

Opportunities and Challenges of the Knowledge-Based Society in Investments Management

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Abstract

During the last two decades, the economic development of the countries all over the world, above all of the industrialized ones, were progressively oriented towards a significant increase in their economic competitiveness, as a main pillar of sustainable development strategy. The economic globalization, as salient feature of present human society development, brings about the interdependence deepening of national economies and regions, which engenders both numerous opportunities for economic expansion and various challenges consisting in competition intensification, persistent sources of political, economic, inter-ethnic conflicts etc.

Key words: *knowledge-based society, research & development, education system*

Turning to good account of opportunities offered by globalization and avoiding threats engendered by the same process depend, for each country, on the competitiveness of its economy as a whole and its economic branches. This supposes, first of all, the strong intensification of tangible investments in restructuring and modernizing the productive system, chiefly in high/tech sectors (which have a strong and stimulating effect on the whole economy), and intangible investments – in Research & development activities, innovation and technological diffusion, training, professional services (consulting, technical assistance, audit, etc.) for economic agents.

1. Co-ordinates of the European Union's policies related to the knowledge-based society and investments' management

The European Union substantiates its future development projects by defining factors of a knowledge-based society. So, starting from the idea that “industry is the source of economic thriving”, and that “Europe needs a dynamic and competitive industry for keeping and developing its prosperity”, the program-document entitled “Industrial policy in an enlarged Europe”¹ defines three key-factors of industrial competitiveness:

- *Knowledge*, that supposes the intensification of efforts in the fields of education, professional training and research; new technologies, particularly in the fields of computers

¹ ***, Commission des Communautés Européennes, *La politique industrielle dans une Europe élargie. Communication de la Commission au Conseil, au Parlement Européen, au Comité Économique et Social et au Comité des Régions*, Bruxelles, le 11/12/2002, COM (2002) 714 final

and telecommunications, bio-technologies and nano-technologies, as well as necessary know how and skills, should be strongly developed;

- *Innovation*: the European industry has to significantly develop its innovating potential, materialized in a high rate of products / services / technologies renovation and improvement; that implies to provide for necessary conditions to stir up innovating processes;
- *Entrepreneurship capacity*: development of “enterprise mind”, of disponibility to take upon oneself the risks implied by the development of new enterprises should be ensured by objective acknowledgement and fair reward of the social contribution of those who take upon themselves such risks.

The first two mentioned factors are directly related to intangible investments the European Union intends to strongly intensify. With this end in view, the Spring European Council, 2002, Barcelona, has defined three priority areas for making the European Union’s economy the most dynamic, knowledge-oriented and competitive in the world ²:

- development of employment policies, emphasizing the active labor market reform, in order to back up achievement of the Union’s goal to ensure full employment and better jobs;
- connecting European space’s market by filling in the lacking links in industrial networks, investment in infrastructure projects, and speeding up financial market integration;
- investment in human resources, development of the European Knowledge Area by enhancing efforts in the fields of research, innovation, education and training, setting up a new excellence centres network, and increasing European dimension of permanent learning.

With view to industrial policy, the European Commission recognizes two unfavorable realities:

- in spite of advantageous position held by the European Union in basic research, European researchers and businessmen did not fully turn to account their expertise in border technologies as bio-technologies, life sciences, clean technologies;
- investments’ level in education and training, as well as in research and innovation, is still too low, particularly from private sources in the case of research.

In order to fight these deficiencies, the Council set up the objective to increase Research & Development investments up to 3% of GDP until 2010 ³.

The mentioned above document of industrial policy also emphasized the necessity to direct a larger part of public expenditures toward the Research & Development activities and growing the human capital, by the following ways ⁴:

- better harmonization of industrial policy with Research & Development policy, in order to spur innovation and technological diffusion by protecting the innovating enterprises (regulations concerning competition, intellectual property), granting fiscal facilities (for expenditures devoted to research), and making easier the access to financing sources (inclusively by regional development programs);
- development of technological platforms, able to amplify the synergies engendered by close collaboration of public authorities, regulation authorities, users, consumers, and excellence poles, namely networks knots in which basic research and technological transfer are deeply joined;

² ***, European Commission (2002), *The Lisbon Strategy – Making Change Happen*, Communication from the Commission to the Spring European Council in Barcelona, COM (2002) 14 final

³ ***, Commission des Communautés Européennes, *Plus de recherche pour l’Europe – Objectif: 3% du PIB*, Communication COM (2002) 565 final

⁴ ***, Commission des Communautés Européennes. Communication, *Les finances publiques dans l’UEM – 2002*, COM (2002), 209 final

- setting up and consolidation of “clusters”, and innovative networks, able by their creative potential to contribute to improvement of industrial competitiveness;
- development of human capital for better exploitation of existing knowledge stock, its accelerated amplification and diffusion;
- addressing with special attention the defence industry, as one with great Research & Development intensity, based on solid support ensured by public acquisitions, and whose new products and technologies are quickly taken over and diffused in the whole economy.

The innovation potential of EU countries has been the determining factor of trade intensification with high-tech products – computers and bureautics, electronic and communication equipment, electric machines and appliances, pharmaceuticals, aerospace equipment. High shares of high-tech exports, as illustrative indicator of international competitiveness of a knowledge-based economy, prove a country capacity to perform high level research and efficiently innovate. Countries acknowledged for their strong tradition in Science and Technology fields – France, United Kingdom, Finland, the Netherlands -, scored high weights of high tech exports.

The indicator “R&D intensity” mirrors investment effort of a country devoted to these activities. Among EU countries the level of indicator is very variable especially in high and medium tech sectors, indicating a certain specialization in these sectors; in low tech sectors differences between countries are smaller (see the following table).

Table 1. R&D intensity in manufacturing industry sectors, classified by their technological level, in some EU countries, in 2000

	UE - 15	Da	Fi	Fr	Ge	It	UK	Su
High tech industries								
Aviation, space industry	14,6	...	0,9	14,5	29,1	11,9	9,3	15,3
Pharmaceuticals	10,0	14,8	14,0	8,7	8,4	6,0	18,6	21,5
Computers	4,0	5,4	3,1	5,6	7,5	7,2	2,0	12,0
Radio, TV equipment	10,2	7,7	11,4	10,3	13,0	11,7	6,2	17,8
Medical, optical, precision instruments and apparatus	5,9	6,1	7,0	11,1	6,1	1,0	3,5	8,2
Superior tech industries								
Electric machinery	2,4	1,5	4,5	2,6	2,4	1,0	4,8	2,6
Motor vehicles	3,6	...1,8	3,2	4,6	3,3	2,9	6,1	
Industrial chemistry	2,5	1,7	2,8	2,4	4,4	0,8	2,5	2,2
Transport equipment	2,6	0,3	9,4	2,6	5,5	1,2	1,5	2,7
Machinery and equipment	1,8	3,2	2,4	2,0	2,3	0,5	2,1	4,0
Medium tech industries								
Crude oil processing, coal cocking, energy	0,9	...	0,8	0,9	0,3	0,3	2,9	0,4
Rubber and plastics processing	0,8	0,8	1,7	1,6	0,9	0,5	0,4	1,5
Other nonmetallic products	0,5	0,9	1,4	0,5	0,7	0,1	0,5	0,9
Equipment repairs	0,9	0,8	0,7	0,4	1,4	1,2	0,7	2,0
Metals	0,6	0,6	0,7	1,1	0,6	0,3	0,4	0,8
Metal products	0,4	0,2	1,1	0,5	0,5	0,2	0,4	0,8
Low tech industries								
Wood, paper	0,2	0,1	0,5	0,1	0,1	0	0,1	0,7
Food, beverages, tobacco	0,2	0,4	0,6	0,3	0,2	0,1	0,4	0,4
Textile, textile products, leather goods and footwear	0,2	0,1	0,6	0,3	0,5	0	0,2	0,5
Manufacturing industry	1,9	1,6	1,9	2,4	2,5	0,8	2,1	3,7

Source: *OECD – Science, Technology and Industry Scoreboard*, Paris, 2001

Table 1 highlights that R&D intensity in aviation and space industries is considerably higher than the EU average in Germany, Sweden, and France, in pharmaceuticals – in Sweden, the United Kingdom, Denmark, Finland, in computers – in Sweden, Germany, Italy, France, Denmark, in radio and TV equipment – in Sweden, Germany, Italy, Finland, France, in medical,

optical, precision instruments and apparatus – in France, Sweden, Finland, Germany, Denmark. From this point of view, the northern countries are well positioned, Sweden being leader in five of the sectors mentioned above, and Denmark and Finland in three of them.

As far as the second key factor of industrial competitiveness – knowledge – is concerned, deep changes occurred in the majority of industrial sectors as a consequence of production system modernization, which brought about a significant increase in qualification requirements. The public expenditures for education and professional training, as weight in GDP, had a high level, dropping however from 5,7% in 1990 to 5,0% in 2001; moreover, the private investments in education, permanent learning and scientific research are considerably lower than in the United States and Japan, as a consequence of the insufficient attention given to these fields in the last two decades. This was the main reason why 2000 Lisbon European Council's main goal was the "considerable increase in investment per capita" in human resources.

In conclusion, despite the fact that the European Union's industry is modern and in several fields very competitive at the world level, the strengthening of its competitiveness remains an essential requirement for the years ahead. Defining the three engines of European economic growth and competitiveness, the Union intends to stimulate their action for successful facing to globalization challenges. The future effects of the engines' action will be: restructuring industry by increasing weight of medium and, especially, high tech sectors; more intense participation in world trade with high tech products and services; deepening the EU countries' specialization in medium and high tech industrial sectors; turning to good account the knowledge potential.

2. Requirements of the knowledge-based society's influence on investments' management in Romania

For an economy engaged on the road to the market model, characterized by a keen scarcity of financial and technological resources, Science and Technology should play, or might play, a vital role.

Notwithstanding this conspicuous reality, in the last decade of the past century, Science and Technology was only a peripheral factor of Romania's economic straightening out, condition mirrored by steady reduction of R&D investments, disorganization of these activities by a strong and badly substantiated decentralization, and sharp diminishing of the innovation potential, with long lasting effects. The scientific community involved in these activities alerted several times the governmental decision makers about degradation of national scientific and innovation potential, vital for a country committed to regenerate and modernize its economy.

The main factors which brought about such a state were: delay of enacting scientific research, researchers' status, and intellectual property laws; lack of real scientific motivation of researchers; lack of proper conditions for carrying on research activities; lack of proper tangible and intangible incentives for inventors and insufficient legislative regulations in this field; illegal possibilities to trade non-registered inventions and innovations; migration of specialist because of low wages, uncertain prospects of the sector, and attractiveness of other sectors. The most important factor was, however, the steady diminution of public support allotted to R&D activities, in terms of budget expenditures weight in GDP, during the period 1990-2004.

The re-orientation of Science and Technology policy and R&D activities is under way, according to requirements of Romania's integration into the European Space of Knowledge. The reform process in this field, despite some delays and wavering, registered obvious legal, institutional and functional progresses.

There still are numerous unbalances and disfunctions, which have resulted in insufficient exploitation of the innovation potential, as much as it has remained, especially in the manufacturing industry. R&D activities in manufacturing sectors cannot offer a large range of realistic and modern solutions for a significant improvement of Romanian products / services' competitiveness. The innovation potential has decreased dramatically since 1990, the lack of a

real political will to straighten out and to put on a solid basis for R&D activities having profound effects and making strenuous efforts to retrieve registered recoil. The absence in the past decade of a coherent Science & Technology policy, focused on intensive turning to good account of the potential competitive advantage of different industrial sectors, was detrimental to R&D activities, which did not have a notable contribution to the country's economic and social development.

Taking into consideration all these aspects, one can outline the main requirements to improve investments management in the context of a knowledge-based society.

- *Allocation of a higher share of GDP to R&D activities, the improvement of both physical infrastructure and human resources quality having priority;*

The increase in GDP share earmarked to R&D activities, in order to reduce the lag between Romania and other ECE countries and the EU countries, will be ensured by enhancing the contribution of enterprises, other sources – education system, professional associations, own sources -, as well as foreign funds.

The R&D expenditures will be preponderantly allotted to development of modern and well-equipped centers, support of Romanian researchers' access to EU research facilities, development of computers and communication networks in R&D units, extension of national computers network and its connection with national corresponding networks of the EU countries.

- *Promoting setting up and development of excellence centers, stimulating domestic sources of scientific expertise in vital economic areas;*

Improvement of public funds allocation to the field of R&D will be achieved by identification of the most successful R&D units through their periodical assessment and confirmation, in accordance with the European assessment criteria. Rigorous assessment of the quality of activities and outcomes of R&D units will be carried out at national level by an organism specialized in institutional evaluation, which has chiefly the role of setting priorities in leading R&D areas and of improving public funds allocation for them.

The development of R&D activities in the network system will also be necessary, ensuring integration of R&D units from the EU and acceding countries, contributing to scientific and technological expertise in vital economic fields.

- *Development of human resources in R&D and innovation activities, in accordance with the European model of scientific careers;*

Romania's research human potential, in number of researchers per 1000 inhabitants, is considerably lower in comparison with EU countries and majority of transition countries (researchers number/1000 active inhabitants: Romania – 2,8; EU – 5,3). Stopping remarkable researchers' exodus, in which the young people have an important share, is possible only by proper measures aiming at improvement of work conditions in research units, application of an incentive wage system, and ensuring professional development prospects and stimulating careers.

- *Intensifying research within firms and turning to good account research outcomes in industrial production;*

The absence of the R&D function in most industrial firms dramatically reduced their innovation potential and curtailed their chances of restructuring and technological modernization.

The particular importance of firms' R&D function is underlined by the fact that periodical assessments of European firms innovation performances, carried out on the basis of selective statistical research (Community Innovation Research), use two illustrative indicators: the weight

of firms with R&D activity, and the share of firms whose new and improved products have a substantial contribution to their turnover and exports.

- *Intensification of Romanian researchers' participation in the European Union Framework Programs;*

The European documents regarding Science and Technology field emphasize idea that, in present conditions, R&D success is conditioned by partnership and scientific collaboration, as well as commitment in wide-spreading international projects.

Romanian researchers' participation of in the EU Framework Programs can be improved through different ways: modernization of technical infrastructure quality of R&D units, especially of the most performing ones; stimulating co-operation among research units, universities and enterprises; intensification of information spreading and assistance for projects participants, by means of National Contact Points network.

- *Intense development of scientific and technological parks;*

The scientific and technological parks are an efficient modality of improving the university-industry relationship, that is of intensifying effective contact between university research and business environment, particularly in industry. This form was largely applied in the 7th and 8th decades of the last century, as the developed countries' reaction to the problems of economic recession, unemployment increase and traditional industries' decline, by stimulating development of new technology-based industries, promotion of new technologies transfer and diffusion, and efficient exploitation of the local potential.

Despite the difficulties that arose, the experience acquired by creating innovation and technological transfer centers, as well as their functioning, led to the conclusion that there is a range of determining factors in this respect. Among these factors, the most important are: a real demand for products and technologies as a matter of university research and application by the centers; acknowledgment of the importance and effectiveness of this research form by all involved decision makers, materialized in the setting up of a stimulating economic framework for innovation; a proper infrastructure for scientific research and production, in accordance with requirements of new and complex technologies; diversified and accessible financing sources; university specialists with both scientific personality and managerial skills, essential for successful simultaneous operating in scientific and business environment; setting up of close and diversified ties of the respective centers with persons and institutions from the business environment.

As for the development of human capital, as the other main field of intangible investments, the world experience demonstrates that all countries, mainly developed ones, get over a historic process passing from industrial to post-industrial civilization, in which the human resources qualifications, appreciated in terms of their education level, are decisive. More than ever in world history, nowadays the countries' real economic power depends not only on the amount of value added (GDP), but also on the national innovation potential and human resources quality, finally expressed in the capacity to generate new ideas and innovate.

The Romanian education system's reform began to be carried on in 1997, trying to answer the challenges of an "information and knowledge-based society", in which the real flow of goods and services is replaced by the information flow specific to "virtual economy". In the knowledge-based society, the continuous learning becomes the long term decisive factor of the society's progress. The main specific challenges of the knowledge-based society are the following:

- the impact of new knowledge and communication technologies;
- the globalization, viewed, particularly, as economic, technological and cultural interdependence;

- the need to promote global education (flexible and innovative curricula, interactive learning, high mobility of trainees), as means of globalization promotion and as its effect;
- the improvement of education process' quality by adoption common educational standards for different professions, ensuring proper procedures to improve the quality of institutions and educational programs acknowledged at national level.

The initiation of education system's reform brought about noteworthy changes, which sensibly modified *the education stock* (number of years graduated from school multiplied by population effectives, on qualification levels), as well as *the average level of schooling* (population groups by types of graduated school multiplied by the average number of schooling years corresponding to each type of graduated school, and divided by population groups depending on the type of graduated school). Both indicators mirror the human potential of a population, expressed in both quantitative – “population effective” -, and qualitative terms – ‘number of schooling years’.

The *professional training*, as well as professional *re-conversion* are important constituent parts of the national education system. Restructuring of economic activities and enterprises should be preceded, with a long enough period, by proper knowledge restructuring for making it adequate to new needs issued from changes occurred. This is possible only by professional training, which should be a modeling process of labor force tender depending on the productive system needs and aspiration for a better life of society's members.

Increasing the contribution of the national education system to creation and development of the new knowledge-based society is possible in Romania only by providing that consistent pursue of the following reform *objectives* will be ensured:

- harmonizing the education's content and management with the principles of market-oriented economy, lawful state, individual freedom and political pluralism;
- transformation of schools, highschoools and universities into units that should back up moral, cognitive and technological renewal of the Romanian society;
- quick solving of problems engendered by the delayed modernization of the country, by proper utilization of education system's levers – the range of qualifications ensured by schools, scientific research and education policy;
- aligning the organization, functioning and evaluation of education units to the standards in force in the European Union.

Specialization deepening, as a *sine qua non* prerequisite of efficiency and competitiveness' increasing, supposes the carrying out of the education process according to the following main *co-ordinates*:

- Setting up a true social partnership, a close collaboration among employers, employees and State, in order to identify the range of skills required on the labor market which should be get, aptitudes to be developed in the future, and the most effective ways to achieve education process;
- Improving the diploma granting system, in order to increase labor force flexibility and allocation efficiency of labor market;
- Extension of education programs' co-financing – by the State, firms and persons -, given the ceaseless rise of programs' cost and State's incapacity to exclusively cover them;
- Permanent control during training process of professional skills and abilities' individual “gain”, for determining this process efficiency and to what extent its orientation and content correspond to real requirements of production activity;
- Decentralization of decision-making processes concerning orientation and content of educational services, and stimulating private providers of such services, in order that their activity and performances should be monitored by specialized public institutions;

- Significant extension of human resources training within enterprises, in order to better relate the programs' content to dynamic requirements of productivity rising, and to give more people the possibility to attend these programs.

References

1. L a l l , S. (ed.) - *The Economics of Technology Transfer*, Edward Elgar Publications, Inc., 2001
2. P e r ț , Steliana (coord.) - *Evaluarea capitalului uman. Coordonate strategice ale evoluției pieței muncii în România*, SOREC, IRLI, București, 1997
3. S a n d u , S. - *Inovare, competență tehnologică și creștere economică*, Editura Expert, București, 2002
4. S a n d u , S., M u n t e a n u , A.-C. - Contribuția cercetării-dezvoltării la creșterea exportului – balanța tehnologică de plăți, în: *Evoluții structurale ale exportului în România* (coord. Zaman, G., Vasile, V.), Editura Expert, București, 2003, pag. 513-538
5. S u c i u , C. M. - *Investiția în educație*, Editura Economică, București, 2001
6. Z o n , H. van - *The Digital Economy: Challenges for Central European Industry*, AI & SOCIETY, © 2001 Springer –Verlag London Limited
7. ***, Commission des Communautés Européennes, *La politique industrielle dans une Europe élargie*, Communication de la Commission au Conseil, au Parlement Européen, au Comité Économique et Social et au Comité des Régions, Bruxelles, le 11.12.2002, COM (2002) 714 final
8. ***, Commission of the European Communities, *Communication from the Commission to the Council and the European Parliament on Implementation of the Risk Capital Action Plan (RCAP)*, Brussels, 25 October 2001, COM(2001) 605 final, 2001
9. ***, Commission of the European Communities, *Communication from the Commission to the Spring European Council in Barcelona. The Lisbon Strategy – Making Change Happen*, Brussels, 15.01.2002, COM (2002) 14 final
10. ***, Commission of the European Communities, *2005 Regular Report on Romania's Progress towards Accession*, Brussels
11. ***, European Commission, *The Sixth Framework Program, Participation in European Research; Priority 7: Citizens and Governance in a Knowledge Based Society*, Brussels, 2002
12. ***, Eurostat, *Research and Development: Annual Statistics, 1990-2000*
13. ***, Eurostat, *R&D and Innovation in Candidate Countries and the Russian Federation, 1990-1999*
14. ***, Eurostat, *Statistic in Focus, Research investment more limited in the candidate countries than in EU*, Science and Technology, No. 130/2000,
15. ***, Eurostat, *Yearbook, 2002, 2003, 2004, 2005*

Oportunități și provocări ale societății bazate pe cunoaștere în domeniul managementului investițiilor

Rezumat

În ultimele două decenii, dezvoltarea economică a tuturor țărilor lumii, și mai ales a celor industrializate, s-a orientat progresiv către creșterea semnificativă a competitivității lor economice, ca pilon de bază al strategiei dezvoltării durabile. Globalizarea economică, ca trăsătură fundamentală a dezvoltării actuale a societății umane, stă la baza amplificării interdependențelor dintre regiuni și economii naționale, ceea ce generează numeroase oportunități de expansiune economică, dar și provocări diverse, constând din intensificarea concurenței, existența unor surse permanente de conflicte politice, economice, inter-etnice etc.