ACHIEVEMENTS AND CHALLENGES OF RESEARCH AND DEVELOPMENT ACTIVITY AS ONE OF THE PILLARS OF KNOWLEDGE TRIANGLE IN THE REPUBLIC OF MOLDOVA

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Abstract.

In a very short period, economic globalization has changed the world economic order, creating new challenges but also new possibilities. Moldova can not be competitive in this new context, unless it becomes more innovative and responds more efficiently to the consumer needs and preferences. Taking in consideration the remittances and consumption as a result, are unable to fuel long-term economic growth of Moldova, we need a new paradigm of development that would increase based smart investment, innovation and competitiveness. During the 20 years of reform in Moldova, state policies have undergone into an essential metamorphosis: priorities have evolved gradually from fundamental science and military necessities to industrial and key technologies. Currently, it outlines a new stage, focusing on innovation and societal needs as a whole. An analysis of the sources of growth in Moldova in a classical representation of the production function Cob-Douglas suggests a very alarming conclusion - without a serious effort to change the paradigm of development, growth potential in the next 10 years is limited to a up to 4, 5% to 5% per year.

Keywords: Research and development, researchers, expenditures, research institutions, knowledge triangle

As a way to increase the stock of production, capital and knowledge about its use, economic growth paradigm would imply attracting foreign and local investment, strengthening research and development and the development of export industries. On the other hand, the speed, scale and consistent approach to the broad spectrum of proposed reforms are also important.

This paradigm of economic growth must place in the center of the Knowledge Triangle.

The knowledge triangle refers to the interaction between, education, research and innovation, as the key-drivers of a knowledge-based society. In the European Union, it also refers to an attempt to better link together these key concepts, with research and innovation already highlighted by the development of the Lisbon Strategy. The Competitiveness Council within the EU treats the concept of the knowledge triangle as the need to improve the effects of investments in the three sides of the triangle, and namely: education, research and innovation, by assuring juridical, institutional and financial support for continuous and productive interaction between the actors of each field of the triangle.[1]

[1] The Technopolitan. Knowledge Triangle Activities and Strategies in the Nordics. July 2012 - N° 09. Available at: http://www.technopolis-group.com/wp content/uploads/2014/02/ Technopolitan9.pdf

More and more countries are aware of the importance of building viable mechanisms of Knowledge Triangle functioning. More than this, Knowledge Triangle is a priority in the formation of the globally – innovational society on the base of development and integration of the three elements (education, research, innovation) and capital investments in human resources, development of professional skills and supporting scientific research, as well as ensuring the modernization of education systems etc. ., so that they become relevant to the needs of a global economy based on knowledge.

The abstract scheme of the Knowledge Triangle underlines the essential interdependence between Knowledge Triangle actors (education-research- innovation) for the competitive development of the country and the transfer of knowledge to the society and the economy.(Figure 1)

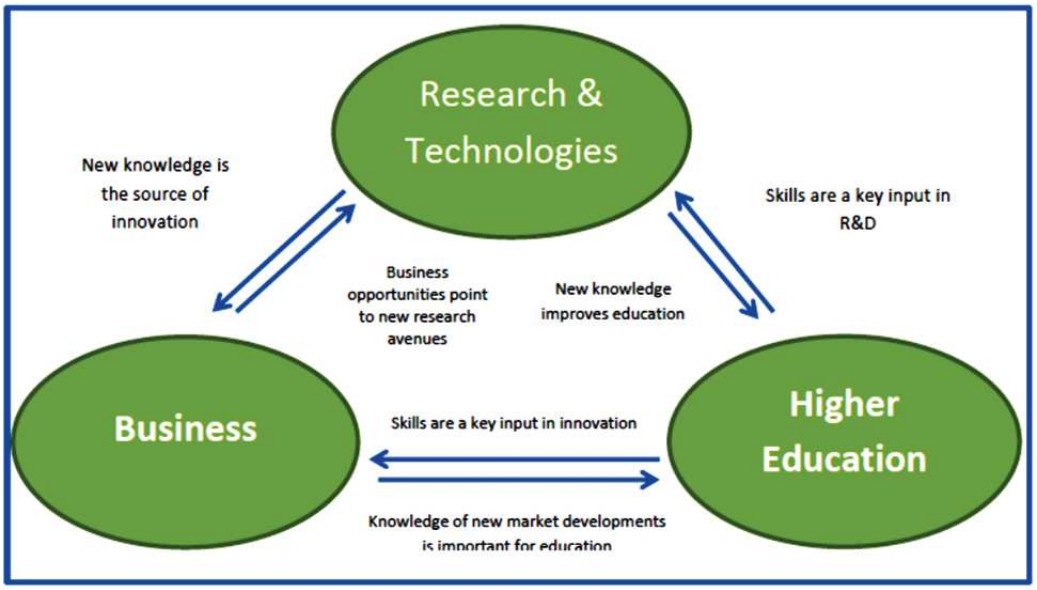

Figure 1. The abstract scheme of the Knowledge Triangle

Source: European Institute of Innovation and Technology (EIT). CATALYSING INNOVATION IN THE KNOWLEDGE TRIANGLE. Practices from the EIT Knowledge and Innovation Communities. Available at: http://eit.europa.eu/sites/default/files/EIT_publication_Final.pdf

The interaction between KT actors is performed on 3 channels, each of which is bidirectional:

1. *Report / interaction between research and higher education.* In this relationship, the functions of the actors involved in the research are the transmission of new knowledge and research results of the process of higher education, development and provision of the scientific-methodological knowledge and methods of their application. The role of stakeholders in education is to define qualifications for researchers to identify areas of research for graduate students as well as coordinate their research projects etc.

2. *The relationship / interaction between research and innovation*. In this relationship are multiple actors, each with distinct functions.

For example, research should provide businesses the newest invention, methodical and scientific knowledge (know-how) for their use and provide services and expertise in various fields etc. In turn, companies define the research directions, determine the economic parameters of the application of research results, and apply in practice those research results which are expected to be profitable etc. On the other hand, institutions which promote technology transfer, act as an intermediary between research and real economy. However, business support organizations create and ensure the necessary conditions for developing a healthy business environment and provide legal and economic enterprises, especially those newly created.

3. *Report / interaction between higher education and innovation.* In this relationship, the private sector (businesses) make academic requirements for professional skills and social future specialists and managers and universities integrate them into the academic curriculum and prepare young professionals and managers in accordance with modern requirements of the labor market and the real economy. The University also contributes to entrepreneurial culture development, work with institutions to promote technology transfer and participate in communication platform (cluster) of students, scientists and business representatives.

The specifics of the channels described above, highlight the fact that Knowledge Triangle replaces the traditional one-way flow of information from research to education and from educators to students, by a two-way circular motion between the three corners of a triangle that, besides research and education, also includes innovation, which is the "poor relation" of many universities.

In this context, it is clear that the activity of each separate KT element cannot ensure its functionality and subsequently, beneficial in establishing a knowledge-based economy at the national level. Only ensuring conditions for development of all sides of the knowledge triangle can achieve reliable growth that will visibly reduce the gap between our country and European economies, and Moldova will become a competitive and innovative country in Europe.

The knowledge triangle has all the capabilities to introduce an effective contribution to the progressive development of the Moldovan society. Also, this triangle is a key to ensuring research process based on excellence, integrated into the international research and to satisfy the growing needs of society and the economy.

Each component of this "knowledge triangle" will enhance the level of knowledge, increase productive stock of capital, economic development by attracting investments, developing export industries, promoting the knowledge society, including the strengthening of R & D through the transfer of the innovation technologically which is oriented to a better efficiency and competitiveness.

Also, the knowledge triangle helps create necessary conditions in order to achieve innovative products in the real sector of economy - key –element to the establishment in Moldova of a knowledge-based society and economy.

The current knowledge triangle in Moldova is marked by the legacy of a system of research, development and innovation like a Soviet-centralized type .The massive exodus of skilled labor, low capacity of the internal market, low production capacity, diversity of business constraints etc. determines the relatively low performance of each component of the knowledge triangle (KT) in Moldova. Moreover, its defective functionality is determined by the weak interaction between the sides KT.

Due to different constraints the present paper is focusing the research and development activity in Republic of Moldova, as one of the pillars of the knowledge triangle in Republic of Moldova, the one that is continuing the education process towards innovation.

In order to assess the situation in this field (R&D), four framework factors are analyzed: institutional organisation, legislative framework, labour force and financing.

In this context, we consider appropriate to identify the main actors involved in the construction of the KC in Moldova, especially in the field of R & D.

The research activity in Moldova is administered almost entirely by the Academy of Sciences of Moldova (ASM) together with its executive body - the Supreme Council for Science and Technological Development and other agencies and institutions subordinated to the Center for Financing basic and applied research, International Projects Center (ICC); Agency for Innovation and Technology Transfer (AITT); Consultative Council of Expertise (CCE). Also, the research is conducted in 66 institutions, including institutes and research centers (including 19 research institutes subordinated by the ASM), 15 higher education institutions accredited by the National Accreditation and Attestation and 11 institutions of other type.

However, in organization, the management and carrying out the research and development, ASM follows the partnership agreement between the Government and Academy of Sciences of Moldova.

Moldovan innovative policy was designed, modeled according to the Soviet research and innovation style, in which the Academy of Sciences of Moldova (ASM) have extended political rights[1]. Over time, it has undergone a series of reforms. In 1992 (30 October) it has adopted a new statute for ASM which established that it is "a state institution, the highest scientific institution in the country" and is responsible for the implementation and coordination within its terms of policy in the fundamental research field. On 29 July 1999, Law no. 557 on state policy in the sphere of research and development, later was diagnosed with some "leaks" that aimed possibility of co-financing by the state of research and development undertaken by companies and the financing of research in higher education institutions . Given these shortcomings, and also the role of politics , the 1999 law failed to reach the goal proposed by the authorities ("stimulating the development of the sphere of research - development through diversification of ownership and legal forms of organization subjects of research and development ").Thus in 2004, the state policy in the field of research and development has been fundamentally revised and the previous laws were repealed and

[1] Statutul provizoriu al Academiei de Ştiinţe a RSMM din 12 decembrie 1990, aprobat de Guvernul RSSM la Adunarea Generală a Academiei

was adopted by Law no. 259 of 15 July 2004, the Code on science and innovation that the ASM has become the main authority responsible for all stages of policy components (development, implementation, monitoring, reporting) and determining research priorities. Almost all public financing programs in the field of research - development - innovation are managed by ASM in its executive body, the Supreme Council for Science and Technological Development, and its management agencies and institutions: Center for Fundamental and Applied Research Funding; Center for International Projects; Agency for Innovation and Technology Transfer. Expert Advisory Board provides assessment for these three funding agencies. Together with the 19 research institutes under its supervision, ASM is the leading research organization in the country.

Priority directions of development of research-development field in Moldova are set by the Moldovan Parliament. Parliament adopts legislation regulating the organization and operation of science and innovation; approves strategic directions of science and innovation; approves the funds to be allocated for science and innovation and ratifies international treaties on cooperation in science and innovation sphere.

The analysis of Title II, Chapter IV, Article 69 (on the "rights of central specialized bodies and other authorities") of the Code on science and innovation allows us to conclude that the ministries, departments and other authorities have limited powers in this area, even if the code specified that they participate in promoting the state policy in science and innovation; develop proposals on strategic directions of activity in science and innovation etc.

The regulatory framework of research can hardly be separated from that of the innovation activity. In spite of this, it has experienced a considerable reform in recent years. Table 1 refers to the most important legislative and normative acts regulating the research, development and innovation in Moldova.

Table 1.

The main laws governing the research, development and innovation in Republic of Moldova

N/o	Law
1	Code on Science and Innovation of the Republic of Moldova, Code no. 259 of 15.07.2004;
2	Partnership Agreement between Government and Academy of Sciences of Moldova for 2013, GD. 714 of 09.12.2013;
3	Law on scientific-technological parks and innovation incubators no. 138-XVI from 21.06.2007;
4	Law on Information and State Information Resources, nr. 467-XV of 21.11.2003
5	Law on State Agency for Intellectual Property no. 114 of July 3, 2014
6	Law on Protection of Industrial Designs No. 161-XVI (adopted on 12.07.2007, in force from 01.12.2007)
7	Law regarding the protection of marks Act. 38-XVI (adopted on 29.02.2008, in force from 06.09.2008)

8.	Law regarding Plant Variety Protection Act no. 39-XVI (adopted on 29.02.2008, in force from 06.09.2008)
9	Law regarding the protection of inventions. 50-XVI (adopted on 07.03.2008, in force from 10.04.2008)
10	Law on Copyright and Related Rights No. 139 (adopted on 02.07.2010, in force from 01.01.2011)

Source: Prepared by the author based on official sites of ASM, AITT, Agency etc.

In addition to the laws listed in Table 1 were developed and adopted a number of development strategies, including:

• *Innovative Strategy for the period 2013-2020 Moldova "Innovations Competitiveness"* approved by Government Decision no. 952 of 27 November 2013 - (innovation strategy), developed by the Ministry of Economy and approved by the Government in September 2013. It provides five general objectives: adopting a model of open governance of research - innovation (R & I); allowing the formation of entrepreneurship and innovation skills; orientation towards innovation companies; applying knowledge to solve problems overall societal; stimulate demand for innovative products and services etc .;

• *Strategy for Research and Development of the Republic of Moldova until 2020* (R & D Strategy) drafted under the guidance of ASM and approved by the Government in December 2013, aims investments in research and development to rise to 1% GDP by 2020;

In both strategies are not clearly identified thematic priorities (for example, research and development strategy, priorities coincide with the six societal challenges of Horizon 2020);

• *National Strategy for Information Society Development "Digital Moldova 2020"* (September 2013) aims to create a foundation for the development and widespread use of the potential of information technology and electronic communications by public institutions, the business community and society generally, the optimal intervention of the state;

• *The national strategy on intellectual property until 2020* - designed to strengthen the legal and institutional framework conducive to the creation, protection, management and use of the full potential of intellectual property (IP), which should become a fundamental development of a sustainable economy based on knowledge, innovation and a source of national wealth for Moldova.

Also, there was developed a concept for the Development of Industrial Clusters in the Republic of Moldova, approved in August 2013[2]. It seeks the following potential effects on research - innovation (R & I): increasing demand for services research - development (R & D) from businesses, increase skill levels of researchers, promoting technology transfer, development of research centers in branch ensuring scientific institutions access to new sources of financing, etc.

The ability of research institutions depends on the quality of equipment, quality and management researchers in the field. Since 2005, many research institutions have received

[2] Hotărîrea Guvernului Republicii Moldova nr.614 din 20.08.2013 cu privire la „ Concepția dezvoltării clusteriale a sectorului industrial al Republicii Moldova ”.

funding for renovation and equipping of new laboratories equipment. However, in most cases it went rather on the renovation of existing equipment rather than purchasing new equipment. The Court of Auditors has found a number of serious violations on the spending of financial resources earmarked for the purchase of scientific equipment (eg. The equipment being paid for several projects at the same time or the money was used for other purposes).

In 2014, R & D activity was conducted in 66 institutions, including 40 institutes and research centers, 15 higher education institutions and 11 other institutions. Of the institutions, about 77% are state institutions, which are less compared to 2013 when their share was 83%.

At the end of 2014, conducting research institutions worked 5038 people (of which 51.4% women), which is more by 1.1% compared to 2013. Of the total number of employees, 70 percent have worked full time.

According to the National Bureau of Statistics (NBS) of all employees, 3935 persons had higher education (78.1%), 376 people - specialized secondary education (7.5%), and 727 people had different level of preparation (14 ,4%). The categories of occupations, the majority of employees in R & D was composed of researchers (65.8%), followed by auxiliary staff (15.0%), other categories of employees who were executing related functions of the institution's work in general (13, 6%) and technicians (5.6%).[3] (Table 2)

The downward trend of researchers in Moldova is caused by massive outflow of labor abroad, caused by the poor economic situation and low salaries of staff employed in R & D field. Moreover, in addition to low salaries that encouraged professional researchers to go abroad, they do not motivate young scientists to continue their research career.

Table 2.

Employees in research and development by category of occupations, in 2013-2014

	Persons				Structure - % -			
	2013		2014		2013		2014	
	Total	Incl. women	Total	including women	Total	including women	Total	including women
Employees - total	**4981**	**2592**	**5038**	**2588**	**100,0**	**100,0**	**100,0**	**100,0**
researchers	3250	1559	3315	1586	65,2	60,1	65,8	61,3
technicians	304	231	282	205	6,1	8,9	5,6	7,9
auxiliary staff	750	386	758	402	15,1	14,9	15,0	15,5
Other categories	677	416	683	395	13,6	16,0	13,6	15,3

Source: National Bureau of Statistics. Research and development in 2014. Available at: http://www.statistica.md/newsview.php?l=ro&idc=168&id=4728

[3] Biroul Național de Statistică. *Activitatea de cercetare-dezvoltare în anul 2014*. Disponibilă la: http://www.statistica.md/newsview.php?l=ro&idc=168&id=4728

Although the situation in the area of remuneration of researchers slightly improved (average salary of a researcher in 2013 was 3870 lei[4]), analysis of the structure of researchers by age in 2014 highlights the fact that 43% of researchers over the age of 54 years, more than one third belong to researchers aged 35-54 years (34.8%) and 22.2% are young researchers (aged up to 35 years). At the same time, every fifth student was aged over 64 years. (Figure 2).

Data related to gender desegregation reveals that in 2014 in averaged the ratio of male and female researchers were 100 to 92, the equal proportion as in the previous year. According to the NBS, the biggest share of researchers were involved in the field of natural sciences (36.1%), followed by those in the social sciences with a share of 15.0%. In comparison with 2013, the structure of researchers per scientific fields has changed, in particular, lessened the share of those from the humanities (1.7 p.p.) and simultaneously the share of researchers in the social sciences increased (2.4 p.p.).

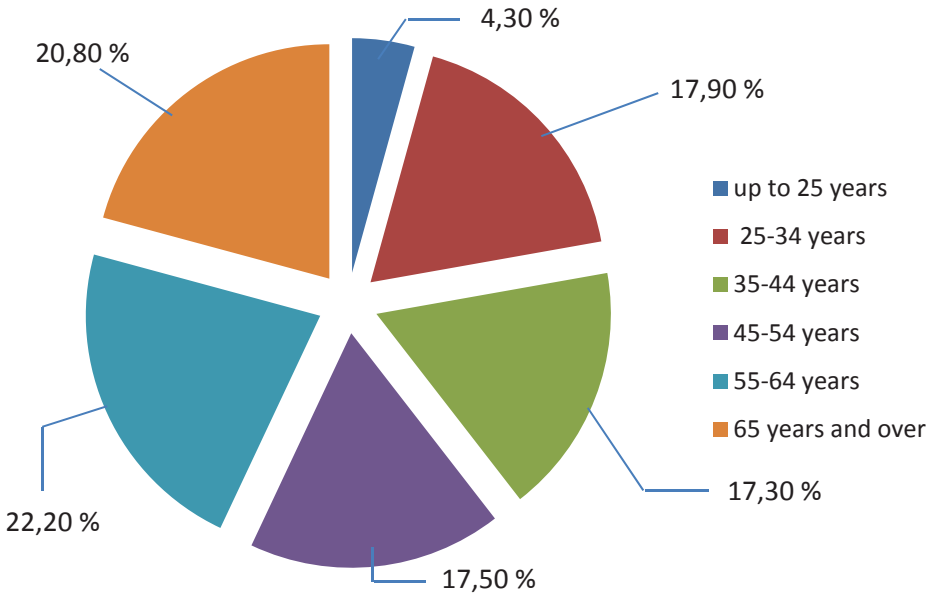

Figure 2. Structure of researchers by groups of age, 2014

Source: Elaborated by theauthor according tothe data of the National Bureau of Statistics. Research and Development Activity 2014 year, available at: http://www.statistica.md/newsview.php?l=ro&idc=168&id=4728

Although in 2011-2014 the funding value in the sphere of science and innovation was increasing, this amount has not been able to full stop the exodus of scientists from science, the renewal of technical-material base and as well to bring back the status of the scientific and innovation activity. Moreover, this financing as a share of GDP is decreasing in the last years

[4] AȘM. Raport privind activitatea CSȘDT și rezultatele științifice principale obținute în sfera științei și inovării în anul 2014 și în perioada 2011–2014. Available at: http://asm.md/administrator/fisiere/rapoarte/f172.pdf, p. 28

(Figure 2), constituting 0.35% of GDP in 2014. This performance is much lower than the average performance of the EU countries, which aim through the Europe 2020 strategy to allocate 3% of GDP for the research-innovation sphere. (Figure 3)

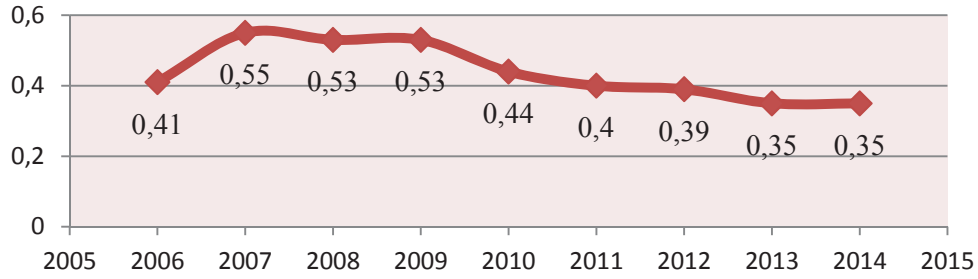

Figure 3. Dynamics of the share of R&D expendituresin the GDP.

Source: Elaborated by the author according to the data of WB. *World Development Indicators*. Available at: http://data.worldbank.org/indicator/GB.XPD.RSDV. GD.ZS and AŞM. *Activity report of Supreme Council for Science and Technological Development and main scientific results obtained in science and innovation in 2014 and in 2011-2014.* Available at:http://asm.md/administrator/ fisiere/rapoarte/f172.pdf

According to the NBS, current expenditure structure per components reveals predominance for staff expenditures - about 72% or 278.8 million lei (with 32.3 million more than in 2013). Administrative expenses accounted for 2.5 million less and constituted 63.7 million lei. "Other" expenses accounted for 45.8 million lei or 17.8 million more than in 2013. (Table 3)

Capital expenditure constituted 26.9 million lei, thus increasing by 11.5 million or by 1.7 times compared to 2013.Allocation of the expenses aimed mainly for the equipping of the institutions/units that conduct R&D activities accounted for the amount of 24, 6 million lei, increasing by 1.8 times compared to 2013. [5]

Capital investments are very important in the research process, whether this involves the acquisition of new equipment and technology, which can therefore increase the return on the investment. But these charges reported to the needs are quite modest even though they constitute more than 90% of the total capital expenditures and represent 27.7% of total expenditure on R &D. (Table 3)

The Science and innovation funds were used for both ,maintenance and development of scientific institutions in the fields of health, agriculture, education, culture, as well as for the development of state programs, staff training etc. According to ASM data starting with 2011 to 2024, for research and development, from the state budget were allocated from 1185.8 ml. lei to 986.3 ml. lei, which represented 83.2% of total funding. (Table 4)

[5]NBS. Research and Development activity 2014.
Available at: http://www.statistica.md/newsview.php?l=ro&idc=168&id=4728

Table 3.

Structure of R&D public expenditures

	2011	2012	2013	2014
Total expenditure (mln. MDL)	333,5	368,2	356	415,2
Research activity (current expenditure) (mln. MDL)	312,9	368,2	340,7	388,3
• Training of scientific staff	70,1 %	71,2 %	72,4 %	71,8 %
• Material expenditures	20,0 %	18,6 %	19,4 %	16,4 %
• Other current expenditures	9,9 %	10,2 %	8,2 %	11,8 %
Research activity (capital expenditure) (mln. MDL)	20,6	14,1	15,4	26,9
• Capital expenditure on equipment	92,7 %	97,2 %	86,4 %	91,4 %
• Other capital expenditures	7,3 %	2,8 %	13,6 %	8,6 %

Source: Adapted by the author according to the data National Bureau of Statistics. Available at: http://www.statistica.md/newsview.php?l=ro& idc=168&id=4728

From the total funding amount for basic researches were allocated 316.9 ml. Lei or 26.7 percent of the total funding for scientific research and - 669.4 ml. Lei or 56.5 percent for applied researches[6]. (Table 4)

Science and innovation financing activities, according to the priority of science development directions, that were approved by Parliament Decision no. 150 on 14 June 2013 are performing in the institutional and competitive system: for institutional projects, state programs, projects for young researchers, topics and bilateral projects, as well as projects of innovation and technology transfer that have been selected through competition, subsidies for publishing monographs, subsidies for the organization of scientific conferences and PhD scholarships etc ..

According to the Academy of Science from Moldova the public funds in 2014 have been allocated to the following strategic directions: "Materials technologies and innovative products" - 97.0 ml. Lei (36.6%); "Biotechnology" - 70.6 ml. Lei (26.4%); "National Heritage and the development of society" - 52 ml. Lei (19.4%); "Biomedicine and Health" - 41 ml. Lei (15.3%); "Energy efficiency and use of renewable energy" -6.8 ml. Lei (2.5%)

Despite these strategic directions, in Moldova most policy measures in the research and development fields are general and the procedures and financial instruments, assessment, monitoring and reporting are identical for all the thematic priorities. Of all the financing instruments for research and development, only the state programs are thematically

[6]ASM report on the SCSTD activity and the mai scientific results obtained in the research and innovation sphere in 2014 ,and 2011-2014.Chişinău, 2015, p. 37. Available at: http://asm.md/admin istrator/fisiere/rapoarte/f172.pdf

concentrated. [7] However, the topics of the programs are kept rather broadly and the financial support allocated for this measure is modest.

It is also appropriate to note that the tendency in the recent years was to increase the share of institutional funding to the detriment of other funding instruments. In 2014, over 90% of public funds were distributed for institutional projects. (Table 4)

Table 4.

The dynamic execution of basic expenditures on priority areas of R&D activity in 2011-2014 (ml. lei)

Types of researches	Executed				Total
	2011	2012	2013	2014	
Basic scientific research	**74,5**	**77,2**	**76,4**	**88,8**	**316,9**
Institutional projects	69,5	73,8	72,5	84,8	300,6
State Programs	0,6	0,6	0,5	0,4	2,1
Projects for young researchers	1,4	0,9	1,1	1,5	4,9
Themes and bilateral projects	3	1,9	2,3	2,1	9,3
Applied Scientific Research	**164,3**	**171,1**	**157,1**	**176,9**	**669,4**
Institutional projects	138	147,6	142,6	157,9	586,1
State Programs	7,5	6,9	1,6	3,2	19,2
Projects for young researchers	2,1	2,1	1,9	1,5	7,6
Themes and bilateral projects	3,6	2,5	3,8	4,4	14,3
Technology Transfer Projects	8,6	8	7	9,9	33,5
Other expenses	4,5	4	0,2	–	8,7
Total scientific research	**238,8**	**248,3**	**233,5**	**265,7**	**986,3**
Staff training	13,1	14,6	2,6	2,7	33
Institutions and activities for science and innovation unassigned to other groups	20,6	31,5	37,5	43,4	133
Administrative bodies	5,8	6,6	7,1	7,7	27,2
Total basic expenses	278,3	301	280,7	319,5 1	179,5
Capital investments	3	3,2	–	–	6,2
Total science and innovation	**281,3**	**304,2**	**280,7**	**319,5 1**	**185,7**

Source: ASM. *Activity report of Supreme Council for Science and Technological Development and main scientific results obtained in science and innovation in 2014 and in 2011-2014.* Available at: http://asm.md/administrator/fisiere/rapoarte/f172.pdf

[7] Cuciureanu G. ERAWATCH Country Reports 2013: Moldova 2014, p. 10-11. Available at: http://erawatch.jrc.ec.europa.eu/erawatch/export/sites/default/galleries/generic_files/file_0527.pdf

According to the legislation, universities are directly dependent on the Supreme Council for Science and Technological Development and institutional projects, in the creation and funding of research activities.

Under the Partnership Agreement, are listed the following as SCSTD duties: distribution of budgetary allocations according to the strategic directions of science and innovation; organization and elaboration of state programs, scientific and international scientific-technical programs and mechanisms for achieving them; development of monitoring mechanism ,stimulation of the state programs realization results in science and innovation, as well as those of products' markets creation for the same sphere; promote innovation and technology transfer activity. SCSTD structure consists of 17 members, from which only three are represented by the university sector. In addition to these three members, only two are from the ASM (National Council for Accreditation and Attestation and State Agency for Intellectual Property). So ASM concentrates on 12 SCSTD members out of the total 17.

Unlike institutions subordinated to ASM those eligible for full funding of projects from the state budget, state universities can only claim to membership profile, allowing them to receive partial funding from the state budget based on competition, however private universities can claim only the membership affiliate, which enables them to benefit from budget financing up to 40% of the total amount of the winning project. In recent years, the share of expenditure on research, development and innovation in the GDP fell from 0.7% in 2008 to 0, 35% (385 ml. Lei) in 2014[8].

At first glance, these schemes appear to be competitive, but analysis of the results and their effects on the economic development of the whole country shows that these are insignificant. According to studies performed by Popa A., "the main form of promotion of the state policy in science and innovation, under the Code are state programs. Despite the importance offered to them, due to the lack of funds allocation, they haven't become the main tool state policy implementation. ".[9] According to the same author, around 8% of the total allocations for RDI are based on funding state programs. Experience of other countries shows another situation in this respect. In most of the countries with a developed and modern RDI sphere -the funding on state programs basis exceed net the funding on institutional one in some cases even reaching the ratio of 70/30% on institutional basis being funded only those military institutions or unique in its field.

The most important conclusion of the author parallel to the issue of research and innovation funding in Moldova is that ASM distributes funds without a clear strategy in this area. Though, the lack of a set of indicators that evaluate research results and their impact on achieving national objectives makes the financing efficiency to be considered as rather low, accompanied by the risk that the budgetary resources being directed to the activities of none national priorities.

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[8] ASM report on the SCSTD activity and the mai scientific results obtained in the research and innovation sphere in 2014 ,and 2011-2014
Available at: http://asm.md/administrator/fisiere/rapoarte/f172.pdf, p. 36

[9] Popa A., Prohnitchi V., *Cercetare, Dezvoltare şi Inovare în Republica Moldova probleme şi opţiuni*. Expert Grup, Chişinău 2011

However, because of high political costs, and due to the difficulties that the universities in taking research responsibilities may deal with, the decentralization of RDI sphere seems to be an early model for Moldova at this stage. Still, in the long term, this could be the best solution, assuming that universities cardinally improve their quality of educational services and strengthen their management capacities of research programs.[10]

An important feature of the efficiency of spending on R & D is their dependence upon the implementing institutions. Motivation and financial opportunities for research and innovation activities range from public to private institutions. While the private sector in Moldova is more market oriented, on increasing the productivity, reducing production costs and increasing the applicability of innovation, the financial possibilities of the private sector are usually relatively low or nonexistent. International experience, however, shows that basic research is performed in public institutions and universities while the applied research is often carried out by the private sector.

Consequently, the access of private sector to the public R & D is very important. This statement is quite important in the context that Moldovan private sector access to the public R&D funds is limited.

In the last decades, the trend in the developed economies is to encourage public research and development organizations to engage more in applied research, usually in cooperation with private companies. These collaborations provide additional potential sources of funding for public research and development organizations. But to catalyze the emergence and development of such partnerships is needed to create more favorable conditions in different directions, such as the judiciary system , the status of organizations, tax system, intellectual property protection system etc. Although direct financing of the private sector is not a common practice in the EU, it can be used to set aside the market failure of R & D activity in Moldova. Conversely Moldovan legislation limits private companies' access to public funds for research and development.

As a response to the criticism concerning the system of financing research and innovation activities in Moldova in 2012 was created the Centre for Financing Basic and Applied Research. This center was created as a division of Academy of Studies from Moldova and the objective of its creation was to improve the competitive allocation of public funds for R & D and to separate the financing from the political and executive bodies within the ASM. But we should mention that this center is still a subdivision within ASM and since its creation essential changes in the funding of research activities weren't seen.

The European experience shows that cluster networking, in which interact production enterprises, educational institutions and state institutions, enhance technological performance and productivity, this way contributing to the enterprises competitiveness, market expansion and increases the field visibility. But in Moldova, majority of companies do not conduct research and technological development due to the increased level of financial risk, though this does not mean that in the near future (for 5-6 years) it's going to be the same.

[10] Popa A., Prohnitchi V., *Cercetare, Dezvoltare şi Inovare în Republica Moldova probleme şi opţiuni*. Expert Grup, Chişinău 2011, p. 12-13

In this regard, as a fundamental support comes Moldovan Innovative Strategy for the period 2013-2020 "Innovation for Competitiveness". Innovative Strategy provides that "The State will support companies that are committed to their own resources for developing new technology perspective." In this context, the intellectual potential of researchers, inventors, engineers, patent services workers etc. will be very demanded by the business sector, which will lead to its rapid development and make those vocations attractive for youth.

Also, innovative strategy states that the current legal framework governing the work of entrepreneurs and the financial tools that will promote small and medium business activity should be brought in line with the requirements and objectives set by our state.

In conclusion, we note that in 5-6 years the need of ensuring the development and growth of Moldova will serve as the basis for consolidation of major forces which are part of the knowledge link. The organizations involved in the process of necessary reports realization for the knowledge link development will contribute to the:

- *Restructuration and reorganization of existing institutional structures of universities and research entities* - such structural reforms would allow the increase of the global competitiveness of universities; the development of strong research environments, the boost of business ties, the insurance and support of better cohesion in academic performance with the EU;
- *Improvement of universities financing conditions*. Key factors for the success of research funding systems are a mix of appropriate framework conditions. Most European universities are publicly funded. This source remains the most important funding flow for universities from Moldova. However, using multiple sources of funding could lead to greater stability and greater autonomy for universities.
- *Promoting competitive funding models*. Worldwide funding is a key concern for universities. To get a better quality research is necessary to develop concepts and clear mechanisms for selection. In this context, the emphasis on performance and establishment of appropriate indicators are important for the success of research funding.
- *Support for researchers throughout their careers, focusing on creating good framework conditions.* Creating an attractive market, open and sustainable labor market for researchers.
- *Ensure better interaction among research, innovation and higher education.* In a society based on knowledge, research should not be isolated nor innovation or education. It is important to better integrate aspects of higher education, research and innovation in the national strategies;
- *Removal of deficiencies of the regulatory framework.* Real impediment in the conduction of both research and innovation activities by all stakeholders at all the levels.
- *Development and implementation of coherent and comprehensive strategies and policies in the field of "brain circulation».* Due to their age, many of researchers retire, and the need for young researchers is increasing. RM should strengthen its capacity to attract and train young researchers and provide competitive research careers nationally and internationally. Also, to attract the best researchers from abroad;

➢ *Ensuring a closer interaction between universities and non-academic sector.* Universities must start working with a wide range of private and public sector partners, to increase the amount of private money invested in research. Major benefits could come from the transfer of research knowledge into new businesses, services and policies.

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