KNOWLEDGE AND INNOVATION - ESSENTIAL FACTORS FOR OVERCOMING THE CURRENT ECONOMIC IMPASSE

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Abstract: *Human resource is currently the most valuable wealth of a nation and carries with it the most important principle of development; it is about innovation, without which competitiveness is unthinkable. Romania is part of the "catching–up" group of countries in innovation. In order to assume new responsibilities and to prepare for the competition with other European countries and not only, many reforms and changes is necessary.*

Assuming these premises, in this paper, our intention is to analyze the situation of innovation at EU level and to see at what chapters our authorities must to work harder to equalize the other states from the Western European states. This thing is absolutely necessary because, now, when our country makes part from EU, it needs to invest in human resources through better education, skills and support.

Keywords: knowledge, innovation, economic impasse, technological change, research
JEL Classification: O1, O31, O32

1. INTRODUCTION

We live today in a world of rapid economic and social change. Any change typically causes other changes, which in turn cause others, and so on, in a concatenation of linked causes and effects. The fact that innovations, both technological and organizational/institutional, are the principal wellspring of economic growth is well recognized (Ruttan, 1978, p. 347). Is it also widely recognized that freedom, based on secure rights, is an essential prerequisite for the promotion of innovation and the increase in wealth that results from it (North, 1988, p. 25).

We can think of technological change as occurring in three stages: invention, innovation, and diffusion. Invention creates new technologies or improves existing ones. Until the nineteenth

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century, individuals, operating more or less on their own, were responsible for most inventions. In the second half of the nineteenth century, invention became institutionalized by the creation of research laboratories both in firms and in the public sector. Today, a large share of invention is done in government and university research laboratories or in the R&D facilities of large firms, while a much smaller fraction is performed by individuals. Innovation occurs when some agent commercializes an invention by producing something that has economic value. This can itself require much development and supporting inventions before the original invention can be embodied in saleable goods or services (thus blurring the distinction between the two). Diffusion is the spreading of invention and innovation from the place where they first occur to other firms in the same industry, to other industries, and to other countries. As technologies diffuse, they usually require changes to adapt to different situations. So, diffusion and innovation are to a great extend intertwined, they are different but closely related activities.

In many contexts, the distinction between invention and innovation is important. For example, many societies have been good at one but not the other. Being able to innovate on the platform of other people's inventions can be socially profitable, while being successful at invention but not at innovation can lead to serious social wastes. Since new technologies largely result from activities of profit-motivated agents, technological change is significantly endogenous to the economic system. Furthermore, scientific and technological knowledge is cumulative. Today's knowledge could not have been discovered or invented in the absence of many earlier discoveries and inventions.

Innovation is a process that is accumulative and it is surrounded by uncertainty (Lundvall, 1992, p. 15). It is impossible to separate innovation from evolutionary economics as well as from theories of technical change and institutional change. The interaction between innovation and economic change is an evolving terrain. It has been signaled that innovation can create employment and also can destroy employment. It means that there is something to be said about good and bad thing about innovation (Edquist, 1997, p. 27).

Modern societies are constantly adapting to new technologies. Because not all of these adaptations have been peaceful or trouble-free, technology has a bad name in some circles. That's why had existed some critics that emphasize the destructive aspects of innovation and technological change. It destroys specific jobs (while creating others), alters patterns of trade, and even eliminates entire ways of life (Nelson, and Winter, 1982, p. 48). The First Industrial Revolution destroyed the livelihood of many craftsmen, while moving work, from the villages to the new industrial towns, where the poverty and squalor that had existed for millennia in the countryside became visible to urban onlookers. The automation, restructuring, and downsizing that has resulted from the late

twentieth-century revolution in information and communication technologies (ICTs) has destroyed the jobs of many unskilled and semi-skilled factory workers as well as many in middle management. Also, while narrowing the gap between rich and poor through the first seven decades of the twentieth century, technological change has helped to widen that gap dramatically since then. But, in time, many researchers have demonstrated that technological change is the most important determinant of long-term economic growth. Through many thousands of years of economic and social evolution, our adaptations to the technologies that we have created have helped to mould and remould our economic, social and political institutions and our behavioral patterns.

2. THE CONNECTION BETWEEN INNOVATION AND ECONOMIC GROWTH

Growth depends on the introduction of innovations. Innovation means doing something that has not been done before. It could be the production of a new good, the opening up of a new market, the discovery of a new source of supply, the development of a new method of production, or changes in the rules of the game (Rosenberg, and Birdzell, 1986, p. 36).

To be leader in innovation and R&D is critical in today's hypercompetitive business environment. It involves years of patient investigation, punctuated by moments of inspiration. It positions uncontrollable creativity side by side with disciplined business process. And it is, for most companies, tremendously difficult to achieve. A successful innovating firm is the one in which the management succeeds to take maximum advantage of existing or potential markets and new opportunities by making appropriate use of the firm structures and resources (including R&D). On the other side, a successful innovation policy is a competition policy where companies see innovation as a cost-effective investment to differentiate them profitably.

The only effective measure of innovation activity is the rate of productivity improvement in an enterprise - the growth in added-value generated per employee. There are lots of ways to "game" productivity in the short-term - for example, by raising prices or by cutting staff and forcing the remaining people to work harder. But these can't be sustained - over time, they generate diminishing returns or, in the extreme case, lead to productivity erosion. What really counts is the ability to sustain and amplify productivity improvements through innovative products, process improvements or new business models. From a competitive point of view, what matters is the relative rate of productivity improvement. R&D spending and patent filings will matter little if they do not translate into faster productivity improvement - in fact, they can be a significant distraction. Those who understand this will have a significant edge as competition intensifies in the global economy. For a firm, R&D is useful to generate innovative ideas associated with design, quality and process

control, technical assistance to production and customers, or with pure research. R&D itself does not make a firm innovative. R&D can contribute to establish criteria for quality and to develop methods to verify them; also it should cooperate to find solutions to production and customers' problem. These activities are important if R&D is to really benefit a firm. R&D facilities must be interdisciplinary - they must include technical, marketing, economics skills to generate packages of new products/processes/services.

Research and experimental development comprise creative work undertaken on a systematic basis to increase the stock of knowledge to devise new applications.

In the knowledge-driven economy, innovation has become central to achievement in the business world. With this growth in importance, large and small organizations have begun to reevaluate their products, their services, even their corporate culture in the attempt to maintain their competitiveness in the global markets of today. The more forward-thinking companies have recognized that only through such root and branch reform can they hope to survive in the face of increasing competition.

Economies are slowly recovering from the most severe economic downturn since the Great Depression. To emerge from the downturn and put countries back on a path to sustainable growth, continuous innovation will be required. However, financing innovation becomes harder in economic downturns when both cash flows and investment funds are shrinking (OECD Science, Technology and Industry Scoreboard, 2009).

According to the *EU Economic Review* (European Commission, 2004), a substantial increase in knowledge investment (R&D and education) could boost potential EU growth rates by between one half and three quarters of a percentage point annually over a 5-10 years horizon. That's why, especially, in the recent countries integrated in EU (Romania and Bulgaria), it is necessary to increase the efficiency of R&D, improve the transformation of new ideas into new products, processes, services and solutions, and make the overall environment more supportive of firms wanting to increase investment in R&D. In this respect, the European Commission's action plan through *Europe 2020 Strategy* proposed a set of actions to boost public and private R&D efforts in order to approach R&D intensity (i.e. R&D expenditure to GDP ratio) of 3 % by 2020.

The level and intensity of overall expenditure on R&D are key determinants of the future competitiveness of an economy. But it is also important to look at the sectors in which this R&D is performed. The level and intensity of business R&D expenditure, as well as the structure of its funding, is therefore a key determinant of an economy's future competitiveness, and a key concern for policy-makers. This is why the European Council has stipulated that two thirds of R&D expenditure should be financed by the business sector.

A country's performance in the knowledge-based economy is not measured simply by outputs of science and technology, but must also be judged in relation to the important goal of increasing its competitiveness. A competitive economy is increasingly understood as an economy able to achieve sustained rises in standards of living for its population at low levels of unemployment. The key determinant of competitiveness is labour productivity. Gains in labour productivity are the result of increasing human capital, capital deepening and technical progress or innovation as measured by total factor productivity. The degree of innovativeness is determined by firms' own R&D activities leading to new products or processes and by spill-over effects that magnify the benefits of own R&D efforts, but also by diffusion effects associated with imported technology and the presence of multinational firms.

3. INNOVATION IN EUROPE

To create a favourable frame concerning the development of innovation and R&D, the authorities from EU have adopted many acts. An important one of them was the Lisbon Strategy and, for example, in January 2006, The Aho Report, who outlines the following areas for action:

- The need for Europe to provide an innovation-friendly market for its businesses, the lack of which is seen as the main barrier to investment in research and innovation. This needs actions on regulation, standards, public procurement, intellectual property and fostering a culture which celebrates innovation. A combination of supply and these measures to create demand should be focused in large scale strategic actions. Several examples have been identified: e-Health, Pharmaceuticals, Energy, Environment, Transport, Logistics, Security and Digital Content;
- The 3% target is seen as an indicator of an Innovative Europe, not as an end in itself. Measures are needed to increase resources for excellent science, industrial R&D and the science-industry nexus. Productivity of R&D must be increased. The proportion of structural funds spent on research and innovation should be trebled;
- Far greater mobility is needed at three levels: human resources need a step change in mobility across boundaries; financial mobility requires an effective venture capital sector; new financial instruments for the knowledge-based economy;
- Mobility in organization and knowledge means cutting across established structures to allow new linkages to be made through the instruments of European Technology Platforms and clusters.

All these measures had been taken because the European Commission is conscientious by the importance of innovation and R&D in economic growth. Innovation is essential for sustainable growth and economic development.

In time, was realized many studies regarding the statistics in Europe in innovation and R&D domain. For example, a relevant study was effectuated in 2007 year by *The Fourth Community Innovation Survey (CIS4)* in collaboration with the *European Commission of the European Innovation Scoreboard (EIS)*. This study was realized in the EU 27 at the level of 42% of enterprises from industry and services that have reported some form of innovation activity between 2002 and 2007. Enterprises with less than 10 employees weren't covered.

The results of the study show like in the table 1:

Table 1 Innovation activity and cooperation[2] during 2002-2007

	Enterprises with innovation activity, % of all enterprises	All types of co-operation with other enterprises or institutions	Co-operation partners:			
			Suppliers	Clients or customers	Universities or other higher education institutes	Government or public research institutes
		% of all innovative enterprises				
EU27	42	26	17	14	9	6
Belgium	51	36	26	21	13	9
Bulgaria	16	22	16	13	6	4
Czech Republic	38	38	31	26	13	7
Denmark	52	43	28	28	14	7
Germany	65	16	7	8	8	4
Estonia	49	35	23	23	9	6
Ireland	52	32	23	25	10	6
Greece	36	24	11	8	6	2
Spain	35	18	9	4	5	5
France	33	40	26	20	10	7
Italy	36	13	7	5	5	1
Cyprus	46	37	24	4	2	2
Latvia	18	39	33	29	14	12
Lithuania	29	56	45	35	12	10
Luxembourg	52	30	24	22	10	8
Hungary	21	37	26	20	14	5
Malta	21	32	22	17	4	4
Netherlands	34	39	30	22	12	9
Austria	53	17	7	8	10	5
Poland	25	42	28	16	6	9
Portugal	41	19	14	12	8	5
ROMANIA	20	17	14	10	4	4
Slovenia	27	47	38	33	19	13
Slovakia	23	38	32	30	15	11
Finland	43	44	41	41	33	26
Sweden	50	43	32	28	17	6
United Kingdom	43	31	23	22	10	8
Iceland	52	29	20	20	5	13
Norway	37	33	23	22	15	16

Sources: Fourth Community Innovation Survey (CIS4) and European Innovation Scoreboard (EIS), 2007

[2] Innovation cooperation measures the active partnership of the observed enterprise with other enterprises or non-commercial institutions such as universities or public research institutes.

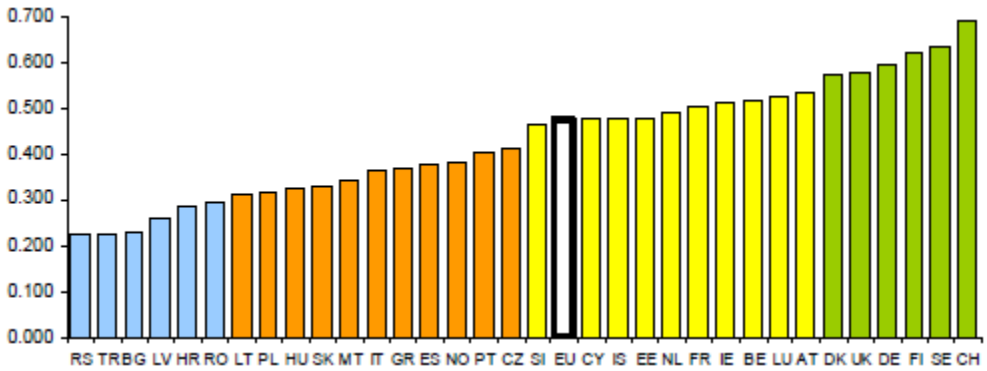
We observe that among the EU27 Member States the highest proportion of companies with innovation activity in this period was recorded in Germany (65% of enterprises), followed by Austria (53%), Denmark, Ireland and Luxembourg (52% each), Belgium (51%) and Sweden (50%). The lowest rates were observed in Bulgaria (16%), Latvia (18%), Romania (20%), Hungary and Malta (both 21%). Concerning the innovation cooperation, the highest levels were found in Lithuania (56% of all innovative enterprises), Slovenia (47%) and Finland (44%), and the lowest levels in Italy (13%) and Germany (16%).

In the EU27, the most common co-operation partners were suppliers (17% of all innovative enterprises worked with them) and customers (14%). Suppliers were the most frequent partners in nearly all Member States, with the highest levels found in Lithuania (45%) and the lowest in Germany, Italy and Austria (7% each). Cooperation with customers in innovation activities ranged from 4% in Spain and Cyprus to 41% in Finland. Innovative enterprises in the EU27 worked together much less often with universities and other higher education institutes (9%) or government and public research institutes (6%). Private-public cooperation on innovation was most frequent in Finland, Slovenia, Slovakia, Latvia and Lithuania, while it was least common in Italy, Malta, Romania and Cyprus.

Another study concerning the leaders from Europe in innovation's sector was realised by *The European Innovation Scoreboard (EIS)*, in 2010 year.

The results of the study are presented in the following:

Graphic 1 Inovation performance EU27 Member States, 2009



Source: EC, European Innovation Scoreboard, 2009.

Note: The Summary Innovation Index (SII) is a composite of 29 indicators going from a lowest possible performance of 0 to a maximum possible performance of 1. The 2009 SII reflects performance in 2007/2008 due to a lag in data availability. The grey colored columns show 2008

performance as calculated backward from 2009 using the next-to-last data for each of the indicators. This 2008 performance is not identical to that shown in the EIS 2008 as not for all indicators data could be updated with one year. The difference between the columns for 2008 and 2009 show the most recent changes in innovation performance.

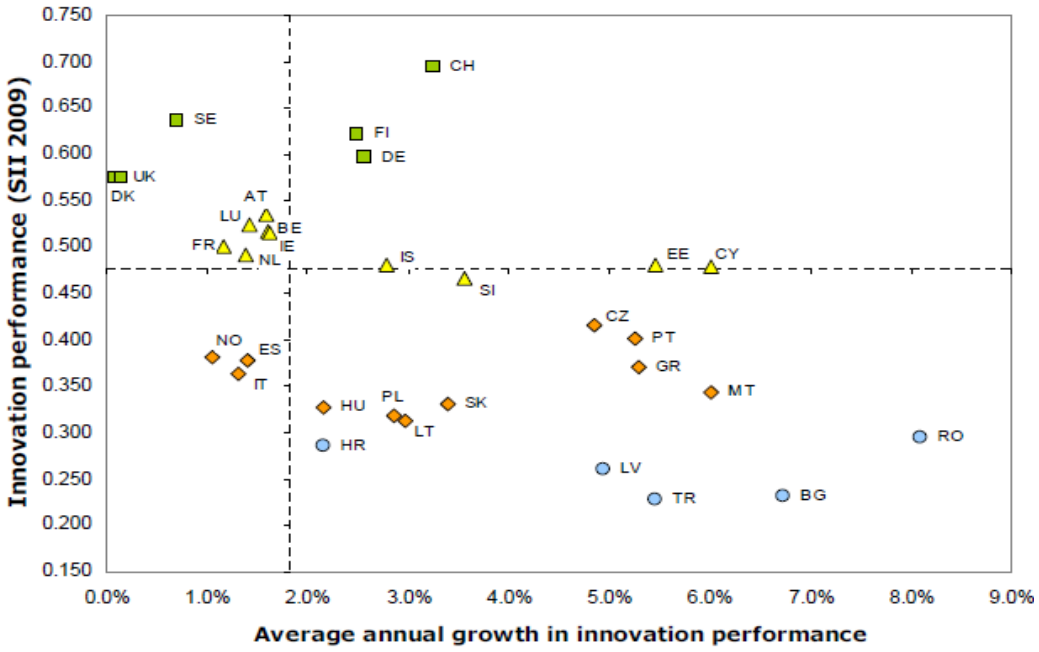
Based on their innovation performance, EU27 Member States fall into the following four country groups[3]:

- Denmark, Finland, Germany, Sweden, Switzerland and the UK are the Innovation leaders, with innovation performance well above that of the EU27 and all other countries;
- Austria, Belgium, Cyprus, Estonia, France, Iceland, Ireland, Luxembourg, the Netherlands and Slovenia are the Innovation followers, with innovation performance below those of the innovation leaders but close to or above that of the EU27;
- Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Norway, Poland, Portugal, Slovakia and Spain are the Moderate innovators with innovation performance below the EU27;
- Bulgaria, Croatia, Latvia, Romania, Serbia and Turkey are the Catching-up countries. Although their innovation performance is well below the EU27 average, this performance is increasing towards the EU27 average over time.

To highlight clearly, in the graphic 2 is presented the convergence in the innovation performance:

[3] The country groups have been identified using the average results of hierarchical clustering using 7 different clustering methods: Ward's method, between-groups linkage, within-groups linkage, nearest neighbour, furthest neighbour, centroid clustering and median clustering.

Graphic 2 Convergence in innovation performance



Source*:* EC, European Innovation Scoreboard, 2009.

Note: green are the Innovation leaders, yellow are the Innovation followers, orange are the Moderate innovators, blue are the Catching-up countries. Average annual growth rates as calculated over a five-year period. The dotted lines show EU27 performance and growth.

SII=The Summary Innovation Index.

So, shortly, the innovation growth leaders are:

Table 2 Innovation growth leaders

Group	Growth rate	Growth leaders	Moderate growers	Slow growers
Innovation leaders	1.5%	Switzerland (CH)	Finland (FI), Germany (DE)	Denmark (DK), Sweden (SE), United Kingdom (UK)
Innovation followers	2.7%	Cyprus (CY), Estonia (EE)	Iceland (IS), Slovenia (SI)	Austria (AT), Belgium (BE), France (FR), Ireland (IE), Luxembourg (LU), Netherlands (NL)
Moderate innovators	3.3%	Czech Republic (CZ), Greece (GR), Malta (MT), Portugal (PT)	Hungary (HU), Lithuania (LT), Poland (PL), Slovakia (SK)	Italy (IT), Norway (NO), Spain (ES)
Catching-up countries	5.5%	Bulgaria (BG), Romania (RO)	Latvia (LV), Turkey (TR)	Croatia (HR)

Source*:* after EC, European Innovation Scoreboard, 2009.

In the last years, the specialists in the endogenous growth theory emphasized in their papers that a country or a region can become a significant source of competitive advantage if it attracts local assets and associates externalities and economies of scale with spatial and specialization innovation clusters. This supposes the reduction of transaction costs, agglomeration, concentration, technological innovations, qualified working force etc. The economic potential of innovation clusters enjoys attention at all the decision levels from Europe.

As regards our country, the picture shows rather clearly the insufficient development of competitiveness clusters, the relatively incipient character of their formation, especially through the activity's profile, but also through the absence of some characteristics of mature clusters (Birsan, M., 2006, p. 39). The studies carried out in Romania by the Group of Applied Economy and the International Centre for Entrepreneurial Studies (CISA) emphasize a rather painful truth, namely that the native clusters are in an incipient stage: 85% of the companies have a non-innovative character, 3% are strategic innovators, 8% are intermittent innovators, 4% adopt new technologies and only 2% implement new technologies. We believe that this is mostly due to the problematic managerial capacity.

4. CONCLUSIONS

Because of factors such as globalization, increasing competition, the growing impact of information and communications technology, and the high pace of scientific and technological change, firms must innovate more rapidly than ever before. Without having innovation and R&D means to be uncompetitive. A possible explanation that some countries from Europe are poors in innovation and R&D is that the innovation policy objectives are still defined very ambiguously. They don't set clearly defined objectives at a more strategic level or link the expected outcomes to specific sets of measures. Thus, to know the way to competitiveness, the government from each member country of EU 27 must take efficient measures in this direction, an also, must invest and take all efforts to sustain innovation and R&D domain.

We consider that for have innovation and encourage economic growth a state must disposed by: strong standards and effective enforcement of intellectual property protection, vigorous competition and contestable markets, open trade and investment in a stable economic environment, a strong and sustainable fundamental research and development infrastructure, sound policies and mechanisms to promote the science-innovation interface, efficient and transparent regulatory systems, ethics and the rule of law, and a strong emphasis on education at all levels.

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