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# **REALITIES AND PERSPECTIVES OF ROMANIAN KNOWLEDGE-BASED ECONOMY IN THE CONTEXT OF EU INTEGRATION**

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**Abstract.** Developing the knowledge-based economy constitutes one of the strategic priorities of the European Union which aims the increase of the performance and economic competitiveness, and Romania like membership country has assumed this important objective. In the paper are carry out the general features of the knowledge-based economy, the competitiveness of Romania within the European Union from this perspective and there are formulated some directions of action in order to achieve the mentioned objective.

**Keywords:** knowledge-based economy, economic competitiveness, European integration, policy innovation, knowledge management.

## **INTRODUCTION**

With multiple significances, knowledge-based economy signifies a type of economy that produces and develops knowledge and it is also a means of business environment operation, whose efficiency is due first of all to innovative factors, the product of human creation.

Initiated in 2000, the aim to turn the European Union into the most competitive and dynamic knowledge-based economy in the world, has announced the beginning of ample economic and structural reforms in Europe. The priorities contained in the Lisbon Strategy and the clearly formulated action lines are meant to improve the national competitiveness of EU member states and extend the characteristics of knowledge-based economy to the entire Europe by 2010.

The EU member states and candidate countries had to undergo sustained efforts to attain the proposed objectives, and namely: create an informational society for the entire European area, develop the European area of innovation, research and development, complete liberalization of the single market, development of telecommunication network, utilities and transportation, the creation of integrated and efficient financial services, the improvement of the business environment, the increase of social inclusion degree, the improvement of sustainable development.

As improved performance of a society, knowledge-based economy is different due to essential elements that are able to enhance economic performance and competitiveness. It has enabled the remarkable development of worldwide countries that are already ahead of the computer age, such as North European countries, Eastern Asia (Japan, China, Taiwan and Hong Kong), the USA, New Zealand.

Informational society and knowledge-based society are two different types of economy, bound in mutuality, which require information and knowledge in order to work. Both concepts are able to fill knowledge gaps in certain areas, but they are different through factors that generate them and that they use. Thus, information

results from the data that information systems use and may serve as a research basis for further knowledge, while knowledge is the result of a unique process of human creation. Knowledge owners not only have information, but they also have immediate abilities to act, which, if used in a favorable productive environment, can become the source of a competitive advantage.

As the world economy is considered to evolve to a knowledge-based economy, it seems that this manner of operation represents the new viable alternative instead the classic economy models during the last two hundred years.

In a knowledge-based economy, knowledge plays the most important part in the development of society and they become the third production factor, next to work and capital.

The basic characteristic of knowledge-based economy, innovative factors are of human essence and they ensure the production of knowledge. Intellectual capital becomes one of the most important economic resources that generate Know-how so that elements such as the quality of education and of labor power qualifications will condition the economic growth of a country. Currently, the general thought is that there is no other alternative for an economy to prosper but to pay special attention to educational products and professional training; steps taken towards the economy of knowledge and the increase of general welfare directly depends on the learning and innovation ability of the population. We can measure investments in knowledge from an economic perspective; thus, more than 40 % of productivity increase in OECD countries in the period 1994-2002, is owed to investments in research and development, investments in IT software and higher education investments, as percentages of GDP [2].

The increase of European economic competitiveness and the evolution towards a knowledge-based society requires the implementation of an innovation policy and the 6<sup>th</sup> Framework Program for Research and Development (2003-2006) as well as the previous ones, funded technological innovations and their integration into the economic environment. New technology and high-tech investments - 3 % of GDP, according to the First Action Plan for Innovation (1996) and to the Lisbon Strategy (2000) -, have had a significant impact on the existing technologies, especially for small companies, and have stimulated innovative aspects in organizations such as new business models, innovative management techniques, innovation services, re-oriented activities and policies with innovation responsibilities (researchers, local forces, education). Certainly, investments in technological innovation will be justified only if there is enough qualified human capital. In knowledge-based economies, labor force is made of experts and countries like Canada, the USA, Great Britain, Singapore, Australia, is believed to possess labor force whose activity represents over 60 % of production.

In order to facilitate access to new technologies and to innovative schemes, the European Union has found it imperative to develop national research and development networks and inter-regional networks that allow competent assistance in order to implement innovation plans at a regional level and offering interactive information services, documentation, evaluation of the impact of adopted innovative policies, the dissemination of research results, the support of innovation creation within the firms. Important specialized networks have been developed:

- CORDIS, the Community Research and Development Information Service facilitates knowledge transfer in the field of innovation;
- PAXIS, a network organized for regions of excellence, facilitates the exchange of valuable applications;

- Gate2Growth initiative is a support network for financial innovations (capital investments, business incubators);
- IPR Helpdesk provides support for dissemination and protection of intellectual property in cross-country research projects;
- IRC, the Innovation Relay Center is the widest European network for technological transfer between companies, research institutes, universities, technological centers in EU member countries, Turkey, Ireland, Norway, Switzerland, Israel and Chile;
- IRE, the Network of Innovation Regions in Europe ensures knowledge transfer in the field of innovation at the level of firm and region management.

Multiple connections between national and international economic agents, as the outcome of information networks leads to higher production efficiencies, increased efficiency and competitiveness. At the same time, the market globalization phenomenon supported by the e-environment (E-everything phenomenon) ensures the premises of perfect competition market: liberalization of goods fluxes, labor force and capital, atomicity of productive centers, information transparency, selection based on economic criteria, prices set depending on supply and demand. For knowledge-based economy products, that is products and services that contain knowledge, the market allows setting higher prices (price premiums) as compared to other products.

The transition to a knowledge-based society also means a re-definition of functions of the main participants to economic activity. In order to manage the current challenges of the competitive environment, through an organizational adaptation and strong competitive increase, the firms have to reconsider their own economy and promote and implement on a large scale a knowledge based management system. A concept often mistaken for management applications in company practice, knowledge management (KM) means a synergic combination between the ability to process information technologies and the creative and innovative ability of man, in order to achieve performance. Thus, the role of KM is shown, as a concept that justifies its integration in the strategic development of firms – economic performance -, and the chain of necessary activities is identified, which adapts to the changes of the business environment – information inputs and human knowledge, at the basis of grounding action decisions, in view of reducing present or possible risks.

Because KM underlines the essential role of the human factor besides information technologies, companies need to orient their strategies to activities of creation and innovation, dissemination, integration of new knowledge into more extensive systems, transfer to other interested organizations, through a common effort of interaction that aims to reduce negative effects in the system.

Companies that implement knowledge management present several characteristics: the ability to permanently re-define their objectives, changes in the organization to achieve new goals, stimulation of the theoretical and practical ability to find solutions to the major problems, assisted management, and especially the use of positive changes in the employees' intellectual capital and the stimulation of its permanent improvement which would benefit the company. In a knowledge-based management system, the organization structure is a network, with information collaboration between work teams created on areas of interest and with changes of responsibility in management. Thus, authority, management and responsibility of decisions are divided and conveyed on interest nuclei whose main objective is to control and run economic processes but to anticipate possible problems and find solutions to meet them. Under these circumstances, changing some concepts of

company management must be based on strict regulations related to: rights and obligations of employees (wages, work hours), standards provisions, precise and well defined objectives, sanctions applied, compulsory character of regulations [6].

Although a recent member of EU, Romania still has a transition economy characterized by attempts to identify efficiency opportunities, initiate economic structural, institutional and legal reforms in order to implement the *acquis communautaire*.

## RESEARCH METHODS AND RESULTS

Romanian knowledge-based society can be characterized through several means of analysis: types of EU regions depending on the innovation capacity; based on the statistical data published by Eurostat, use indicators proposed by the EU, synthesized in the Lisbon score and that expresses the performance of member countries depending on the criteria set in the Strategy; with the help of global competitiveness indices set by World Economic Forum etc.

A. A study of Central and Eastern European regions [5] conducted by countries that became EU members in 2004 and 2007, carried out depending on the synthetic factor 'creative ability', uses as difference criteria RD expenses, staff involved in RD, density of publications and innovations, knowledge creation. Of these, the most important factors are considered to be those that express the innovation potential, the general level of education and economic structure and dynamics (percentage of jobs in manufacturing, rate of economic increase, rate of unemployment).

The European Union map for the new and latest member states, according to the creative ability indicator comprises several regions:

- Capital regions concentrating an important potential for creative development and presenting elements of knowledge-based economy. Considered to be true centers of excellency, they must become service providers for other regions to disseminate knowledge (Slovenia is one of the 7 regions identified);
- Tertiary potential regions with a variable economic dynamics and an average education level (the Baltic countries);
- Production platform regions with a low unemployment rate and a good level of education but with a low level of knowledge creation (Hungary, the Czech Republic, Slovakia);
- Regions in industrial decline, which participate very little to knowledge creation (Poland);
- Agricultural regions with a development shortage, with economies poorly integrated in world economy, part of which encompasses some Romanian regions and rural areas of other countries (overall 10 regions).

Most of Romania falls into the last group, with one of the lowest creation capacities of the new EU member states, with an agro-industrialist production system where comparative advantage resides in the low cost of labor force and of the used natural resources. It is considered that the rigid systems that organize and manage productive systems are not able to stimulate partnerships and research and innovation activities.

Concentrating on internal economic and structural reforms, Romania has created a functional market economy and during the recent years, it has made progress

to achieve information society. IT promotion has been one of the certain priorities of the Government since 2001: promoting information technologies (for instance the introduction of e-government), stimulating software production by lowering labor force taxes in the field, stimulating e-commerce, extending Internet networks in schools, presenting schools with computers.

B. The evolution of indicators available for Romania that illustrate the present stage of economic development and the degree of achievement of objectives set in the Lisbon strategy that refer to innovation, research-development ( table 1).

Table 1. Indicators to measure the development of innovation, RD in Romania, as compared to EU 15 average

<b>Indicators</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
RD expenditure as % of GDP	20.1	19.5	20.0	20.3	
EPO patents per one million inhabitants	0.85	0.83	0.73		
ICT expenditure as % in GDP			41.9	53.3	61.3
Science and technology graduates per 1000 of population between 20 and 29 years old	41.2	46.8	70.7	72.1	
Internet access of households %				13.4	
High-tech exports %	29.4	32.9	22.6	22.6	
E-Commerce via Internet as % of the total company turnover				59.1	

Source: Eurostat

There is a generally positive dynamics of indicators expressing competitiveness potential of Romania, especially regarding expenses with IT development (hardware, software, services). They increased during 2003-2005 by almost 20 %, placing investment efforts to develop information sector in Romania above the average level of IT expenses in Western Europe. The field of labor force training in high tech has almost doubled; in high-tech areas in Romania highly qualified labor force represents about 2/3 of EU 15, which shows an acceptable level of employee qualification in sectors specific to knowledge economy, and a coherent view of the creative potential of population. At the same time, modernized commercial trading (almost 60 % of total company sales are online) is also a positive aspect that suggests elements specific to information society. On the other hand, the low percentage of RD expenses (circa 20 % of EU 15 allocations), high-tech export of only 22.6 % as compared to EU 15 (which means that more than 2/3 of national exports are products with a low degree of processing), and the fact that invention activities are almost non-existent (less than 1 % of applied inventions at a European level), suggests that although in reality progress has been made to modernize the economy, a focus of efforts is still needed to develop technological renewal activities and come close to a knowledge society.

Romania's place among knowledge-based economy countries can be analyzed with the Lisbon score that allows us to compare the performance of EU countries according to a unit index or according to the 8 criteria set as targets and considered to be critical for national competitiveness (table 2).

Table 2. The Lisbon score and competitiveness criteria, 2004

Indicators	Score average in EU	Romania	
		score	% of EU average
The Lisbon score:	4.97	3.35	67.4
- Information society	4.61	2.91	63.1
- Innovation, RD	4.41	2.88	65.3
- Liberalization	4.69	3.04	64.8
- Industrial networks	5.81	3.48	59.9
- Financial services	5.52	3.77	68.3
- Companies	4.74	3.65	77.0
- Social inclusion	4.81	3.74	77.8
- Sustainable development	5.16	3.33	64.5

Source: Blanke J., Lopez-Carlos A., The Lisbon Review 2004: An assessment of Policies and Reforms in Europe, World Economic Forum, 2004

The competitiveness degree of Romanian economy at the end of year 2004, expressed through the Lisbon score does not exceed the average registered in the 25 European Union countries. We can observe an improvement of the business environment quality, an increase of the employability degree and a modernization of financial services whose score is closer to European average and an acceptable level of economic environment liberalization. The lowest performance is registered in industrial networks while the 63 % registered in information society is a signal of improved IT structures in economy.

C. A more detailed analysis of the competitiveness of Romanian economy can be carried out by means of the data published by World Economic Forum for 125 economies. The main aspect traced is the progress that Romania has made within the world economy in view of economic development. Considered to be a resultant of the action of a group of factors that generate increased competitiveness, the economic development degree in less advanced countries is marked by elements such as the quality of the macroeconomic environment, institutional relations (fight against inequality and corruption), improvement of health and level of education, development of basic economy infrastructure, etc., while the progress of more developed economies now depends on more sophisticated factors such as specialized knowledge, market efficiency, innovation, advanced technologies [4].

A classification of countries and their stages of economic development according to the competitiveness degree (table 3) places Romania in the group of countries at an efficiency-driven stage that still has to go through a transition period necessary to radically improve innovative factors to accede to the stage of knowledge and innovation-based economy.

Table 3. Characteristics of economic development stages

Efficiency-driven economy		Innovation-driven economy	
Indicators	%	Indicators	%
GDI/inhabitant	3000-9000 \$	GDI/inhabitant	> 17000 \$
Basic requirements	40 %	Basic requirements	30 %
Efficiency increase	50 %	Efficiency increase	40 %
Innovative factors	10 %	Innovative factors	30 %

Source: Eurostat; World Economic Forum, The Global Competitiveness Report 2006-2007

The Global Competitiveness Index (GCI) attached to the qualitative level of Romanian economic development in 2006 is 4.02, which places it on the 68<sup>th</sup> place in world hierarchy, one place higher than in 2005. The economic reforms promoted during the recent years and general restructuring efforts for our country's accession to the European Union have managed to ensure the passage from an economy based on primary production factor consumption to an efficient market economy, which defines at present our stage of economic development. Romanian economy is supported by more productive production processes that ensure an increased product quality and a high level of labor force qualification – the occupancy rate of science and engineering graduates in Romania as compared to Western Europe [3] was of 63.2 %, in 2004. Looking at the three key elements of an economy's competitiveness, we can see that access to a higher stage of innovation and knowledge-based economy depends on the development of innovative factors, which ensure economic growth up to 30 %. Increasing innovative factors create the premises of doubling the GDP per capita. In Romania's case, as concerns this basic element of knowledge economy and namely innovative factors, the global competitiveness score ensures the 68<sup>th</sup> place (73 for the level of innovation), of all countries that have recently joined EU, it is only ahead of Bulgaria, which is on the 85<sup>th</sup> place (table 4).

Table 4. GCI - innovation factors for EU countries

Countries	Innovation factors		Global competitiveness (GCI rating)
	place	score	
The Czech Republic	27	4.47	23
Estonia	32	4.24	25
Slovenia	34	4.18	33
Hungary	39	4.08	41
Slovakia	43	3.96	37
Lithuania	44	3.96	40
Croatia	50	3.81	51
Poland	51	3.80	48
Malta	53	3.79	39
Latvia	58	3.74	36
Romania	73	3.52	68
Bulgaria	85	3.26	72

Source: World Economic Forum Global Competitiveness Report 2006-2007

At considerable distance from the country that is at the top the list, the Czech Republic, (46 places) Romania has an innovative capacity of only 80 % as compared to this country. At the same time, there is a significant distance from the most competitive economy in the EU, Germany, which has the 3<sup>rd</sup> place (with a score of 5.89), from the point of view of innovative factors, the Romanian creative potential exceeds only half of its innovative potential (59.7 %). The direct correlation between the decisive contribution of innovative factors and the increase of global competitiveness can be seen in the hierarchy of recent EU member states according to the Global Competitiveness Index, which has almost not changed, so that Romania is on the second to last place.



## DISCUSSION

The path of Romania towards the improvement of general competitiveness requires the placement of the research-development-innovation policy to the center of its economic policy. However, in order for the long-term strategy to be successful, other aspects have to be aimed at as well: the development of knowledge-based occupational structure, investments in knowledge (in RD, informational software, in higher education), the promotion of innovation-based modern entrepreneurship to the entire economy.

The modernization and development of the Romanian economic environment aims at several norms mainly described by the basic characteristics of knowledge-based economies in the European Union (table no. 1):

- Becoming aware of the utility of the RDI system, main creator of new knowledge and technologies that are necessary to restructure and reshape productive systems;
- The stimulation of innovation by improving funding of this sector today represents only 20.3 % from the average of R&D expenses of the GDP as compared to the EU;
- The development of research infrastructure that would lead to technological developments. At present, IT expenses in GDP, as compared to the EU 15 average is low, namely 61.3 %;
- Increase the afflux of foreign capital, bearer of new technologies and know-how as well as of internal capital. Compared to the EU, R&D in Romania uses foreign financial capital as a source of investment in a lesser manner, only 64.7 % as compared to the average of financing at the EU level;
- E-commerce development; in 2004, Romanian firms present online had a turnover of 59.1 % as compared to the turnover of EU firms;
- Enhance the innovation capacity of firms through more funds available for research and development;
- Increase expenses with labor force training that represents less than half of the sums allocated as average in EU on this line;
- Reconsider the role of highly specialized labor force which together with the technical capital represents the key factor of quality attainment in the field of RDI services (at present, the people employed in high tech industry only represent 13% as compared to EU 15) while the percentage of graduates of science and technology per 1000 inhabitants is of only 72.0 % as compared to the EU average;
- Participation in European research programs within the European research system for the better coordination of national and European mechanisms;
- Development of industrial processes and knowledge-based services. In 2005, almost 40 % of the EU 15 labor force was employed in branches of knowledge-based industry (Great Britain and the Northern countries hold the first places) and over 35 % of the total employees work in knowledge-based services;
- Modernize the market of knowledge-based products and services [7] consisting in industrial products with a high or average degree of processing, hi-tech services (RD, computer processing), financial services, knowledge-based market services (communications, travel and business

services), other services (health, education, cultural and recreation services).

At the same time, the Romanian government may play an important role in the evolution of RDI activities. In 2007, Romania has allocated 1% of the GDP for research and development expenses, which is a positive fact, on the condition of increasing efficiency of these expenses. The actions taken refer to[3]:

- Creation of an independent consultative body to reduce the difference between the strategic and the executive level in the innovation system in Romania; set up and implementation of a coherent RDI strategy;
- Transfer of the state aid from current objectives (mainly debt canceling) to strategic RD strategies, which would contribute to introducing modern technologies, necessary for the Romanian companies;
- Innovating companies must assume the risk based on government co-financing for the risk capital fund;
- Support expenses from the private R&D sector through indirect financial measures, allowed by the EU directives (technology parks, expenses allotted R&D) depending on the rate of turnover, number of employees or the number of industrial patents registered each year.

## CONCLUSION

In conclusion, we can state that the obvious economic discrepancy that characterizes Romania as compared to the prosperous economies of the European Union and of other states imposes an increased attention for the elaboration, implementation and coordination of structural policies, focused on progress and innovation. Only if measures are implemented to restructure the economic, social and institutional environment, then will perspectives of a stable knowledge based society become real.

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