

A Vision upon Science in a Knowledge Society

Gheorghe Duca¹, Constantin Gaidric^{2,3}

¹ Academy of Sciences of Moldova,
1, Stefan cel Mare Avenue, MD-2001, Chisinau,
Republic of Moldova

² National Council of Accreditation and Attestation, Republic of Moldova,
180, Stefan cel Mare Avenue, MD-2005, Chisinau,
Republic of Moldova

³ Institute of Mathematics and Computer Science, ASM,
5, Academiei Str., MD-2028 Chisinau,
Republic of Moldova

Abstract: The article describes development trends of the Republic of Moldova, economic prosperity means, the role of science in transition to the knowledge society. The first steps that have been done so far towards the reform of science and technological transfer process, as well as some measures were assigned by public central authorities in response to the scientific community proposals.

Keywords: knowledge based society, information society, science development.

Gheorghe Duca graduated from State University of Moldova, Faculty of Chemistry in 1974, received his Ph.D. degree in 1979 and Doctor Habilitatus degree in 1989. Since 1990 Dr. Duca has been professor at State University of Moldova. In 1992 and 2000 he was elected as Corresponding Member and Academician (full member) of the Academy of Sciences of Moldova correspondingly. Currently Acad. Duca is President of the Academy of Sciences (elected in 2004). Acad. Duca is a member of the International Academy of Informatics.

Constantin Gaidric graduated from the Pedagogical State Institute by Alecu Russo, Faculty of Mathematics and Physics (Balts, Moldova) in 1962, received his Ph.D. degree in 1972 and became Doctor Habilitatus in 2000. In 2007 he was elected as Corresponding Member of the Academy of Sciences of Moldova. Currently he is the President of the National Council of Accreditation and Attestation of the Republic of Moldova, main researcher at the Institute of Mathematics and Computer Science, Academy of Sciences of Moldova. Prof. Gaidric is a member of editorial board of 9 scientific journals (Romania, Bulgaria, Ukraine, Russian Federation, Republic of Moldova), member of scientific associations: Mathematical Association of Moldova, Balkan Association of Fuzzy Systems, Romanian Association of Mathematical Modeling, Romanian Association of Fuzzy Systems.

1. Introduction

The expression designating the new society that we are heading towards – the Information Society or the Knowledge Society – clearly reveals the nature and the progress of the basic concepts that will stand at the basis of the society; thus, the name itself could be considered too plain and technical, but only at first sight.

The economy of this new society, still in formation, will be significantly different as compared to the existent one. The importance and significance of the novelty will justify the name itself.

The economy of the knowledge-based society has to rely on its own resources at a new level of knowledge. These resources – the new techniques and technologies – are directly correlated with the process of information and knowledge, providing a new configuration for the society and the economy.

A socio-cultural and economic metamorphosis, without precedent in the known history of the mankind, takes place now, under the pressure of continuous acceleration of all processes related to the society. Until not very long ago, our only concern was storing and processing material goods, but the computers era brought along the importance of storing and amplification of the most brilliant results of the scientists' activity. Every single day brings more exact models and simulations of the processes of the real world we live in.

One knows that only those who possess information have the power of choosing the appropriate solution to a given situation. It is true, indeed, but not for long...

The information society represents the first stage of the metamorphosis, consisting in the development and generalization of the infrastructure and the environment we activate in. At the same time, this imposes a new rhythm of human and societal development towards a new, almost unknown destination.

The digital era, which began in the last century, has shown how the evolution of knowledge can be

influenced by technology. Huge quantities of information have been revised, stored, evaluated and disseminated. The INTERNET encouraged the access to the global knowledge through a perpetual learning. The humankind started democratically sharing the most important wealth – knowledge.

A lot of specialties disappear nowadays, and other new ones appear at the same time; there is a more and more acute necessity of adapting our knowledge to the high standards of cultural and scientific production. The process of decision-making becomes more accelerated and coherent, as it can be simulated, projected in teams situated in any location on the Globe. An enterprise may be managed at distance, as well as the activity of a technological stream with a small number of well prepared specialists.

The science, technologies become more and more interdisciplinary. Knowledge, theories, strategies, models and technologies obtained in a field are rapidly assimilated by others.

The management of knowledge is identified with a synergetic process, regardless of countries, economies and societies' borders. The dialogue, debate, interpretations and innovations are applied more and more frequently nowadays, leading to the discovery of a variety of approaches in the field of information systems, from the perspectives of human resources, strategy, advantage and competition approaches. All this is facilitated by the ability of continuous learning and dialogue under the liberal influence of the cultural environment and science.

All this outstanding mixture would have never undergone the transformation into knowledge in the absence of the centre of the process, represented by the educated person. The peculiarities of an educated person in the process of learning are the necessity of being supported during the research process and the exploitation of knowledge (know-how and know-what).

The employees-of-knowledge are already a challenge for the actual society. The totality of abilities and capacities of this new type of employee demands both a good education, based on a continuous learning, and a positive state of mind regarding the phenomena of change and innovation.

The specialization itself does not necessarily lead towards performance and results.

The role of catalyst belongs to the organization and the working team, which form the environment and the necessary continuity for converting the information into knowledge and thus reaching the performance. The employees of knowledge are the ones who will be the essence of the future societies and economies, the leaders and promoters of values, fundamentally opposite to those known in the present. Their access to working places, as well as to social and economic status, will be achieved through education, in all its forms that are to be discovered yet.

Furthermore, the society and the economy of knowledge will have unprecedented forms of competition, as there will be no more excuses and explanations for the lack of performances, due to the permanent low-cost access to knowledge at any time. Thus, ignorance will be a proof of the lack of will to progress. The major changes we hope to actively witness will be related to knowledge, namely its form, content, concept and responsibility.

The scientific research has the task to enrich the knowledge and to prepare the technological basis for the economical prosperity.

The contemporary science can be described by *accelerated* development; a *multidisciplinary* character; a *faster* application of the scientific knowledge; *science-based technology* (as opposed to the “art” or “handicraft” based on empirical knowledge); *integration* of the scientific research activity within both the education and training activities and technological transfer and innovation (as these activities are interdependent, including that they take place during the same period of time, and are performed by the same organization or individual); the growth of the necessary human and material efforts for solving major scientific and technological problems imposes an intense *international cooperation*; the development and use of science and technology is more and more limited by the lack of *human resources*. The science determined the evolution of the postindustrial era, as it represents the basis of the technological progress, and thus the science has an overwhelming importance in a knowledge-based society (economy).

Knowledge is “*information in context*”. The information does not automatically become knowledge and shouldn't be confused with it.

In order to deeply understand the concept of *knowledge society*, it should be noted that it is used in correlation with the concept *knowledge-based economy*. Obviously, these two concepts are related to each other, but not identical. First of all, the intensive use of knowledge, including the generation of

information, represents the *essence of several processes with economical impact*. On the other hand, the “society” represents a concept larger than the economy or the progress. Therefore, beyond its economical effects, the formation of the knowledge society will bring consequences of a more complete realization of the human personality [1].

By signing the Lisbon declaration [5], the European Union proves its intention to develop the most competitive knowledge-based economy within the next ten years. This declaration also refers to a plan which identifies the main directions of activity (which we had call vectors of the knowledge-based economy). We mention here three of them: the information society, the education, the research activity.

One essential concept of the European politics in the field of research is ERA (i.e. the *European Research Area*), stating the intensification of collaboration in the frames of the European Union, regardless of the geographical boundaries (including countries of potential adhering and third parties).

The importance of research was emphasized by a European Commission report, which reveals that the European Union faces a deficit of the export-import balance in the field of high technologies and needs to make efforts to intensify the research [4].

The Seventh Framework Program foresees a high-level concentration of the research efforts, offering financing for the next directions:

- a) financing of extensive projects, which would settle important problems and would assure the Europe’s competitiveness;
- b) networks of research;
- c) partnerships between states.

Moldova can not ignore these evolutions. Moreover, the only opportunity to reduce the economic gap is to orient rapidly towards the newest evolution-trends in the world and particularly in Europe.

In this context, the country’s officials launched a science reform proposal and optimization, because science found itself in severe decline after the disintegration of the Soviet Union. The first reform stage was the adoption of the Code on Science and Innovation, approved by the Parliament in 2004 [3]. Thus, in accordance with the Code, the Academy of Sciences represents the only public institution of national interest in the field of science and innovation, being a plenipotentiary coordinator of scientific and innovation activity within the country, scientific advisor of the public authorities of the Republic of Moldova.

According to the Code, starting with 2005, the state budget is financing the scientific research exclusively through the Academy of Sciences and only on the basis of competition. The technological transfer projects should provide a co-financing of 40 % from the total cost of the project. Thus, similar subjects of research and the research areas that are not relevant for the economy of our country are excluded, as well as investors from outside the Academy are attracted [7]. The strategic directions of the science and innovation field are established by the Partnership Agreement [10], concluded, according to the Code, between the Academy of Sciences of Moldova and the Government of the Republic of Moldova. This Agreement stipulates the increase of the annual financing of the science and innovation field from the state budget up to 1% of GDP in 2008.

The time schedule of the priority assignments and the budgetary funds tends:

- To strengthen relations between the research-development system and the economic progress requirements, in order to implement quickly the research-development results by the economic agents;
- To convert some centers and institutes into performing research platforms, as institutions of national interest, able to develop and utilize the existing research potential, as well as to minimize the risk of its dissipation into other sectors of activity or abroad;
- To promote the projects of cooperation within the Republic of Moldova and the scientific research centers, which will gather collaborative teams of local and European Union countries experts;
- To facilitate the process of technological transfer and valorization of obtained scientific results in economy;

- To change the stereotypes related to the research activity, acknowledging the fact that science generates sustainable development;
- To define the priority fields of the scientific research;
- To create suitable conditions for researchers, particularly for the young generation, as to prevent them leaving the country.

The role of the scientific research in the context of economic development has to be regarded not only from the point of view of the actual requirements of the “nowadays” economy, but from the position of the further development of the Moldovan economy. In this regard, the strategic directions in the field of the science and innovation, provided in the Partnership Agreement, are revised every 4 years.

There are three key problems that should be settled in time.

2. Valorization of Research Within the Frames of Economy

The technological transfer continues to remain a difficult problem that is linked not only to the legislation or organizational structures. The problem is: *what* technologies and products are to be transferred and to *whom*. In many countries technological transfer is supported by the state:

- a) in the field of *high* technologies;
- b) for some innovative industrial units benefit (of course – private units).

The necessity to implement scientific results and technological innovations in the social and economical reality for assuring the competitiveness of the country on internal and external markets, welfare of the citizens, protection and improvement of environment are considered top priorities for the Government and the Academy of Sciences of Moldova. This is clearly proved by the main documents of strategic planning at the national level, drawn up during the last several years. These documents stipulate special commitments by introducing several distinctive compartments:

- (i) into the Economic Growth and Poverty Reduction Strategy (EGPRS) [6], also extended for 2007 – compartment “6.7. Research and innovations”;
- (ii) into the National Program “The Moldovan Village” (NPMV) [9] – the compartment “3.14. Scientific and innovational support for NPMV implementation”;
- (iii) into the Action Plan “European Union – Republic of Moldova” [2] – compartment “2.6. Transport, energy, telecommunications, environment and research, development and innovation” – all these with the support of informational technologies.

An important set of actions concerning the development of science and innovation will be included in the National Plan of Development of RM (NPD) for 2008-2011, oriented, especially, towards the realization of three (out of five) strategic priorities of this plan, namely: “Enhancement of the competitiveness of the national economy”, “Human resources development, increasing job opportunities and promoting social inclusion” and “Regional development”. Also, within the NPD the objective concerning the development of innovation infrastructure and promoting technological transfer will be emphasized.

This objective is introduced into the main strategic document that deals with the planning of the social and economic development of RM for 2008-2011, due to the recognition of the importance of innovation – a critical element of political strategies at the national level. The link between the capability of nations to implement the innovations into the economical activities and the ability to compete on world markets is clearly defined for modern governments. The efficiency of the economies in the XXI century depends mostly on the results of structural transformations, based on a process of continuous replacement of the existent producing technologies and management systems with new ones, more progressive. The innovation field represents the core of structural changes in any economic system, while the characteristics of this field determine the speed and the quality of economic changes.

In accordance to some estimation, almost 50% of the GDP increase is due to the implementation of scientific results and advanced technologies into economy. As a result, the improvement of life quality, the decrease of pollution and degradation of the environment, as well as the maintenance of the biodiversity, are phenomena absolutely inconceivable in the case of absence of a modern scientific-

technological and innovational basis. The social-economic innovational development is based on the triad of knowledge *education-research-innovation*, the first element of which is of crucial importance, due to its direct link with the quality of human capital. Nowadays, the most important source for economic growth of any state, including those developing and those in transition is not represented by the energetic or mineral resources, nor by agricultural fields, but by the human capital. History shows that human resources combined with the scientific-technological progress, tend to replace the other resources: the percentage of the ground and underground resources, including minerals, energy and food, constitutes almost 50% of GDP at the beginning of the last century, nowadays – less than 10%. Today, the implementation of scientific results and innovations together with human resources, contribute with 75-80% to the GDP increase.

It has to be noted that unfortunately, the innovation infrastructure in the Republic of Moldova is very poorly developed. The delay of economic reforms represented a severe hindrance in the process of lining up to the world's tendencies, while its productive sector, extremely fragile, couldn't generate a real demand for innovation. Large enterprises, carrying out a full or partial innovation cycle in the '90s, stopped the innovation activity or were shut down due to the lack of financial resources. The entrepreneurship doesn't make substantial and long-term investments into the innovation area, because of the high risks characteristic to these activities and, as a result there are no such financial structures (risk funds, etc.) in the country. At the same time, the process of providing support for the innovation activities by the state is only at the beginning.

The level of innovation culture is extremely low in the productive and service sectors, as well as in the research institutions. The activities of technological transfer, supported by the state, were launched only 2 years ago. There is no information regarding the level of innovation activities in the companies and enterprises, due to an unattractive system of registering these expenditures, as well as due to the weaknesses of the statistic system. Present innovations mostly happen only thanks to the import of technologies and management systems. The lower cost of research and innovation in the Republic of Moldova, as compared to the international environment, which is a short-term advantage, creates additional risks when it comes to long-term achievements, as it is strongly linked to the "brain-drain" phenomenon in the context of globalization. Analogically to economic activities, the innovation activities are exclusively concentrated in Chisinau and Balti. This represents a serious impediment for regional development and trans-boundary cooperation in the frames of Euro regions, in which Moldova is involved.

3. The Integration of the Moldavian Research in that of the European Union

This process copes with a lot of difficulties due to:

- the decrease in human resources and the difficulty to attract the young generation into a scientific career;
- the delay of the institutional reorganization;
- the lack of an adequate material basis for research.

Taking into consideration that the European integration represents an absolute priority for our country, in order to build a society and economy based on knowledge, we must be guided by the stipulations of the policy on innovation of the member states of the European Union (EU), discussed in the "Lisbon Strategy", adopted by the European Council in March 2000 and revised in 2005 as the "Lisbon Strategy for Growth and Jobs". This important communitarian document established strategic objectives of economic development of EU for a period of 10 years, foreseeing creation of a dynamic and lasting economy based on knowledge, capable to improve working conditions, to increase social cohesion and which would consider the innovation activity as the decisive factor in assuring the competitiveness at any level: enterprise, sector, region or country.

4. The Lack of Economically Attractive Environment

As it was mentioned, there are enough reasons to consider the scientific career unattractive. The exodus of qualified people has reached alarming proportions and there are no clear methods to stop it.

It has to be underlined that if research doesn't have any economic impacts, then there is no serious

motivation to support it. In a market economy, the industrial units can not be made to find their own solutions regarding the development of new products on the basis of local researches (if the autochthonous research is not competitive on the international level, it doesn't have any long term chances for the economy of the country, either).

Except several achievements, the scientific research from our country can not be successful in science and high-technology if left alone. This is proven by the promotion between the scientific and technological areas by the most developed countries and powerful transnational companies.

The ways of solving these three problems can be the following:

- The establishment of an innovation and technological transfer system, that will facilitate exercising the autochthonous specialists, as well and open access to the technological services of the European Union.
- The creation of attractive conditions for investments in high technology (foreign and autochthonous capitals), including human resources policy.

At the moment, there are no essential elements in the Republic of Moldova of any modern innovation system (or are only at the beginning of their development) such as:

- (i) the structural-institutional component – scientific-technological parks, innovational incubators, centers for technological transfer, clusters and technologic platforms;
- (ii) the personnel component – universities and other organizations, which would ensure the training and the continuous development of specialists (including profile civil servants) in the innovational and technological transfer management and marketing, technologic audit etc.;
- (iii) the consulting and informational component – organizations, centers, independent consultants, which would offer services in various fields of the innovational process, including the gathering, processing and dissemination of information;
- (iv) financial component – diverse budgetary and extra-budgetary funds, investment, risk, assurance funds etc.

The creation of a competitive economy based on knowledge implies the realization of three major objectives:

- (i) creation of a national innovation system;
- (ii) increase of the competitiveness of the economy;
- (iii) improvement of the quality of life.

The creation of national innovation system will be realized by the formation of: a) a proper legislative - normative frame for the organization and stimulation of the innovative activities; b) formation of a network of institutions, which will contribute to obtaining and dissemination of knowledge and new technologies, all together or each in part. Being a set of interactive structures, this system will allow the elaboration, absorption, protection and implementation in social-economic practice of the technological and managerial innovations.

The increase of the economy's competitiveness will be accomplished by: a) creation and stimulation of the partnerships between research organizations, universities and economic agencies; b) diversification and development of the financing and/or co-financing schemes of the innovative process; c) introduction in the economic circuit and social practice of the new technologies and knowledge. Accomplishment of this objective will assure the increase of the efficiency and quality of the existing products and services, as well as obtaining of new ones.

The improvement of the quality of life will be achieved by the elaboration and implementation of solutions, including technological ones, for national, regional and local problems in order to increase the efficiency of the policies regarding health, education, environment, territory improvement and valorization of natural resources.

The innovational infrastructure, which is to be created in the next few years in the Republic of Moldova, will have the following basic components:

- (i) Scientific-technologic clusters and technological platforms – groups of persons and legal entities, created on the basis of association agreements, signed between an accredited scientific or innovational organization and/or accredited institutions of high education, other non commercial organizations, on one hand and economic agents, authorities of local and central public administration, professional or employers associations, persons, financial institutions, international organizations, foreign or domestic investors, on the other hand, in order to unfold scientific research activities, education and technologic transfer of the scientific and innovative results, implementation of this results through economical activities.
- (ii) The scientific and technology parks – groups of legal and physical entities, from scientific, innovational and technological transfer organizations, economical agents, that will use the scientific results in their economical activity.
- (iii) The innovational incubators – groups of legal and physical entities, that will use scientific results obtained in one or several technological-scientific areas, through innovational and technological transfer activity, research designed to provide the scientific assistance for the above mentioned. The innovational incubators will provide advisory services regarding the fiscal system, financial evidence, will facilitate the obtaining of grants and credits, conclusion of contracts, elaboration of business-plans, management, marketing services, obtaining of patents and licenses, rent facilities, cars, phones, faxes, e-mail, offer media services, publishing services, and will also assure the access to scientific and technological information.
- (iv) Innovation companies, inclusively innovation small and medium enterprises (SME) or research-innovation divisions within big companies;
- (v) Joint funds (with participation of the productive capital, financial-banking, sources of the insurance companies etc.) aiming to encourage innovational enterprises;
- (vi) “Venture” type organizations – for the investment of the capital in risky ideas, but with higher chances of obtaining high profits;
- (vii) Engineering organizations, which have to collect finite scientific experimental and planed results, to implement and to commercialize them on a large scale;
- (viii) Organizations of leasing of the advanced technological equipment etc.

The first steps were made in the field of innovational infrastructure in the summer of 2007, when the Parliament of the Republic of Moldova adopted the Law regarding scientific-technological parks and innovational incubators [8] was elaborated in order to liberalize the economic activity that has been carried on in our country during the last few months. Thus, the residents of the scientific-technological parks and innovation incubators will benefit from fiscal and customs advantageous conditions, such as: a) the exemption of the value added tax and the custom tax for the imported services and goods; b) the exemption of the value added tax for the services and goods acquired from the economic agents from the Republic of Moldova; c) the exemption of the income tax for the first three years of their activity.

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