

Characteristics of the Technology Transfer Processes in the Republic of Moldova: SME Case Study

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Abstract

Nowadays, in a world of constant economic change, SMEs and technology transfer play a key role when it comes to innovation. SMEs are directly engaged in the development and commercialization of innovations. They are also adopters of innovations developed by other organizations, they provide ideas and inputs to ideas generation that are exploited by large firms, universities/research organizations and other small firms. However, SMEs often face larger barriers on capital and labour markets than larger established businesses. It is for that reason that multiple policy measures have been adopted to target those firms and their opportunities to engage in innovation, which is why this study aims to reflect upon the characteristics of the technology transfer in the Republic of Moldova through means of a SME case study.

Key words: technology transfer; innovation; SME; Republic of Moldova

JEL classification: O30, O 32

1. Introduction

The Republic of Moldova, as a member of the World Trade Organisation (WTO), has subscribed to the rigor imposed by the Trade-Related Aspects of Intellectual Property Right Agreement (TRIPS). Currently there are no intellectual property (IP) provisions, to which the Republic of Moldova, as a state, has not complied, but the international framework in the field is in constant development and modernization, and our country is monitoring its evolution to bring about improvements. Strong IP rights, by their very nature, are intended to encourage innovation. However, according to estimates by European experts in the field of IP, the main impediments that persist are not of a legislative nature but are related to the effective enforcement of intellectual property rights, including the exploitation of these rights, which is directly related to the innovation activity.

"Innovation" is the process by which new ideas meet the demands of society or those of the economy and generate new products, services or business models that are successfully introduced into an existing market or that can create new markets. The definitions of the concepts of "innovation" and "innovation" in the Republic of Moldova can be found in several

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legal documents, which differ in their approach: For example, art. 20 of the Code on Science and Innovation of the Republic of Moldova no. 259 of 15.07.2004 focuses mainly on the implementation of the results of the scientific research and the transfer of the results of the given process in the economic sector: "Innovation - application of the new or improved final result of the scientific research activity and the technological transfer realized in the form of knowledge, product, service, competitive process, new or improved, used in practice and / or marketed on the market." The same approach is found in Law no. 138-XVI of 21 July 2007 on science-technology parks and innovation incubators, although it does not explicitly include a definition of innovation. The Innovation Strategy of the Republic of Moldova for the period 2013-2020 "Innovation for Competitiveness" (hereinafter "Innovation Strategy") is based on a modern vision, according to which "innovations are new technologies and practices for the given society. They may not be unprecedented in absolute terms, but they may be new at the company or market level."

The policies of the knowledge triangle in Moldova are still in a phase of evolution. Some efforts have been made to build the innovation infrastructure: an Agency for Innovation and Technology Transfer with incentive and funding instruments. (Crudu et al, 2016)

A small role in innovation development lies with small and medium-sized enterprises. According to Eurostat data, about 50% of EU SMEs have an innovation activity: technological or non-technological. It is interesting to note that an OECD study in 2011¹⁵⁶ indicates at a surprisingly high level the innovative activity of SMEs in Moldova: about 54% of SMEs said they have introduced a new product or service over the past 3 years.

According to the data of the National Bureau of Statistics, in 2012 in Moldova were:

- 49.4 thousand SMEs, or 97.5% of the total number of enterprises in which they were active
- about 20 thousand enterprises or 40.5% of the total SMEs operating in the trade area;
- Only 4.9 thousand enterprises or 9.8% of the total SMEs have activated in the manufacturing industry, where technological innovations can be implemented.

Despite the large share of SMEs, they use insufficient IP. Furthermore, there are no clear criteria for awarding the qualification "innovative enterprise", and the SME patenting activity of the inventions is extremely low compared to trademark registration and industrial design. (Table 1)

Table 1. The share of Moldovan SME applications to register objects of Intellectual property (OIP)

OIP	Number of:	Total	SME	% SME
Inventions	Applicants	1915	124	6,5
	Requests submitted	5948	211	3,5
	Patents granted	4485	167	3,7
Industrial designs	Applicants	740	310	41,9

	Requests submitted	1691	692	40,9
	Patents granted	1204	493	40,9
Brands	Applicants	5530	2777	50,2
	Requests submitted	22355	10879	48,7
	Patents granted	12428	6051	48,7

Source: adapted by the author based on the statistical data provided by AGEPI (2016)

For SMEs, innovative development can often be the only way of survival. At the same time, SMEs need support in promoting IP exploitation and innovation in particular. Often, SME management does not value the priorities of OIP capitalization and the competitive advantages that can be gained from their application. Therefore, the intellectual property infrastructure, including the innovative one, must primarily be targeted at small and medium enterprises (SMEs). Given that the implementation of innovations has become a determinant factor of economic growth and SME's priorities have been fully reflected in practical economic activities, their development through the innovative way has become an imperative of time. Encouraging the use of intellectual property by small and medium-sized enterprises is one of the specific objectives of the IP Strategy, which includes a number of measures to achieve it (Turcan, A, 2013, p. 43-46):

- By informing the business environment about the commercial opportunities offered by IP and increasing the benefits of SMEs from the use of objects of IP (OIPs);
- Prioritizing the innovative process within SMEs;
- Providing SMEs with access to IP protection information and IP pre-notification services;
- Encouraging the creation and operation of small and start-up businesses;
- Providing innovative SMEs with access to preferential dollars (loans, grants, etc.);

At present, encouraging innovative SME activity can be in the form of grants, tax incentives, tax deductions for legal services in the IP field: for inventions only 15% of the normal taxes, for industrial design - 35% for brands - 50%.

The economy of the Republic of Moldova does not know any field in which it can be said that it is a global leader in innovation. In this respect, a balanced policy is needed in order not to waste the scarce resources by too much diversification of the priority areas and directions of innovation. The latter can and must be adjusted periodically, based on registration successes and needs identified by the Government. State innovation policies must promote the dissemination of new knowledge in order to enable local companies to become competitive first and foremost in the domestic market, after which those lonely companies will want to become innovative on the local and competitive market t, he regional / global market, engaging in research and innovation, technology transfer.

The analysis of R & D and innovation activity in the Republic of Moldova denotes that the official statistics until 2013 had only the scientific activity in this sector and in 2012 the National Bureau of Statistics in the "Science" section, which became "Science and Intellectual Property ", also included statistical indicators in the field of intellectual property. It should be

mentioned that the statistical data for 2006-2011 were included retroactively. At the same time, as far as the statistical evaluation of the innovation activity is concerned, the Republic of Moldova is the only country from the CIS, Europe, OECD, etc., which does not have the necessary statistics in the field of innovation activity. This complicates the possibility of evaluating the efficiency of the research and development activity regarding the application of the innovations in our country.

To obtain a deeper analysis of the impact of innovation and technology transfer on the success of a company, a survey was conducted among some companies in the Republic of Moldova. The survey was sent to a number of companies working in different domains, with the aim of obtaining data that would illustrate a full picture of the impact of innovation and TT, but for some reasons many companies avoided replying to the polite request and providing the requested information.

The poll aimed to collect data on:

- What product / process / organizational innovations have been brought to the market?

- What is the ratio of finished and abandoned or suspended innovations?

- In what innovation activities are local companies trained?

- What budgets are allocated to R&D by companies?

- Which sources of funding are used by local companies, own or external sources?

- How do companies evaluate the importance of OIP?

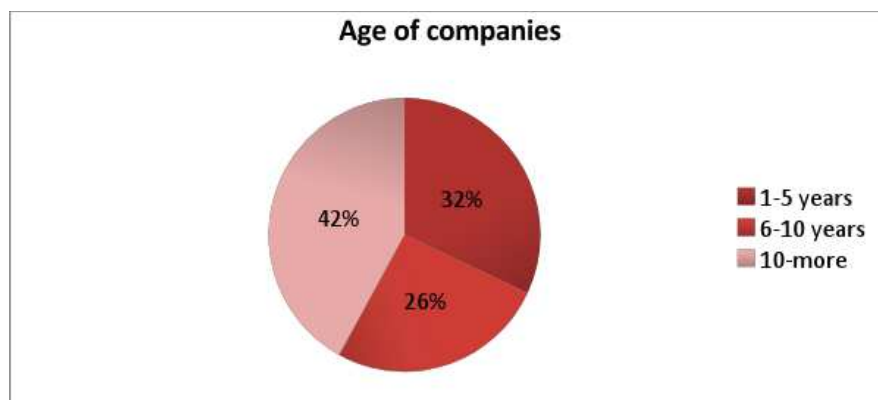
➤ *Portrait of companies participating in the survey*

Of the total number of companies that were invited to the survey, 19 companies accepted the request, with different areas of activity, sizes, staff numbers and different OIP portfolios, of which:

➤ *Age registered by companies, as shown below:*

It is easy to observe that most of the companies participating in the survey record 10 or more years of activity followed by novice companies up to 5 years old on the market. (Figure 1)

Figure 1. The age of companies participating in the survey



Source: elaborated by the author based on the results of the survey

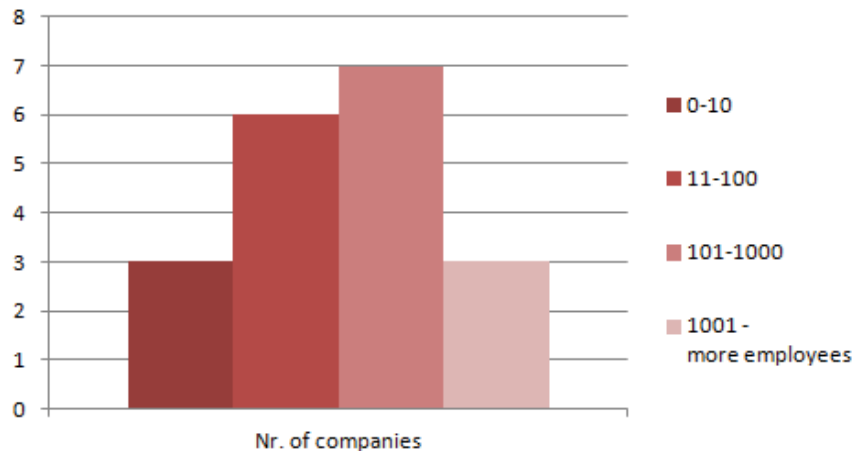
➤ *Turnover achieved by participating companies between 2010 and 2015*

Exceeds the volume of 1 000 001 lei for 15 companies, of which 13 are aged 6 years and over. It is worth mentioning that two novice companies up to 5 years of age managed to reach the turnover of 1 000 001 lei.

➤ *Average number of employees detained by companies between 2010 and 2015,*

As depicted in the figure below, most of the companies that participated in the survey are SMEs, with the following number of employees. (Figure 2.)

Figure 2. The average number of employees of the company in the years 2010-2015

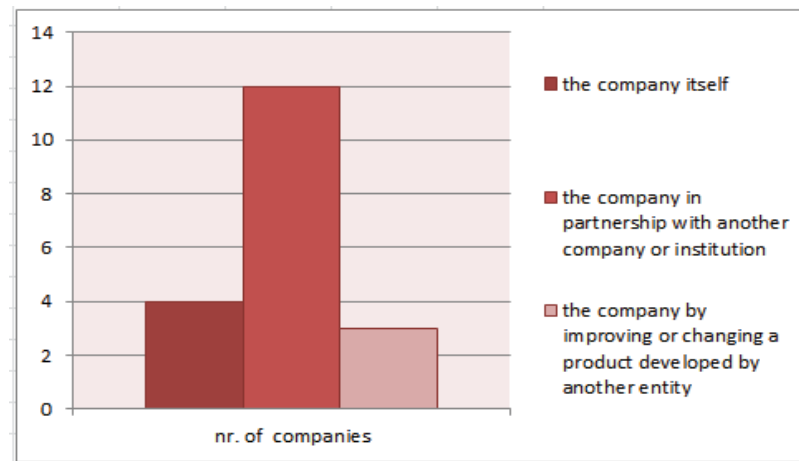


Source: Elaborated by the author based on data collected from the survey

➤ *Product innovation (goods or services)*

A product innovation is the process of launching a new or improved product or service on the market, respecting its original features, components, and other compelling parts. It is mandatory for the product innovations to be new to the company, but not necessarily new on the market. These can either be invented by the surveyed company or by other companies and institutions.

Out of the surveyed companies, 60% mentioned that they have launched innovative services: new or significantly improved services during the period 2010-2015 and 40% have launched innovative goods: new or significantly improved goods (excluding simple resale of products and Aesthetic improvements.) To the question who developed these product innovations, the companies declared the following (Figure 3.)

Figure 3. The origins of the innovations implemented by the surveyed firms

Source: Elaborated by the author based on data collected from the survey

Of all the product innovations launched, according to survey results, the majority, 70%, were new innovations on the market, meaning that the company introduced a new or significantly improved product as that of the competitors (the product may already be available in other markets), while 30% were new innovations only for the company that launched them, the innovations having existed on the market before.

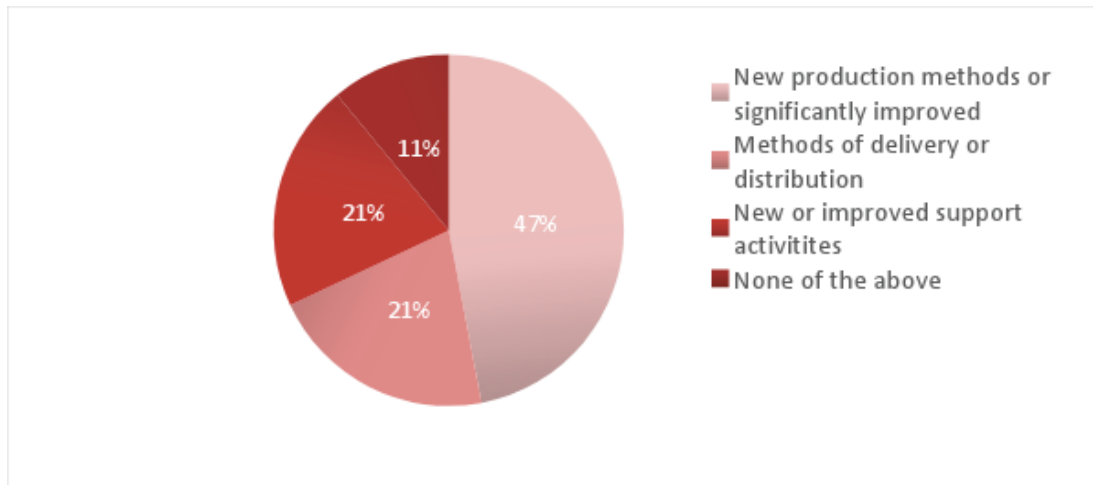
➤ *Process innovation*

A process innovation is the implementation of a new or significantly improved production process, a distribution method, or other support activity, which must comply with the following:

- Process innovations must be new to the company, but not necessarily new on the company's market
- Process innovation can be developed by both the surveyed company and another company
- Innovations of purely organizational nature are excluded

The survey showed that the majority of the participating companies have launched new or significantly improved production processes as process innovations, only a few have launched delivery or distribution methods for products / services. There are also companies that have not launched any process innovations. (Figure 4.)

Figure 4. Types of process innovations launched by companies, in the period 2010 and 2015



Source: Elaborated by the author based on the data collected during the survey

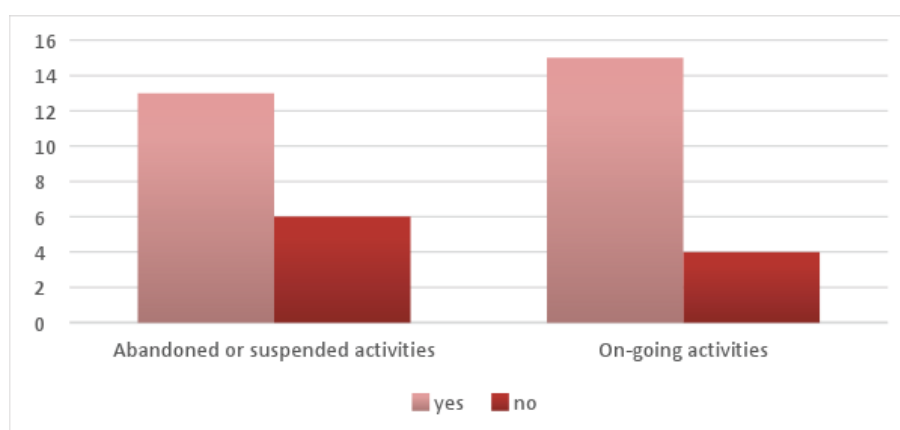
As with product innovations, process innovations have been for most companies, the result of collaborations with other companies or institutions, and only 5 companies have launched self-developed process innovations.

Being asked if these new process innovations have been existing on the company's market, 80% responded with "Yes," and only 20% of the companies have launched products that were completely new.

➤ *Innovations in progress or abandoned*

The activities related to innovations include the purchase of equipment, buildings, software, licenses, consultancy, design services, marketing, training and other activities undertaken to develop or implement a product or process innovation.

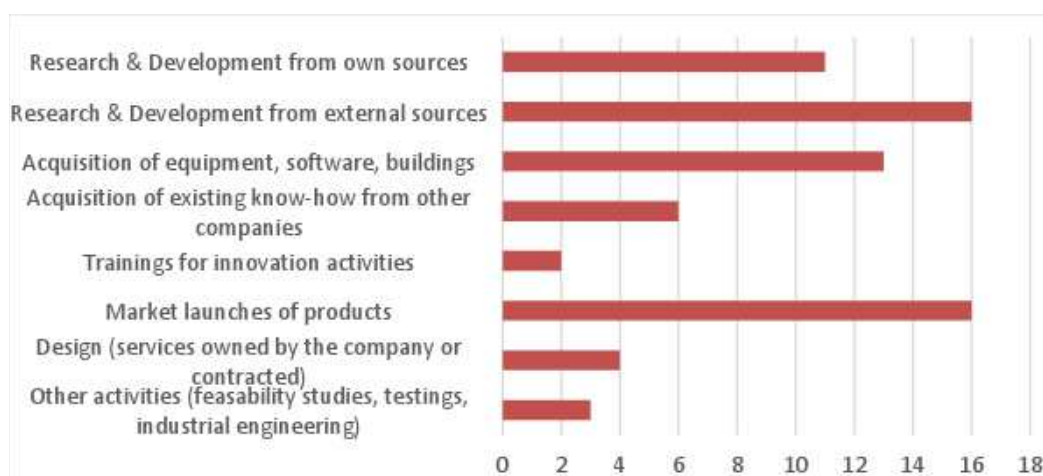
While it is commendable to successfully launch innovation activities, it may happen that for various reasons these efforts do not come to fruition with the launch of innovations, so to the question whether in the years 2010-2015 the company has undertaken any activities of innovation that did not result in the launch of a product or process innovation because the activities were either abandoned or suspended or are still in progress, the companies responded as following. (Figure 5.)

Figure 5. Activities that did not lead to the launch of innovations

Source: Elaborated by the author based on data collected from the survey

➤ *Activities and expenses related to product or process innovations*

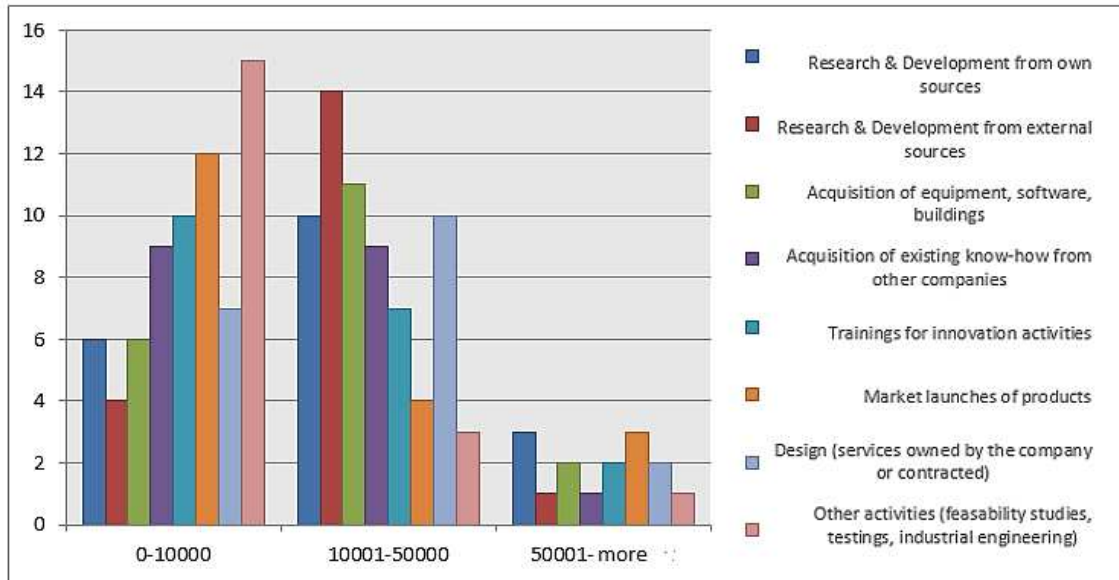
In order to conclude which innovation-related activities have generated most of the company's spending, the companies were asked to enumerate the activities that they have undertaken, which can be seen in the figure below (Figure 6.)

Figure 6. Types of innovation activities undertaken by Moldovan firms

Source: Elaborated by the author based on data collected from the survey

When asked about the amount of money the company spent on each of the activities, the companies responded as follows (Figure 7.)

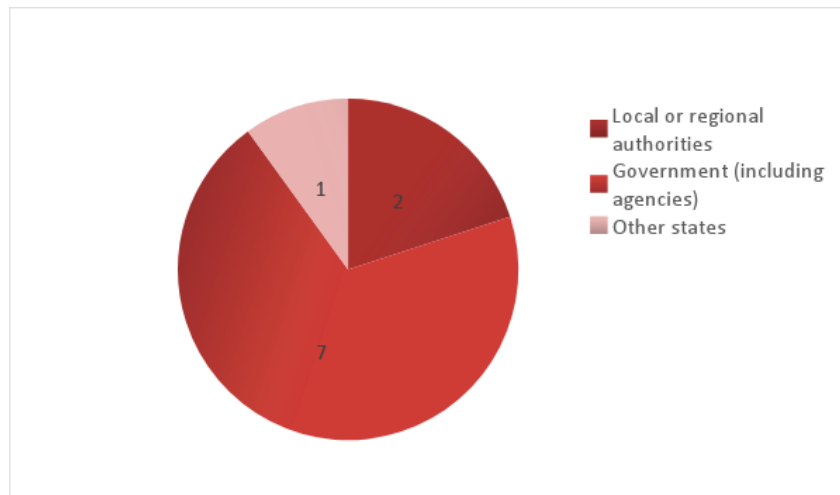
Figure 7. Amounts of money allocated by Moldovan firms for the types of undertaken activities



Source: Elaborated by the author based on data collected from the survey

Seeing that the financial support of innovative projects is one of the prerogatives of our state and of many other international organizations concerned with funding innovation, we have been curious to find out what is the contribution of public financial sources in the companies' balance sheet. So, the companies that participated in the survey declared that only a few of them received public funding in the years 2010-2015: (Figure 8.)

Figure 8. The public funding sources used by Moldovan firms for their innovation activities



Source: Elaborated by the author based on data collected from the survey

The general provisions of the legislative and normative acts of the Republic of Moldova in the field of innovation denotes a predominantly formal and fragmentary approach of the innovative process. Thus, out of all the mechanisms for encouraging the innovation activities applied abroad, only the following are used in the Republic of Moldova:

- direct co-financing of innovative projects implemented through AITT;
- promotion of the infrastructure of the innovation process (innovation incubators, technology transfer centers in universities, etc.)
- providing facilities for the payment of patents, industrial design and other IOPs through AGEPI
- product competitiveness and OIP used by companies

Reiterating the previously mentioned importance of the OIP for the economic success of an entity, the companies participating in the survey were asked to assess how effective they think OIPs are to the purpose of maintaining or raising the competitiveness of innovations and which of the following OIPs: patents, copyright and trademark do they find most effective, and the answers denounce that not all of the participating companies use OIP, and those that do have operated with them, highly appreciate the use of copyright and trademark and consider patents the least efficient.

The lack of awareness of IP rights is one of the obstacles that SMEs often face when trying to make use of OIP to increase their business. SMEs and entrepreneurs often do not have a coherent IP management strategy, they lack the necessary knowledge to develop and manage their IP portfolios, they do not fully understand the IP rights system and the need for resources for the proper protection and enforcement of intellectual property rights . These problems are aggravated when SMEs operate in international markets where they need to cope with different national IP systems

➤ Public Procurement and Innovation

Starting from the idea that the support for innovation activities is one of the most current prerogatives in the policies of all the world's states, we consider the partnership relationship that is established between the state and companies when the state recruits companies into a contract procurement an important criterion to analyze. When asked whether the companies have concluded between 2010 and 2015 public procurement contracts with public sector organizations, only 4 companies responded positively. Asked if they have undertaken some innovation actions as part of a public procurement contract, most companies answered that they have not done so, which shows with the partnership relationship in the field of innovation between the state and the private sector is still at an beginner stage in the Republic of Moldova.

Based on the survey data, the **following conclusions** can be drawn:

- The activity of innovation and technological transfer is not a priority activity for the majority of Moldovan companies, which remain highly concentrated on production, with a strong propensity to use classical techniques
- Except for large companies, most of the local companies lack the implementation of innovation management at the corporate level
- While using OIP instruments and declaring that they are extremely effective in their field, companies do not capitalize on OIP and do not reflect their values or their depreciation

- While the national budget is rather modest in terms of innovation support programs, it is still easier for innovative enterprises to access available financial resources

Conclusions and recommendations

The innovative activity is very complex and includes a number of other scientific, technical, technological, organizational, educational, financial, commercial activities. It aims not only in creating, protecting and commercializing the results of scientific research, developing knowledge, but also distributing knowledge in the economy and in society in general, improving and streamlining technological, organizational, marketing, education and training processes, training employees, diversification and improvement of the quality of products and services, their promotion in domestic and foreign markets.

The growing interest on the world stage to intensify the innovation activity of enterprises, especially the technological one, is pursued both to maintain or increase the competitiveness of national economies and as a result of the awareness of the effects of the economic activity on the consumption of resources and the environment, which requires the design of new production and consumption patterns.

Technological transfer is very important in the economic development of a state, the least developed or developing countries feel the need to import technologies that could support their growth and penetration into developed countries.

A successful technology transfer will translate the strategy into achievable goals that allow states or firms to harness their technology and knowledge to gain a competitive edge on the global market. It is obvious that the main technological management activities in the development phases of the companies focus on the technological transfer, namely on the following phases of evolution: 1. The Learning Stage; 2. Construction phase; 3. The internationalization phase; 4. The globalization phase; 5. Dominant global phase.

Developed countries can obtain a huge market for their surplus production by selling goods, technology transfer by setting up joint ventures, for example, while developing countries can acquire advanced technologies and knowledge by offering new market opportunities and providing human resources and raw materials.

Therefore, the reasons why a country or a company that decides to engage in the technology transfer process may vary, but may include:

- achieving a positive economic impact on society;
- obtaining acceptance and / or financial rewards;
- generating increased funding for the laboratory / department;
- compliance with research contract obligations;
- attracting investors to research;
- creating educational facilities for students;
- connecting students to future employment opportunities;
- getting a sense of personal achievement.

Therefore, technology transfer is the process of promoting technological innovation through the transfer of ideas, awareness, mechanisms from ambitious companies or R & D organizations for wider application in industrial activity. Scientific and technological innovations can be seen as the process of transforming an idea into new or improved products used in industry or commerce. Innovation requires scientific, technological, organizational,

financial and commercial resources and is usually a result of applied research and experimental development.

In order to stimulate technology transfer and innovation, developing countries and countries with economies in transition should establish a clear development agenda based on a needs assessment, identification of indigenous capabilities, coordination of external resources, establishment of an effective process of consultation and development of appropriate monitoring and evaluation systems. While developed countries tend to focus on the private sector and market forces, developing countries tend to emphasize the role of the public sector and intergovernmental agreements.

One of the declared priorities for restructuring and modernization in the context of European integration initiated at national level in Moldova is the technological transfer. It is expected that through the transfer of production of new technologies they will deliver results that will increase productivity, increase exports and ultimately increase profits and create new jobs, thus justifying state investment in research and development technologies. Therefore, one can say that a country must invest in the renewal of production and products, at least to the extent that it invests in equipment, because technological progress is a catalyst for development.

In the case of Moldova, technology transfer is one of the means still at an early stage of development, although it is included in the state action plan, the lack of sufficient funding makes them have modest results compared to other states in the region.

One of the current and most pressing problems of the innovative infrastructure is the reduced number of residents in the parks and incubators, due to the lack of scale and customs facilities for them, and the attractiveness of the innovative infrastructure under these conditions is considerably decreasing. In addition, work to develop innovation infrastructure faces a number of other challenges:

- Insufficient stimulation of innovation activities through public policies;
- Lack of legislation on risk capital;
- Lack of official statistics on innovation activity;
- The weak link between research and business

An essential component of the development of innovation infrastructure is also the incentive mechanisms. These are currently limited to:

- public funding of residents' technology transfer projects (up to 50%)
- finding the infrastructure development projects;
- partnerships between business and academia within the WCT and II;
- reductions in rates for the rent of communal rooms and services for residents of science and technology parks and incubators for innovation;
- provision of free or low-cost services;
- facilities for the tariffs for the protection of industrial property objects.

However, existing mechanisms prove to be insufficient to increase the attractiveness of innovation parks and incubators. In this respect, starting from the existing instruments in other countries, the innovative infrastructure in the Republic of Moldova requires the implementation of new incentive mechanisms that would increase the entrepreneurial predilection for innovation, thus attracting more residents to the parks and incubators.

A small role in innovation development lies with small and medium-sized enterprises. According to Eurostat data, about 50% of EU SMEs are performing some innovation activity: technological or non-technological. It is interesting to note that a study by the OECD in 2015 indicates at a surprisingly high level the innovative activity of SMEs in Moldova: about 54% of SMEs said they have introduced a new product or service over the past 3 years.

Despite the large share of SMEs, companies use insufficient IP. Moreover, there are no clear criteria for awarding the "innovative enterprise" quality, and the SME patenting activity is extremely low compared to trademark registration and industrial design.

The economy of the Republic of Moldova does not know any field in which it can be said that it is a global leader in innovation. In this respect, a balanced policy is needed in order not to waste the scarce resources by too much diversification of the priority areas and directions of innovation. The latter can and must be adjusted periodically, based on registration successes and needs identified by the Government. State innovation policies must promote the dissemination of new knowledge to take on innovative technologies to enable local companies to become competitive first and foremost in the domestic market, after which those lonely companies will want to become innovative on the local and competitive market. The regional / global market, engaging in research and innovation, technology transfer.

Among the major issues related to the stimulation of innovation faced by the Republic of Moldova are:

- low innovation capacities of enterprises, especially SMEs, which are not the main players in technological innovation;
- division of the S & T sector, which leads to the dispersal and duplication of efforts and to a low overall level of performance;
- particularly poor capacity and motivation of S & T innovation in the public sector;
- inefficiency of the S & T model of innovation resource allocation and innovation project evaluation system;
- lack of mechanisms for remarkable staff remuneration and encouragement of innovation and pioneering activities.

On the basis of the findings and conclusions presented, in order to stimulate the innovation activity, the following general proposals and recommendations can be formulated to improve the efficiency of the national innovation system and to strengthen the capacities of its participants:

1. Studying and taking on good international practices

The development of an innovating ecosystem as complete as possible, adapted to the socio-economic conditions of the Republic of Moldova, establishing the role and functions of each actor within this system, highlighting the links and correlations between them, finding the functional elements and possible gaps and constraints to develop the most appropriate mechanisms for the most effective political coordination of the system, based on the goals to be achieved.

2. Reinforce innovation policy by taking on international best practices:

In order to optimally promote the production, distribution and use of new knowledge among others,

- expanding research-development-innovation demand by increasing the potential for innovation absorption by the business environment; Increasing its capacity to assimilate and

improve technologies and know-how; Developing human capital through education and training;

- development of a modern set of institutions and related mechanisms for the coordination and financing of public research organizations;

- improving synergies between the priority areas of innovation activities, spreading innovation beyond science parks and innovation incubators and promoting more market-based clusters and networks;

- strengthening the interaction between actors in the innovation system, in particular between public research organizations and industry;

- making foreign enterprises more active in the developing innovation system

3. *Deepening, expanding and systematically and radically complementing policies*

Traditional innovation through the creation of innovative and participatory governance models and methods, full review and continuous monitoring of methods, procedures and achievements within the various institutions, as well as interaction between them. Improving the regulatory framework for innovation through:

- encouraging the implementation of innovation management at the corporate level

- capitalization of OIP by reflecting their value in the financial statements and their depreciation;

- increase and facilitate the access of innovative enterprises to financial sources.

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