# Improving scientific-methodical support of innovative processes cluster development in the regions of Moldova, based on the „Dual-use" research

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In the Republic of Moldova, in 2011, has been developed the "Conception to support cluster development of industrial sectors of the country's regions". In the first phase, the implementation of State policy to support cluster development of industrial sectors of the regions of Moldova highlighted the need for scientific-methodical support. It involves the definition of industries in their territories (identify industrial specialization of regions, autonomous-territorial units), which has formed the necessary conditions (General and specific) for creating clusters.

Planning future "Strategy of cluster development" *firstly* requires improvement approaches in scientific-methodical support for Moldova in general (drawing on the experience and errors analysis of Central and Eastern Europe in the integration into the European Community), *secondly,* ensuring the level of "Technological mode" of the Commonwealth of Independent States (CIS) , with which regions of the Republic of Moldova have intentions to cooperate (non-members of the Eastern partnership initiative and Associated EU countries).

Support predetermining of the use innovative methods - it is designed and adapted the methodology (approaches) on the coherent "turning ideas into product" within the framework of international standards and best practices in one or other of the territorial-administrative unit (according to NUTS-nomenclature of territorial administrative units for statistics in EU), as applied to the EU New Associate Countries. The latter, as member countries of the European Union, seek to be guided by the principles of the EU regional policy, inextricably linked with innovation policy. ***[1]***

Innovative methods directed on providing strategic sectorial planning of regional economic development by hardening the business support infrastructure (for example, business innovation incubators, industrial parks) in each region of development. On the basis of such planning, it will be possible to support the implementation of priority projects, contributing to the economic development of the regions.

Support of cluster development of industrial sectors of the country's regions should primarily affect the industrial sector of small and medium-sized enterprises oriented to the production of "dual-use" goods and services.

Small and medium-sized enterprises account for over 90% of EU enterprises and form the backbone of the economy within the Community. "The plan for the implementation of the Association Agreement of the Republic of Moldova for 2017-2019" stipulates the creation of better frameworks conditions through the exchange of information between

Moldova and the EU, and best practices, helping to improve the competitiveness of regions.

The conception identified main causes of affecting the development of industrial enterprises, such as: ***[2]***

– low Association of enterprises both large and SME sector;

– lack of cooperation between enterprises and research and innovative organizations;

– lack of cooperation between businesses and educational establishments;

– limited exchange of information in business Wednesday;

– underdeveloped business partnerships between Wednesday and local authorities;

– lack of own funds, lack of budgetary financing and high interest rates of bank loans

Cooperation between Moldova and the EU, includes managing structural changes (restructuring), development of public-private partnerships, as well as environmental and energy issues, such as energy efficiency and ecological production. Here touches on issues of organization of the transfer of dual-use technologies "*their modernization/improvement programmes and projects of the European research area*", where a special place is given to the "*Regional dimension of the European research area" **[3]***

Dual-use research refers to studies and technology development that can satisfy more than one goal at any given time. Especially research at *Lower Technology Readiness (TRL)* levels leads to technologies or products that can have either a military application or a civil application. Research in the areas of electronics, components, nanotechnologies, radars and sensors, telecom and ICT but also materials and propulsion or aeronautics in general don't have at the outset a specific defense or civil orientation. This research is called dual-use research: its findings and results can be shared between the civil community and the military community. This common or sharing of research at lower *TRL levels* has one benefit: expensive technologies, which would otherwise only serve military purposes, can also be used to benefit civilian commercial interests when not otherwise engaged. One such example is *Internet* or *Mobile Telephony*. It is exactly this type of research that seeks funding from the European Commission's programmes ***[4].***

In 2008, the Council Directive 2008/114/EC of December 8, 2008, came out. The purpose of this directive is the determination and designation of European critical infrastructure and the need for the evaluation for greater consideration of its protection. The directive defines the primary and ultimate responsibility for protecting critical infrastructure European scale.

From it, should also be obligations on all Member States of the EU to make sensitive critical infrastructure protection into its legislation. It can be considered as the legal basis for the whole subject area. In the EC(MEMO/06/477) Document of 2006, it was first presented a list of alleged areas of *European and national critical infrastructure*. Such areas include the following: ***[5]***

Annex 1 identifies the following CI sectors:

1. Energy;
2. Nuclear industry;
3. Information, Communication Technologies, ICT;
4. Water;
5. Food;
6. Health;
7. Finance;
8. Transport;
9. Chemical industry;
10. Space;
11. Research facilities;

Experience in the application of "*Dual-use*" technologies in the CIS/EU shows that they will have a chance of success if investments are made outside of "*Defense enterprises*" more quickly than within their frameworks. It is possible to implement "*Dual-use*" technologies in small and medium-sized enterprises (SME) in one region, using the industrial infrastructure of the core of a large enterprise. In the EU, this approach is called "*Cluster initiative*".

Association of the Republic of Moldova in the programme Horizon 2020 – "European Union's framework programme for research and technology development" or (FP8) funding program, established in the EU to support and encourage research in the European research space, involves planning the sustainable territorial development based on the criterion of the EU policies.

Thus, scientific-methodical support of cluster development regions of Moldova may be directed to the formation of a "*Regional innovation systems*" with the definition of "*Centers of responsibility*" for

developing, managing projects and programs *(regional project clusters),* taking into account the specifics of each region and "*Autonomy territorial administrative units".*

In this case, it is appropriate to rely on the provisions of the theory "Diffusion of innovations", which seeks to explain: how, why and with what rate new ideas and technology spread through cultures (innovative culture). The French sociologist Gabriel Tardom (1890) and the German and Austrian anthropologists, such as Friedrich Ratzel and Leo Frobenius, first studied the concept of "Diffusion of innovations".

In 1962, Everett Rogers, a professor of rural sociology, published his seminal work: Diffusion of Innovations. Rogers synthesized research from over 508 diffusion studies across the fields that initially influenced the theory: anthropology, early sociology, rural sociology, education, industrial sociology and medical sociology. Using his synthesis, Rogers produced a theory of the adoption of innovations among individuals and organizations. Diffusion of Innovations and Rogers' later books are among the most often cited in diffusion research. His methodologies are closely followed in recent diffusion research, even as the field has expanded into, and been influenced by other methodological disciplines such as social network analysis and communication ***[6].***

The main elements in the study of diffusion are presented in *Table1:*

***Table 1.***
**Key elements in diffusion research**

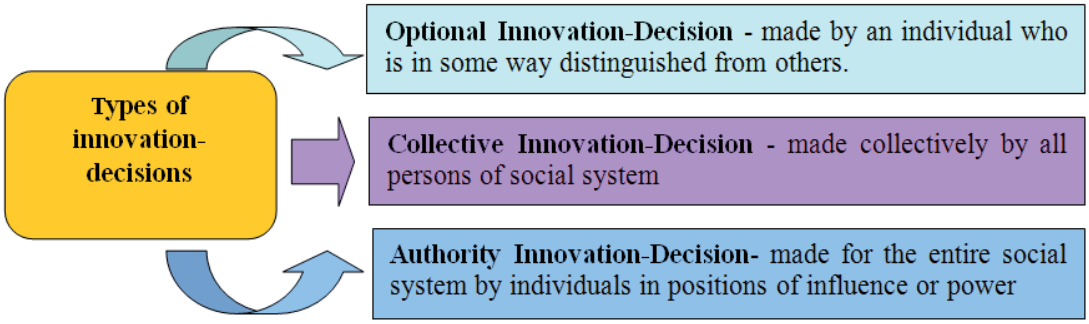
| Element | Definition |
|---|---|
| Innovation | Innovations are a broad category, relative to the current knowledge of the analyzed unit. Any idea, practice or object that is perceived as new by an individual or other unit of adoption could be considered an innovation available for study. (E. Rojers) |
| Adopters | Adopters are the minimal unit of analysis. In most studies, adopters are individuals, but can also be organizations (businesses, schools, hospitals, etc.), clusters within social networks, or countries |
| Communication channels | Diffusion, by definition, takes place among people or organizations. Communication channels allow the transfer of information from one unit to the other. Communication patterns or capabilities must be established between parties as a minimum for diffusion to occur. |
| Time | The passage of time is necessary for innovations to be adopted; they are rarely adopted instantaneously. In fact, in the Ryan and Gross (1943) study on hybrid corn adoption, adoption occurred over more than ten years, and most farmers only dedicated a fraction on their fields to the new corn in the first years after adoption. |
| Social system | The social system is the combination of external influences (mass media, organizational or governmental mandates) and internal influences (strong and weak social relationships, distance from opinion leaders). There are many roles in a social system, and their combination represents the total influences on a potential adopter. |

***Source:*** prepared by the authors based on E. Rogers

Two factors determine what type a particular decision is:

- Whether the decision is made freely and implemented voluntarily
- Who makes the decision.

Based on these considerations, three types of innovation-decisions have been identified.




Regarding the specifics of "Dual-use" technologies: we believe it is necessary in the "Optimal innovation policy" development regions to preserve a uniform level of protection for critical infrastructure security (level of military security in general for the State) without attracting additional resources.

Therefore, transfer of promising technologies and effective development of the military (defense) sector of the economy in the civilian sector, and vice versa, becomes one of the main priorities of the industrial and scientific-technical policy of the States ***[7].***

"Clustering" in terms (frameworks) of the innovation processes of association with the EU and a solution to the problems of unification of military and civil purposes, can make the development and production of "Dual-use" products realization economically advantageous. It will provide positive synergistic effects, as in the sustainable functioning of critical infrastructure, national security, and civil spheres.

The most profitable innovations are related to the creation, development and diffusion of interspecific/multiuse, because there is an opportunity to cross-sectorial harmonization, and therefore the implementation of the cost reduction factor with increasing seriality.

In the context of the development of relations with the CIS countries, it is necessary to take into account that one of the types of the "*International economic relations*" is the "*Military-technological cooperation*". This cooperation legally regulates the powers of institutional organizations, which are responsible for the management activities of production of "Dual-use" goods and services in the context of the EU (NATO), for organizing the internationalization processes "Research and development". Processes (R&D) include certain steps ***[8]:***

1. Formation of R&D capability;
2. National (regional; territorial) funding;
3. Intergovernmental organization for pan-European research and development funding and coordination;
4. Framework Programmes for Research and Technological Development.

Now under the EUREKA programme the following types of projects:

– Individual projects.

– Umbrella projects: "PRO FACTORY +" (high technology manufacturing, robotics and computer applications); "E–SURF action" (production materials); "EUROTOURISM" (tourism).

– Cluster projects : information technology and communication technology; Energy; Water;

– EUROSTARS-support programme for European research and development carried out by small and medium-sized businesses.

**Conclusions of the publication:**

1. At the present stage of scientific and methodological support for the formulation and implementation of State policy of cluster development in the industrial sector should be "Decentralized" to the regions development as analytical processes in clusters/cluster initiatives, free economic zones. [9]

2. Strategy for regional development (regional operational plans) must pay more attention to implementation of ICT in SMEs regions of development. They must be consistent with the work of the Working Group on the elaboration of a Strategy for the development of the "*Digital innovation ecosystem*" and support start-ups. A working group, established under the auspices of the Ministry of Economy (Department/Agency of Information Technology and Communications), should include representatives of interested State agencies, development partners, academia and the industry, etc.

3. It is advisable, to the adequate management of scientifically research on topics related to the "Technological" and "Non-technological innovations", establishing capacity regions of development to use the basic stages/steps of the transfer dual-use technologies (DUT), well-qualified specialists actively involved in the military departments at universities

4. Provide preparatory work (National level) for the organization of the transfer of dual-use technologies in regions of development:

– External analysis *(PESTLE-analysis);*

– Identification of potential dual-use technologies;

– Evaluation/expertise of their economic and commercial potential;

– Formation of the list of objects (products) military and civil purposes can be carried out through the use of dual-use technologies;

– Formation of economically and commercially effective synergistic technology cluster objects (products) for military and civil purposes.

"PEST analysis" (political, economic, social and technological) describes a framework of macro-environmental factors used in the environmental scanning component of strategic management.

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**ABSTRACT**

**Improving scientific-methodical support of innovative processes cluster development in regions of Moldova, based on the „Dual-use" research.** In the article is discussed about scientific-methodical support of innovative processes cluster development in regions of Moldova. It is revealed

the need to create conditions for the coordination of processes of internationalization of „Dual-use" research related to the development of the most promising directions in applied science and technology-based industries that require significant intellectual and economic costs that tend to lead to a high level requirements for their quality and effectiveness.

***Keywords:*** innovation, SME sector, decentralization; cluster development, diffusion of innovations, "Dual-use" research, European critical infrastructure.

**REZUMAT**

**Îmbunătățirea suportului metodico-științific al dezvoltării clusterului de procese inovatoare în regiunile Moldovei, pe baza cercetărilor științifice „cu dublă utilizare".** În articol este abordată problema susținerii științifico-metodice a dezvoltării clusterului de procese inovatoare în regiunile Moldovei. Este reflectată necesitatea creării unor condiții favorabile privind coordonarea proceselor de internaționalizare a cercetării „cu dublă utilizare", pentru dezvoltarea celor mai promițătoare direcții în științele aplicate și în industriile bazate pe tehnologie, care necesită investiții intelectuale și economice semnificative, asigurând atingerea unui nivel superior de calitate și eficiență.

**Cuvinte-cheie:** inovare, sectorul IMM, descentralizare, dezvoltarea clusterelor, difuzarea inovațiilor, cercetarea „cu dublă utilizare", infrastructura critică europeană.

**РЕФЕРАТ**

**Совершенствование научно-методической поддержки инновационных процессов кластерного развития регионов Молдовы на основе организации научных исследований «двойного назначения».** В статье рассматриваются вопросы научно-методической поддержки инновационных процессов кластерного развития регионов Молдовы. Раскрывается необходимость создания условий по координации процессов интернационализации исследований «двойного назначения», связанных с развитием наиболее перспективных направлений в прикладной науке и в наукоёмких отраслях промышленности, которые требуют значительных интеллектуальных и экономических затрат и, как правило, приводят к высокому уровню требований к их качеству и эффективности.

**Ключевые слова:** инновации, сектор МСП, децентрализация, развитие кластеров, диффузия инноваций, исследования «двойного назначения», европейская критическая инфраструктура.