the priority thematic areas, in other areas supporting Community policies and anticipating scientific and technological needs, in specific international co-operation research activities, and in research activities developing harmonious relations between science and society. STIPs are used in activities ex-

ploring, validating and disseminating new innovation concepts and methods at European level. More information is on the website: http://www.cordis.lu/fp6/instrument-strp

As a matter of fact, research and technology development in Europe has not reached the "critical mass" necessary to levy the public and private resources needed to face the many challenges ahead of the Union. These challenges cover a wide range of political, economic, technical, scientific and education issues. Time here is also a big constraint: critical decisions at the EU level need to be taken before the year 2015. The future of EU innovation policy now is based and restarted by new framework programme FP-7. With this programme EU should create the framework conditions for innovation in clusters, encourage the engagement of a wide range of local participants and stimulate cross-border policy learning.

The success or failure of the ERA depends naturally on the commitment of the stakeholders interested in joint research and in particular, in the achievement of the integration process of production, dissemination and exploitation of knowledge.

Conclusions

1. Modeling of innovation diffusion process suggests, that this process follows the S-curve, the rate of adoption is slowly diffused in the early stage of diffusion and it increases fast after the critical point "critical mass" is reached. Also the diffusion of innovation is easily disturbed by economic turbulences, such as recessions or wars.
2. Based on the theoretical assumptions we can conclude, that speed of innovation diffusion process in a social system depends on informativeness, innovativeness and preparation of society to adopt the innovation. So, seeking a better integration of science in society, policy makers and citizens should be equipped to make informed choices from the ever-growing range of options thrown up by scientific research and technological progress.
3. The latest enlargement of EU is one of the greatest challenges to create solid knowledge-based economy, by reducing economical inequality among members of EU and to increase its potential growth.
4. The rapidly advancing progress in RTD is in harmony with the diverse cultural backgrounds across the Europe countries. EU government should deepen the new scientific and technological developments and their application in international scale by conducting research, including also legal, social, economic, and cultural impact on the ERA.
5. The effective management of knowledge highlighting the integration process of production, dissemination and exploitation of knowledge has to be an essential feature of EU research and innovation strategy.
6. The innovative competitiveness of firms, countries and regions strongly depends on their ability to absorb, develop and transfer innovation, adapt management techniques and organize structures and networks with other firms and public support structures.
7. Seeking to create an integrated European Research Area, EU has to encourage and support the development of harmonious relations and cooperation of industrial (including small and medium-size) enterprises, research institutions and universities.
8. The successful innovation policy in EU will depend, on the consciousness and openness of the involved participants and the flexibility of the related institutions of the political systems.

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Inovacijos padidėjusioje Europos Sąjungoje inovacijų difuzijos teorijos požiūriu

Santrauka

Pastaruoju metu radikaliai pakitusios verslo sąlygos lemia didelius pokyčius ir nacionalinėje, ir tarptautinėje ekonomikos sistemose. Sparčiai augantys žinių ir informacijos srautai, inovacijų plėtros tempai greitina esamų struktūrų ir procesų valdymo kaitą bei didina reikalavimus verslo kokybei. Plečiantis Europos Sąjungai (ES), ypatingą reikšmę įgyja tokios inovacinės veiklos formos kaip kooperacija bei internacionalizacija. Dabartinėmis verslo sąlygomis kuriant žiniomis grįstą ekonomikos sistemą, vienas svarbiausių uždavinių yra formuoti struktūras ir priemones, spartinančias mokslinių tyrimų, inovacijų bei naujų techninių sprendimų įtraukimą į verslą ir įmonių veiklą. Gerai veikianti inovacijų diegimo sistema ne tik padeda išspręsti įmonėse kylančias problemas, bet ir atveria naujas galimybes įmonės vystymuisi. Todėl įmonės, norėdamos išsilaikyti rinkoje ir sėkmingai vystyti savo veiklą, privalo sugebėti greičiau reaguoti į kintančias rinkos sąlygas, aplinkos pasikeitimus, sparčiau modernizuoti ir kurti inovacijas bei naujas technologijas. Šiuolaikinių inovacinių procesų sėkmė priklauso nuo gebėjimo pasiekti ir kūrybiškai integruoti žinias, generuotas įmonės ar šalies aplinkoje. Tai, kaip šalyje yra suvokiami inovatyvumą lemiantys veiksniai ir procesai, lemia, kokios inovacijų vystymo strategijos ir priemonės bus pasirenkamos. Ypač tai aktualu tokioms valstybėms kaip Lietuva, kuri savo socialinio ir ekonominio išsivystymo lygiu gerokai atsilieka nuo kitų ES šalių.

Praėjusiais metais į ES buvo priimtos 10 naujų narių. Dabartinė ES rinka apima apie 450 milijonų vartotojų. Reikia pažymėti, kad ES plėtra yra susijusi ne tik su didelėmis galimybėmis konkuruojant pasaulinėje rinkoje, bet ir su naujomis neišvengiamomis problemomis dėl šalių narių netolygumo ekonominiu, socialiniu, moksliniu bei kitais svarbiais aspektais. Todėl šiuo metu pagrindinis ES siekis yra sukurti bendrą, žiniomis grįstą ekonomikos struktūrą, pabrėžiant mokslinių tyrimų bei inovacijų svarbą bei užtikrinant jos tolygų vystymąsi ir konkurencingumą.

Siekiant padėti mokslinių tyrimų bei kitoms šia veikla suinteresuotoms institucijoms veiksmingiau bendradarbiauti ir pagerinti jų vykdomos veiklos koordinavimą visoje Europoje, kuriama Europos Mokslinių tyrimų erdvė (EMTE). Pagrindiniai šios specialios erdvės tikslai – skatinti investicijas į mokslinius tyrimus ir jų taikomąją veiklą, didinti žmogiškųjų išteklių bei tyrėjų judėjimą derinant su nacionalinėmis ir tarptautinėmis iniciatyvomis. EMTE pabrėžiama nacionalinių mokslinių tyrimų programų sistemos sukūrimo svarba bei suderintų ir tikslinių ES mokslinių tyrimų projektų ir infrastruktūros vertė. Taip pat akcentuojamas pagrindinis žmogiškųjų išteklių – moterų bei jaunimo ir mokslo, inovacijų kūrimo sklaidos ir naudojimo – vaidmuo vystant Europos mokslą ir skatinant technologijų plėtrą ES. Tenka pripažinti, kad šiandieninėje ES mokslas ir technologijų kūrimas finansuojamas nepakankamai. Lėšos išskaidytos atskiroms institucijoms, o projektų finansavimas deramai nėra susietas su tarptautiniu bendradarbiavimu. Užsibrėžtiems tikslams įgyvendinti reikia didelių finansinių išteklių, todėl EMTE numatoma remti per tarptautinį bendradarbiavimą, fundamentalius tyrimus, mokslinių tyrimų infrastruktūros plėtrą bei tyrimų programų koordinavimą. Technologinė pažanga sąlygoja ekonomikos augimą, todėl investicijos į mokslą ir naujų technologijų kūrimą paspartins ekonomikos vystymąsi ES šalyse.

Ne mažiau svarbi užduotis kuriant EMTE yra ryšio tarp vyriausybės, verslo bei mokslo ir švietimo sektorių užtikrinimas, dirbant ta pačia linkme daugiakultūrinėje aplinkoje. Gerinant mokslo ir technologinės plėtros padėtį, Europos Komisija nusprendė padidinti mokslo sektoriaus finansavimą. Kuriant bendrą EMTE, ES vadovai viršūnių susitikimuose Barselonoje 2002 ir Briuselyje 2003 metais patvirtino nutarimą: mokslo vystymui bei technologinei plėtrai finansuoti iki 2010m. visos ES šalys turi skirti 3% BVP (1% iš valstybės biudžeto ir 2% iš privataus sektoriaus). Šiuo metu tik dvi ES šalys jau atitinka šiuos reikalavimus. Tai Suomija, kuri mokslo ir technologinės plėtros finansavimui skiria 3,51%, ir Švedija – 4,27%. Tačiau Lietuvoje kalbama tik apie tai, kaip pasiekti 1% iš biudžeto, o verslo sektorius gerokai atsilieka nuo ES reikalaujamų investicijų. Finansavimas iš verslo Lietuvoje sudaro tik apie 0,3% BVP. Lietuvos finansuojamų tyrimų tematika nepakankamai susieta su ES mokslinių tyrimų prioritetinės veiklos programomis. Mokslinių tyrimų finansavimas yra ne investicinio, o remiamojo pobūdžio, taip pat yra nepakankamas tarptautinis bendradarbiavimas. Todėl šiuo metu Lietuvai labai svarbu suformuoti šalies mokslo ir technologijų plėtros strategiją, kur būtų numatyta įsilieti į ES mokslinių tyrimų erdvę įgyvendinant Europos Komisijos nustatytus tikslus. Norint pasiekti ES pramonės konkurencingumą, turi būti skatinamas pramonės, privataus verslo ar finansinių įmonių, mokslinių tyrimų institucijų bei valstybinių struktūrų bendradarbiavimas vykdant inovacinius projektus ar tyrimų programas, mobilizuojant privačius bei valstybinius išteklius bei steigiant tam tikras technologines platformas.

Svarbiausia priemonė, skirta įgyvendinti EMTE, yra Šeštoji bendroji programa (6BP). Ši programa yra vykdoma 2002–2006m., ir jos biudžetas – 17,5 mlrd. eurų. 6FP orientuota į aukštos kokybės mokslinius tyrimus, skatinančius inovacijų kūrimą, sklaidą bei naudojimą, žmogiškųjų išteklių stiprinimą ir jų laisvo judėjimo užtikrinimą. Ypatingas dėmesys skiriamas žinių naudojimui silpniau išvysčiusiuose ES regionuose. 6BP siekia užtikrinti tarptautinius ryšius su kitomis pasaulio šalimis, piliečiams garantuojant galimybę mokytis visą gyvenimą. Programos pagrindinės veiklos sritys, susijusios su mokslinių tyrimų ir technologijų vystymu, yra dvejopo pobūdžio: EMTE struktūrizacija ir pagrindų stiprinimas; mokslinių tyrimų integracija ir stiprinimas. Netrukus 6BP pakeis Septintoji Bendroji Programa (7BP), kuri tęs ankstesnėje programoje pradėtą veiklą bei užsibrėžtus tikslus. Šioje programoje moksliniai tyrimai įgauna dar didesnę politinę svarbą.

Taigi bendros EMTE sukūrimas yra inovacijų kūrimo, sklaidos ir efektyvaus panaudojimo proceso pagrindas. Šios erdvės sėkmingumas bei inovacijų sistemos lygis ir efektyvumas labai priklausys nuo vyriausybinių, verslo bei mokslo struktūrų tarpusavio sąveikos nacionaliniame ir ES lygmenyje.

Raktažodžiai: *inovacijos, inovacijų sklaida, Europos Sąjungos plėtra, Europos mokslinių tyrimų erdvė.*

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