

## The Role of Knowledge, Research, Innovation and Competitiveness According to the Romanian Strategy for 2007-2013

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**Abstract:** *The engine for the development of the Romanian knowledge society will be from now the Research, Development and Innovation (RDI) system. This offers the opportunities to sustain performance through innovation in all areas contributing to the welfare of the citizens, while reaching scientific excellence recognized at international level. We emphasize in our paper the new stage from Romania defined by the necessity to build a knowledge-based society, focused on solving problems arisen from the demand to innovate, as expressed by economy and society.*

*It is a big challenge from our country, and in order to respond to this challenge we have to build and consolidate an international scientific environment based on a new changed educational system. Ensuring a real openness will depend on the way the knowledge demand will be concentrated and directed towards the RDI system, within the thematic priorities reflecting the medium- and long-term social and economic needs.*

*The correlation of the national need of innovation with the evolution of science and technology in the world will take place through research-action networks, where the multidisciplinary international cooperation will be targeted to the resolution of specifically identified problems.*

*From Romania is the best moment to reach the European average for the basic indicators describing the structure and performance of the research, development and innovation system, laying down the bases to focus in the future on niche areas, where Romania would have the critical mass and the performance level needed for leadership. Meanwhile, the 2007-2013 RDI Strategy intends to support the social and economic development of our country, with a real opportunity to create a knowledge-based economy, well managed and competitive at the global level.*

**Keywords:** Knowledge-based economy, Knowledge creation, Knowledge management, research, development, innovation, increase social quality and competitiveness of the Romanian economy

## 1. INTRODUCTION

The Romanian society is concern about the role of science, technology and innovation for the development of the knowledge society. Taking into account the fact that Romania is from 2007 member of EU, the National Research, Development and Innovation (RDI) Strategy for 2007-2013 provides the consistency with the main specific political documents at the Community level.

To prepare the new Strategy for 2007-2013, a broad analysis of the current state of the Romanian RDI system was performed too, including strengths, weaknesses, opportunities and risks. It was take into account the national social and economic context existent at that time and was analyzed, in the mean time, the aspects concerning the globalization and the integration into the European Union.

Representative personalities in the fields of science and technology, economy, civil society, central and local public administration, and non-governmental sector were consulted, and they identified deadlocks in the system and directions for intervention and due to their implication they reaffirm the role of the state in the field of RDI, i.e. So they conclude to lay down the conditions and to induce on the one hand the creation of knowledge, and, on the other hand, the application of knowledge for society's interest, through innovation.

The Strategy provides the ground for RDI system's organization and defines the main areas and the way in which the public investment will be concentrated in research and development to support innovation in the coming years.

### **The specialists established the basic principles in the field of RDI, referring to:**

- ex-ante evaluation of policies and actions;
- international evaluation of policies,
- programmes and projects implementation;
- international evaluation of public institutions (universities and research institutes);
- correlation between performance and institutional funding;
- career promotion based on internationally-recognized professional performance;
- support for researchers mobility; involvement of young doctoral students, post-doctoral researchers, and experienced, performant researchers of any nationality;
- increase of scientific cooperation connections with the Romanian scientific Diaspora;
- development of international cooperation and support for the participation to programs and projects;

- support for innovation, also by increasing the public demand for innovation;
- increasing the share of state aid dedicated to innovation support; constant dialogue with society.

This special strategy, allows to our country to demonstrate its political decision in building a knowledge-based society, open to international values and competition. In this context is very important the international cooperation and partnership in advanced research which must be encouraged, for the topics of general scientific and technological interest. It is also important to emphasize the fields where they can contribute by solving the national scientific and socio-economic problems, while providing the desired competitive level of the Romanian RDI system.

Obviously the Strategy has the main goal to eliminate the disparities between Romania and other European countries and to prepare the Romanian RDI system for identifying and consolidating, through international openness, partnership and competition, those unique areas where Romania can excel.

## 2. IN THE CONTEXT OF THOSE NEWS CHALLENGES

### 2.1. About the international context

According to the new era of IT, the creation and use of knowledge have become vital sources of boosting the global wealth. As we already know the central element who determines competitiveness is knowledge. That why, the countries of the world, especially the developed ones, have engaged for generating knowledge in a systematic way, developing sophisticated national systems and international interactions.

Without reducing the importance of the complex of local factors in adapting and using knowledge, the intensification of the globalization has led to an increased importance for the international cooperation and to the explicit exchange of knowledge and has also created strong international scientific communities.

Consequently, in that environment, both collaborative and competitive, the significance of excellence rise exponentially, and in such special medium, the entities and individuals are the chance to reach the excellence level. As they have the ability to attract resources and to influence both the scientific environment and the socioeconomic systems, they become extremely valuable. This is exactly the explanations for the developed countries where people work so hard both to attract brilliant scientists and engineers and to reach the critical research mass in strategic fields.

We can see Education-Research-Innovation (RDI) knowledge like a triangle. The innovation knowledge is the most closely element associated with the impact on welfare. But there is also a problem, because in the same time innovation is the most problematic as regards the connected policies. Innovation, as a process with many variables, is centered on the cooperation between research and industry. That why in the last decade, developed countries have proposed intermediary entities or forms of interaction and cooperation establishing bridges between these two sectors, providing those entities increased public financial resources.

In order to reduce the economic growth gap as compared to the United States, the European Union made efforts putting the

RDI domain at the core of those efforts. It was a wise decision to allocate 3% of the GDP for research and development in the European Union in 2005 at Lisbon. Most European states have already rallied behind that objective; however, the level of private investments is still seen as too ambitious.

Now, the main challenges for the European Union in order to enhance the capacity to innovate are related to the insufficient concentration in poles of excellence able to compete at a global level, the poor integration of the elements in the knowledge triangle, the insufficient trans- and interdisciplinary research focusing on innovation needs, the absence of models of research and education governance and organization at European level, the high patenting costs in the EU and the low level of researcher's mobility.

After Lisbon reunion, for the period 2007-2013, the European Union, has launched a set of initiatives regarding research and innovation, the global competitiveness of universities and research institutes, the development of entrepreneurial skills and the transfer of knowledge into goods and services. The established policy guidelines have the correspondence in the programs provided within the Financial Framework 2007-2013, respectively: the Seventh Framework Programme for Research, the Competitiveness and Innovation Programme, the Programme Education and Training 2010, the economic and social cohesion programs.

All of these programs will have a very significant role in the context of a new and exciting generation of technologies, able to contribute in an essential way to launch Joint Technology Initiatives, involving substantial public and privates' resources, to supports

innovation and development in SMEs, providing financial support, at least for their start-ups. Its also purpose is to sustain the transnational technology transfer network and many other initiatives, in the benefit of the education and training system in order to achieve the Lisbon goals, including for this purpose a mobility and cooperation component. There is no doubt that, at this reunion was pointed the relevance of the economic and social cohesion programs, where the Member States, including their regions, admitted the necessity to sustain them with substantial funds, in order to reduce the structural gaps, because the RDI area is definitely a recommended high priority.

## 2.2. About the internal context

As everybody already knows, for Romania was a very difficult period after 1989, not to mention the previous one: the underinvestment and delayed restructuring only permitted a connection to the global trends in science and technology and only in some isolated cases. We can say there was a fragile enterprise sector in Romania. It was a real need for research, development and innovation.

The R&D system was fragmented, as the various components tried to survive with the minimum available resources, mainly by public funding, within mostly formal and autarchic systems.

In fact it was about the low attractiveness of the research career which determined qualitative losses of the human resources. Due to chronic underinvestment, the number of researchers decreased drastically from 1990 to 2004, while the average age of

scientists increased. To attract top young people into research was extremely difficult. Consequently, many good researchers choose to leave the country. The low wages in RDI system might be considered as main reason for the low attractiveness, but in reality the reasons are complex, and they are connected to the delayed institutional reform, the poor quality of the research & development infrastructure, the absence of an evaluation system fostering and compensating the real performance – the excellence.

But, first of all, one of the strongest reasons of such a situation was about the absence of clarity and transparency concerning the professional career. Still there are great opportunities for our country because of his valuable human resources and long tradition in several areas of science and technology. So there is a hope that the current strategy will create the basis for recognition and fosters their development.

In the new circumstances, the negative impact which affected mainly the international cooperation and the participation to European research projects and networks is no longer valid. Now the period which generated isolation, which disconnected Romania from the main European research goals and which reduced the access to performant products and technologies, necessarily to the Romanian industry and services, are gone.

The managerial ability and the absence of minimal institutional resources for supporting research laboratories generated dysfunctions even in places where there was a performant infrastructure. The low degree of utilization was also generated by the reduced capacity to provide requested services, especially to the economic operators.

Although the RDI system did not succeed to generate impressive examples in transferring research results into the social and economic field, it has managed to preserve or develop actors (among them universities, institutes, research teams) with a clear international visibility and that may become or already are poles of excellence.

The project-based funding, by competition, which was launched in 1995 and was expanded in 1999, generated essentially an increase of performance and a change of attitude regarding the access to resources.

The GDP share of the public expenditures allocated to research and development was doubled in 2005-2006, with a subsequent increase target of 1% in 2010; it was a big step for Romanian research and development. From now we can observe a radical changes starting with 2005. The CEEX-Research of excellence program launched in 2005 by the National Authority for Scientific Research has contributed this time, to direct public expenditures for research towards developing the Romanian Research Area. It is an important moment for the scientific community of our country which meant to prepare the Romanian research and development community for the successful participation to the next EU Framework Research Programme, FP7, for the period 2007-2013.

In a wider context, the innovation culture is still low, both in the enterprise field and in the academic environment. The enterprise innovation level has not been consistently supported by an operational technology transfer system, and the risk capital may be considered absent.

With the RDI strategy for the period 2007-2013, Romania intends to reach the European average for the basic indicators

describing the structure and performance of the research, development and innovation system, laying down the bases to focus in the future on niche areas, where Romania would have the critical mass and the performance level needed for leadership. Meanwhile, the strategy intends to support the social and economic development of Romania, with a real opportunity to create a knowledge-based economy, competitive at the global level.

### 3. THE RDI SYSTEM AND HIS STRATEGIC OBJECTIVES

In order to increase the competitiveness of the Romanian economy, to improve the social quality and to enhance the knowledge likely to be valorized and to be used for expanding the horizon of action, the research, development and innovation (RDI) system in Romania has our days a significant role to develop science and technology.

According to this specific role, the RDI system has to stress on three strategic objectives: *knowledge creation, increase competitiveness of the Romanian economy through innovation, increase social quality through the development of solutions, including technological solutions.*

#### a) Knowledge creation

Rooney and Mandeville referring to knowledge management at the national level, consider that:

"As the global economy becomes more knowledge intensive and the wealth of nations more dependent on their knowledge assets being harnessed, it is essential for policy makers of having frameworks for the development and the utilization of national knowledge assets".

In their *abstract of their paper* they argue that a policy framework can be developed through which policy initiatives in a range of policy areas can be filtered in order to meet the challenges of the knowledge economy.

"We have developed an approach that has previously been applied to managing intellectual capital in firms and adapted it to the public policy arena. In doing so we question policy orthodoxies such as the assumption that free trade automatically facilitates international knowledge flows, that participation in a global knowledge economy necessarily challenges national sovereignty, and that online delivery of education is necessarily a progressive strategy".

It is definitely a necessity to recognize schools of excellence internationally. This aspect will be supported, having the critical mass and the needed facilities for high performance research, experience in training young researchers through doctoral studies, and good conditions for young post-doctoral researchers.

By financing projects recommended by personalities with the highest potential, recognized at the international level, in particular young ones, the specialists will establish poles of excellence. The training of young researchers in doctoral or postgraduate schools of excellence will be specifically emphasized, and that would provide them an appropriate training and the development of the ability to carry on advanced research. For that purpose, the schools will have to attract performant researchers, experienced in supervising young doctoral students, of any nationality.

In these circumstances, the role of *Knowledge Management* is essential if we consider that conceptualizing of an organization

as an integrated knowledge system, and we understand that the management of an organization is for effective use of that knowledge, which refers to human cognitive and innovative processes,

Ikujiro Nonaka (1998) has some very interesting observations concerning the **knowledge creation, referring to a company:**

*"[...] few managers grasp the true nature of the **knowledge-creating company**, let alone now how to manage it ... The reason: they misunderstand what knowledge is and what companies must do to exploit it. [...] A company is not a machine but a living organism. Much like an individual, it can have a collective sense of identity and fundamental purpose. This is the organizational equivalent of self knowledge – a shared understanding of what the company stands for, where it is going, what kind of world it wants to live in, and most important, how to make that world a reality ..."*

In such a company the creation of new knowledge is not only a specialized activity of the research and development department. It is much more. It is a way of being. Every worker is a really *knowledge worker*, so his role is extremely important and he must be very responsible of his activities.

*"In this respect", continue to stress Nonaka, "the knowledge creating company is as much about ideals as it is about ideas. And that fact fuels innovation".*

Dalke Neef expresses, in his specific and synthetic way, the role of a technological and organizational **knowledge:**

*"In the knowledge-based economy it is the production of ideas, not goods, that is the source of economic growth, and the reason that the new computing and telecommunications*

*technologies are so economically revolutionary in their nature is that they allow ideas – in the forms of techniques, research results, diagrams, drawings, protocols, project plans, chemical formulae, marketing patterns, etc. - to be distributed instantaneously and in a coherent way to anyone, anywhere in the world".*

#### **b) Increase competitiveness of the Romanian economy through innovation**

International cooperation and partnership in advanced research will be fostered, for the topics of general scientific and technological interest, emphasizing the fields where they can contribute by solving the national scientific and socio-economic problems, while providing the desired competitive level of the Romanian RDI system.

The new economy is based our days on create knowledge, used in economy, science, technology, especially by **innovation**. In this new context, innovation has the capacity to assimilate and to convert knowledge in order to improve the productivity, or to create new products or services.

Without innovation we can't talk about a new economy. That why the new economy encourages the creation and the development of innovative enterprises. Such enterprises can be a result of international cooperation and partnership between firms, government, universities or organizations in advanced research, publics or even academics.

Now we have to admit that every business is on his turn an „information business". Information plays a surprisingly critical role, and the process of capturing, storing, processing, and retrieving information is not only difficult, but complex and, many times, very expensive. Information dominates processes

as well as products and, no doubt, information and the mechanism for delivering it represent the glue that holds together the structure of every business. But when we talk about information we have to consider his relevance, his power, his quality. So that's way is so important that the formal organizational structure of any company must be a fundamentally set of channels for the rich exchange of information among the employees.

*" ... When everyone can communicate richly with everyone else, the narrow, hardwired communications channels that use to tie people together simply become obsolete. And so do all the business structures that created those channels or exploit them for competitive advantage."*

The objective of **increasing competitiveness of the Romanian economy through innovation** has a great impact upon the economic operators and the transfer of knowledge into economic practice. This objective concerns the achievement of high level technological results, complex problem solving research of local, regional or national relevance, or requested by the economic operators, as well as the development of innovative technologies, products and services, with direct applicability.

As a realistic solution we can mention these one who put a real accent on partnerships between universities, research institutes and economic operators. It is about a plan that must be supported, with medium-term financing and/or co-financing, from five to seven years. The financing schemes will consider the issues related to the state aid for RDI.

**c) Increase social quality through the development of solutions, including technological solutions**, generating direct benefits for the society.

This category includes solutions to local, regional and national problems, to social cohesion and dynamics, an increased effectiveness of the policies and issues related to health, environment, infrastructure, land management and utilization of national resources.

#### 4. THE NECESSITY OF CHANGES IN A NEW GLOBAL WORLD LEAD FROM NOW BY RDI

Obviously Romania from now will support advanced research, directed towards world-class scientific results, but in the mean time it is necessary to encourage the development of the research career and the establishment of poles of excellence.

If we have to take into account the significance of fundamental research for knowledge development and the training of highly skilled human resources, no doubt will be emphasized the excellence, the interdisciplinarity and the international visibility. It's the time for a new vision about the whole world which must sustained research more and more complex, situated in frontier areas including the participation to international excellence research networks.

The relevance of that type of research is for the long term, with no other priorities established for the funding of research topics, except the proposals coming from the researchers. Advanced research may be directed towards strategic or technological priorities, as necessary for solving complex problems, with social and economic impact. The evaluation will be in the peer review system and the panels will include international participants.



From the scientific world of European Union there will be a strong focus on the better integration of the Romanian scientific community into the international scientific environment, through the broad access of the researchers to information resources, participation to international conferences, organization of international scientific conferences in the country and, finally, through the participation to European scientific clusters and technology platform.

The research projects will have to provide the necessary conditions for the exploitation of the performance related to research career stage of the participants, ensuring their further development. The development of human resources in the context of national priorities will aim at the achievement of an expertise level permitting the correlation of the knowledge regarding the global technical developments with the possibilities of national adaptation.

One of the most important targets is to establish *the poles of excellence* in the form of interdisciplinary research networks and, in particular, of competence's centers. To avoid the formalism of such entities, a gradual financing strategy will be approached, on the project-network-centre of competence direction.

According to the importance, there are some **priority areas**, as follows:

- Information society technologies,
- Energy,
- Environment,
- Health,
- Agriculture, food security and safety,
- Biotechnologies,
- Innovative materials, processes and goods,

- Space and security,
- Socio-economic and humanities research.

## 5. CONCLUSIONS ABOUT THE IMPORTANCE OF IMPLEMENTING THE STRATEGY OF RDI

### 5.1. Major principles guide in implementing the Strategy of RDI

Some major principles guide the implementing of the Strategy of RDI. Amongst them we have to mention the social responsibility, the transparency and the performance.

**a) Social responsibility** is a relevant principle because the provision of public funds to the RDI system has to be taken as an investment serving the wider societal interests;

**b) Transparency** offers to everyone access to all the information regarding the policies, the instruments and the results obtained; access to the information on RDI funding opportunities from public funds, the stage of the Strategy, including e-governance. It is the most normal way to simplicity and clearness of the procedures for obtaining public finance for RDI.

**c) Performance** represent a way in order to assess the degree to which the objectives have been achieved, in comparison to the investments deployed.

The monitoring, evaluation and correction mechanisms will ensure the capacity to adjust and adapt the strategy in accordance with national and international developments.

The ex-post evaluation of the implementation will take place both at mid-term, in 2010, and at the end of the implementation period. The evaluation will be made

independently, preferably on an international basis. The evaluation of the impact following the implementation of the strategy will provide the information needed for the formulation of future policies.

## 5.2. Monitoring and evaluation

The monitoring and evaluation of the Strategy will be based on the performance indicators of the subsequent implementation plans, and on the indicators of the whole RDI system, corresponding to the specific objectives of the Strategy.

Annually, a report will be prepared and published, which would monitor the achievement of the objectives; the independent mid-term evaluation report will be published in 2010, and a post-implementation and impact study will be prepared at the end of the implementation period.

The correction of the strategy will be based both on the evaluation of the results achieved, on the system evaluation, and on prospective elements related to the development of science and technology.

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