

## **ASPECTS OF SCIENTIFIC RESEARCH, TECHNOLOGICAL DEVELOPMENT AND INNOVATION IN THE SECURITY SYSTEM**

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*Security became one concept that integrated different fields: political, economic, social, cultural, ecological, military, moral, diplomatic and humanitarian.*

*The economic component of national security has gained great importance in current internal and international circumstances. In this context, the activities of scientific research, technological development, but also innovation have an important role leading to the qualitative and quantitative increase of the national production and technological potential as being essential elements for the provision of material and spiritual wellbeing.*

*In order to settle the role of scientific research, technological development and innovation in the fulfillment of the scientific progress contributing to the economic and social development, and also to the strengthening of the security system, it is necessary to define the mentioned notions. These aspects are meant to emphasize our scientific work.*

**Keywords:** security; system of national security; scientific research; technological development; innovation.

### **The analysis of concepts: security of state, system of national security, scientific research, technological development, innovation**

The world we live in is in a permanent change because of some predictable or unpredictable situations. Perhaps this is the reason for the following statement "we are prisoners of an international system with nonlinear evolutions and with much heterogeneous actors hardly to be caught into a single equation"<sup>1</sup>.

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<sup>1</sup> Șerban Filip Cioculescu, *Terra incognita? Repere pentru "cartografierea" haosului din relațiile internaționale contemporane*, Military Publishing House, Bucharest, 2010, p. 7.

Until now, regarding the definition of the security concept it has not been a unanimously accepted expression. One reason could be the variety of factors defining the security state being in continuous change following the challenges appeared in the international security environment.

Our scientific work aims to define the security concept starting from a main institution of the political system, as state; therefore, we will refer to the security of state. Considering the state as a living structure, the security concept can be defined as “sentimental state of population and supra-structural institution (the authority of state) attitude determined by the absence of any danger”<sup>2</sup>.

After the end of the Cold War, *the common security*, a new concept, is a more and more used in the relations among states, which began with the measures to strengthen the trust and agreements over the armaments control and disarming. Every state’s security has two branches, one internal and the other external, and in both situations it is based on the anticipation capacity and proactive action, and on the capacity of reaction and adaptation to the changes from the security environment.

Another concept submitted to the analysis in this scientific endeavour is the system of national security. In some authors’ opinion, the system of national security of democratic type represents “the basic condition for good governance and to guarantee the liberty and prosperity of persons”.<sup>3</sup>

The system of national security of Romania, in current circumstances it has the following main functions: to promote and protect the national interests, to guarantee and defend the sovereignty, independence, territorial integrity and unity of the Romanian state, the constitutional democracy and the state of law. Also, the national security system must provide Romania’s freedom of action in relation with other state and non-state actors, the active participation in crisis situations’ management in the area and the support in the civil emergency situations (natural disasters, industrial accidents, other special situations).

Every security system exists within a security environment framework characterized by a series of trends as the ones regarding the activities of research, technological development and innovation.

Science and technology determined and continues to determine the economic and social development. Science represents the main source of innovation, respectively the scientific research as activity contributing to the accomplishment of inventions which once applied, the technical progress is done.

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<sup>2</sup> Assoc.prof. Gabriel I. Năstase, Ph.D., *Implicațiile cercetării științifice, dezvoltării tehnologice și inovării în sistemul de securitate*, Universitaria Publishing House, Bucharest, 2010, p. 205.

<sup>3</sup> <http://www.zulean.com/blog/tag/securitate-nationala/>, accessed on 26 April 2012, 18.10 h.

The contemporary science is characterized by a series of *features*<sup>4</sup>: accelerated development; multidisciplinary character; the more rapid application of science's results; the integration of scientific research with the activities of education and training; technology mainly grounded on science.

The field of science and technique comprises:

- Activity of research-development represented by: fundamental research, applicative research and technological development;
- System where these format activities are undertaken, institutionally speaking, as: institutions with responsibilities in coordination and financing of activities, networks of organizations (institutes, centers, departments, etc.) where activities of research-development are accomplished, the system of extended relations between the already mentioned organizations.

*The fundamental research*, as activity systematically developed aiming to know and develop the scientific knowledge about nature and society, integrates with the *applicative scientific research*, as activity systematically undergone to elaborate on new scientific and technical knowledge some new methods which once applied determine the economic and social progress. The objective of fundamental scientific research and applicative scientific research represents the creation of technologies, so that the science, when is materialized in technology, can become an important mean of modernization and development of production activity.

Before 1989, there was little interest on national plan in approaching the issue regarding the implications of the scientific research, technological development and innovation on the security system. Things were not different on international plan. The analysis of the implications of scientific research and technological technology in the security system was approached by few researchers owed to its complex character. Among the few researchers preoccupied by this implications were Derek J. de Solla Price.

The National Science Foundation (NSF) an independent federal agency created in 1950 by the US Congress to promote the progress of science, the progress of national health and the provision of national security<sup>5</sup> and the Organisation of Economic Cooperation and Development (OECD) created in 1961 to promote the public policies designed to enhance the economic and social policies of humans from the entire world, accomplished a classification which showed that the following categories of research activities existed: fundamental research, applicative research and development.

Furthermore, we will present the definitions of the third categories of research activities formulated by NSF and OECD.

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<sup>4</sup> Hanganu Marius, Coșoreanu Mihail Liviu, *Implicații ale cercetării științifice în managementul dezvoltării produselor militare*, "Carol I" National Defence University Publishing House, Bucharest, 2011, p. 133.

<sup>5</sup> <http://www.nsf.gov/about/>, accessed on 26 April 2012, 19.15 h.

### **NSF definitions:**

The fundamental research takes into consideration the industrial interest and aims "the knowledge or the complete understanding of the studied subject rather than its practical application".

The applicative research is directed to obtain "knowledge or understandings needed to determine the means used to reach to the recognition and specific necessary".

The development is "the systematic use of knowledge or understandings gotten by research, directed to the production of useful material, devices, systems or methods, inclusively the projection and development of prototypes and processes".

### **OECD definitions:**

The fundamental research is "an investigation originally started aiming to get new scientific knowledge or understandings. It isn't firstly directed at any practical or applicative goal. The fundamental research is directed to the generalization of solution or conception".

The applicative research is "an original investigation started to get new scientific or technical knowledge. In first, it's anyway directed to a specific, practical or objective goal. The applicative research develops ideas in operational forms".

The technological or experimental development represents "the use of scientific knowledge in order to produce new materials, devices, products, processes, systems or services or substantial improvements to those".

Other authors define the technological development as "the activity undergoing on the basis of applicative scientific research results and of empirical knowledge to create a product, some machineries, installations and similar technologies as are to be used in the production process and also for the modernization and perfecting of existent products and technologies".<sup>6</sup> The technological development is fulfilled by activities of technological engineering, of product technology projection and product projection to apply in the production of new or perfected technologies, products and systems.

We conclude that:

- *The fundamental research* is oriented to the acquirement of new knowledge;
- *The applicative research* is oriented to the widening of knowledge to develop new products, processes or services and to their significant improvement;

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<sup>6</sup> Mitea V. Ticovschi, Violeta I. Dănescu, *Transferul internațional de tehnologie și dezvoltare economică*, Political Publishing House, Bucharest, 1993, p. 29, apud. assoc.prof. Gabriel I. Năstase, Ph.D., *op. cit.*, p. 51.

- *The technological development* is the process to accomplish the development, application and transfer of research's results in economy and society.

The science and technology influences the economic and social development in many ways:

- Directly on medium and short term by the application of applicative research results in different areas of economic and social life;
- Directly on medium and long term by the formative role played by it;
- Indirectly by continuous growth and/or modification of humanity knowledge and consequently, by the shaping of its interaction with the surrounding environment.

*Innovation* is a complex and diversified activity offering the new product an intellectual value added and sufficient technological advance to ensure the commercial success. The specialty literature differentiates the innovation by invention.

Invention is defined as new idea, new scientific discovery or technological novelty which was not implemented and released, while the innovation regards a commercialized application of an invention after its integration in the economic-social practice.

The main source of innovation is science, respectively the fundamental and applicative scientific research, whose results transferred in the production of material goods and services by technological development, technological engineering and the introduction of the technological progress. Innovation does not involve necessarily a change of technique, an invention, but an act to apply the novelties in the economic activities: the introduction in production of a new technologic procedure, the introduction in production of new products, new organization of the enterprises, the finding of new raw materials and the accession to new markets. By innovation, the scientific knowledge is transformed into physical realities. The innovation process is present in all countries of the world regardless of their development but becomes performant in the states depending on the extern market.

### **The importance of scientific research, technological development and innovation in the national and collective security system**

The security environment also changed because of the escalation of asymmetrical threats asserting innovator activities in the field of research and technology aimed to contribute to the identification and defusing of conflicts, to the prevention and combating of asymmetrical type actions and to the preservation of national and international security.

The scientific research in the military field involves the development of new military technologies applicable to the military systems and is oriented to create technical means needed to enhance the fighting capability of the Armed Forces. To the fulfillment of security objectives of scientific research contribute disciplines from different fields, for example: from the technical field, from the social sciences field, environmental sciences field, and economic field<sup>7</sup>.

At European level, there is potential in the field of research, development and the production of wide range of technologies for security. The European Union, confronted to different threats against security, should overlap the existent functional and structural gaps by diminishing the fragmentation and duplication of efforts, the increase of cooperation and the accomplishment of standardization and interoperability<sup>8</sup>.

The competitiveness of scientific research at the European Union's level has been analyzed since 2000, on the occasion of the Lisbon European Council. Latter, the Lisbon Treaty (2009) introduces a new clause of solidarity offering to the EU the possibility to provide its economic growth and competitiveness by great investments in education and research. In order to support the European member states to improve the capabilities of defence in the field of crises management and the sustenance of European policy of security and defence the European Defence Agency subordinated to the Europe Council was created.

The main tasks of this agency are:

- *The development of defence capacities in the field of crisis situations management.* The Agency identifies the future requests of the European Union over the defence capacities, coordinates the application of the European action plan over the capacities and the harmonization of military requests, proposes activities of collaboration in the operational field and provides assessments over the financial priorities;
- *The promotion and improvement of the European cooperation in the armaments field.* The Agency proposes new multilateral projects of cooperation, coordinates the existent programs and manages specific programs;
- *The strengthening of the European industrial and technological basis in the defence field and the creation of a European competitive market for the defence equipments.* The Agency develops relevant policies and

<sup>7</sup> In regard to Hanganu Marius, Coşereanu Mihail Liviu, *op. cit.*, p. 120.

<sup>8</sup> Eng. Ioan Ion, *Dimensiunea europeană a cercetării științifice și dezvoltării tehnologice din domeniul apărării*, p. 1, [www.dpa.ro/rp/publicatii/rtm/RTM12006/studii/RTM2006\\_1\\_1.pdf](http://www.dpa.ro/rp/publicatii/rtm/RTM12006/studii/RTM2006_1_1.pdf), accessed on 29 April 2012, 20.30 h.

strategies by consultation with the Commission and with the profile industry, develops and harmonizes relevant norms and regulations;

- *The increase of European research and technology efficacy in the defence field.* The Agency promotes and coordinates, together with the Commission, research activities regarding the accomplishment of future requests on defence capacities<sup>9</sup>.

The Agency coordinates three sections of analysis as follows: security studies of global context (in the task of the Institute for Security Studies from Paris), the future of the military environment for the next 10-20 years and the trends from the science and technology field.

By the Decision no.1350/16.12.2008 of the European Parliament and European Council, year 2009 was declared "*The European Year of creativity and innovation*", thus being recognized the importance of the scientific research, technological development and innovation in the European Union. "Imagine. Create. Innovate" was the slogan of 2009 at the European Union level aiming to promote creative and innovator demarches in sectors as education and culture, but also in other social fields as research, media, social entrepreneurship, rural development, etc. this declaration goal was represented by: the increase of public conscience level over the innovation designed for individual, social and economic development; the popularization of successful cases; the stimulation of education and research; the promotion of debates on some related policies and subjects.

Between 2007-2013, the European Union launched a set of initiatives concerning the research and innovation, the global competitiveness of universities, the development of entrepreneurial aptitudes and the transfer of knowledge in products and services.

In the North-Atlantic Treaty Organization's framework, the NATO Strategy in the field of research and technology signals the enlargement of activities in these fields, the cooperation and coordination of member countries and between the specific bodies associated to the field of research and technology. By the New NATO Strategic Concept, adopted at Lisbon in 2010, NATO wants to remain an efficient organization in defending peace, security and prosperity and in adequately answering to some challenges as: the terrorism; cyber attacks, etc. The armament and the military technique should have, along with the technique performances of last hour, operative compatibility for a wide range of actions aimed to provide the interoperability, the collective defence and their rapid deployment.

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<sup>9</sup> [http://europa.eu/legislation\\_summaries/foreign\\_and\\_security\\_policy/cfsp\\_and\\_esdp\\_implementation/r00002\\_ro.htm](http://europa.eu/legislation_summaries/foreign_and_security_policy/cfsp_and_esdp_implementation/r00002_ro.htm), accesat la 29 aprilie 2012, 20.20 h.

At NATO level functions the Agency for Research and Technologies with its specific body of research – the Organization for Research and Technologies. This leads and promotes research by cooperation and the exchange of information, develops and updates the NATO Strategy over science and technology providing data to all the factors from the organization or to the member states on specific matters of research and technology.

At national level in the field of defence and security, the opportunities to involve the scientific research structures outside the sphere of bilateral cooperation are offered by the National Plan for Research, Development and Innovation (NPRDI) of the Ministry of Education and Research, and also by the Sector-type Plans of the structures from the National Defence System, Public Order and National Safety.

The National Strategy for Research, Development and Innovation (NSRDI) for 2007-2013 period of time adopted by Romanian Government Decision no. 217 on February 28, 2007, reaffirms the role of state in the field of research, development and innovation to create conditions and stimulate the creation of knowledge by innovation in the society's benefit. The RDI system will represent the engine of knowledge society development in Romania being able to sustain the performances by innovation in all the fields contributing to the preservation of citizens' wellbeing and to the acquire to the scientific excellence recognized on international plan. The research, technological development and innovation field was opened to all the entities with activity of research: national institutes of research, universities, small, middle or big enterprises, on European and national plan.

One of the main fields of the National Strategy for Research, Development and Innovation is *space and security*, new fields with multidisciplinary character, their development and gathering being generated by the technological evolutions and the reconfiguration of security in the late years. For these fields, the research objectives comprise the fulfilment of exploratory researches, spatial, aero-spatial and security applications and technologies, generated by major international programs, by the specific needs at national level and by the development of identified technological niches.

The National Authority for Scientific Research (NASR), a specialized public institution of the central public administration being subordinated to the Ministry of Education, Research, Youth and Sport, has the mission to provide the elaboration, application, monitoring and assessment of policies in the research-development and innovation field in accordance with the National Strategy for Research, Development and Innovation and to the Governance Program.

Thus, innovation in Romania is considered to be the main engine of economic agents' competitiveness aiming at the accomplishment of a national

system of innovation as part of the process to build an economy based on knowledge.

In the Ministry of National Defence, the activities of scientific research and technological development aim to create new materials, equipments, systems, etc. and are part of the following research categories: oriented fundamental research, applicative research, technological substantiations, technological development, testing and assessment of development and development of operational systems.

The mission of research and technology in the defence field is the provision of the military body of scientific and technological solutions at the level of NATO and EU in order to:

- ground the decisions in the field of endowment with new or modernized technique;
- endow the new technique in accordance with the missions the forces must accomplish;
- integrate the technique systems of the Romanian Armed Force in the multinational joint structures at NATO level, and obtain products to answer the new threats identified by the categories of armed forces and the new conceptions of engagement of fight actions;
- provide the organizational framework, the human and technical potential for the testing, assessment and certification of the military technique products in conformity with the military standards applied at NATO level;
- provide the application at national level of the military technique standards which apply at the level of NATO member states;
- provide the dissemination of the research results in the defence industry framework<sup>10</sup>.

The maintenance at high levels of the scientific and technological knowledge presents advantages for the Ministry of National Defence because of the identification of new possibilities of collaboration, the contribution to the assessment of research performances, the increase of the level of expertise needed for the acquisition of military technique, the rearrangement of research-development priorities.

After 1990, the research from the economic, social and humanist fields have known an enlargement with the creation of new institutes in the Romanian Academy framework (for example: the Institute of Life Quality Research), new centres of research in universities and new private institute (marketing and surveys).

The importance of scientific research, technological development and innovation for the security system are visible and are not new. For example,

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<sup>10</sup> <http://www.dpa.ro/cd/index.shtml>, accessed on 29 April 2012, 22.05 h.

in 1776, Adam Smith was interested in the implications of innovation in the production growth. In the late years, innovation is seen as engine of sustainable development. The production of new goods or the implementation of new processes friendly to the environment into a certain sector fuels the development of other sectors contributing to the diminution of the effects of human action over the surrounding environment.

### **Conclusions**

In the modern society, it is obvious that scientific research is a development factor. The European Union strives to diminish the gaps in the economic growth, situating the research-development-innovation field on the basis of these demarches. The activity of the European Science Foundation in this concern is noticeable. It is a nongovernmental international association with non-profit activity comprising 80 institutional members from 30 countries acting as catalyst to develop science by gathering well-known researchers and financing agencies to debate, plan and implement pan-European initiatives. In Romania, the research, development and innovation are recognized as national priorities being assigned the role of promoter of economic development as an instrument to stimulate competitiveness, modernization and economic diversification, directly and actively contributing to the enhancement and perfecting of the scientific patrimony creating the premises for Romania affirmation on international plan.

The national security is a vital indicator of every state and provides that state with the capability to confront any intern or extern danger. The new risks and threats against security do not respect the borders and in the end refer to the national interests of states. In order to diminish them, we consider that scientific research, technological development and innovation have determinant role in the scientific grounding of security and defence vision on medium and long term taking into account the present geopolitical, geo-economic and geo-strategic context.

The role of scientific research, technological development and innovation for the security system is important because it brings the novelty, modernization and variety to human's life. But, the passion and the good intentions manifested by the researchers are not entirely applicable without the available financial resource. In order to underline this idea, in 2005, *Magazine on European Research* publication stressed that the importance of scientific research must be promoted not only by exceptional results but also by the presentation of daily activities' content that leads to those results in order to obtain the political and social support for science.

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