

## Evolution of EU Innovation Policy

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**ABSTRACT.** The article is dedicated to the comprehensive study of the key stages of the evolution of the European Union innovation policy, the conditions and factors of transformation of its priorities, as well as the estimation of the main advantages and disadvantages of implementing its polystructural integration model. It is fixed that in course of its development the EU innovation policy has gone through several qualitatively heterogeneous stages, which tended to the interaction of a number of elements, the combination of which ensured identification of scientific, technological and innovation models of this policy.

It is proved that the initial stage of the EU common research policy was based on the development of large international cooperative projects of basic and applied research, investment in scientific infrastructure, improvement of scientific education systems and training. In the second stage, the EU's innovation policy acquired the features of technological effectiveness characterized by the identification of the EU's strategic industrial sectors for global innovation leadership, harmonization of technological standards within the integration group, deepening the scientific division of labor with narrow profile of member states in various technological field, strengthening of international scientific and technical cooperation, technological transfer and commercialization of newly developed technologies, as well as the introduction of a favorable environment for technological development of production and service sectors of the economy. The current stage of community innovation policy reflects innovation practices as a systemic process of continuous generation and commercialization of innovations, focused on building the knowledge economy, improving the infrastructure of commercialization of new technologies, protection of intellectual property rights, involvement of small and medium businesses, and social values.

It is outlined that as in line with deepening integration processes in the EU, research and innovation practices have become a priority in the comprehensive strategy of competitive development of the integration community, as confirmed by the constant growth of financial allocations for research and innovation development goals, attraction of more stakeholders to the research work and strengthening of common European research area. The EU's innovation policy has now introduced a regular and polystructural pattern with a clear division of goals and coordination of efforts at the supranational, national and regional levels of its implementation.

The open model of EU innovation activity, which tends to the involvement of a wider range of associated countries in the implementation of European cooperation research and innovation

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projects, significantly triggers the introduction of research activities of domestic institutions of Ukraine, unprecedented opportunities for innovation patterns of national economy growth, as well as finding promising niches in international chains of high-tech industrial production and providing knowledge-intensive services.

KEY WORDS: European Union, research, innovation activities, innovation policy, financial allocation, innovation ecosystems, European technology partnerships, European Research Council, Marie Curie Actions, European Innovation Council, European Institute of Innovation and Technology.

## Introduction

Innovation activities and technological innovations at the present stage of development of the global economy have become the determinants in the development and approval of international competitiveness of the global states. The continuous process of transforming the latest advances in basic and applied science into commercially viable consumer products and production technologies is fundamental for stable economic growth of national economies and ensuring the welfare of their populations. Global leaders in technological development, including the European Union, have developed unique models and strategies for innovative development that allow national companies to grab leading positions in the global markets for high-tech goods, knowledge-intensive services and technologies. All this necessitates the study not only of the current model of EU innovation policy, but also the main stages of its evolutionary development, which will fix the key components of innovative competitive advantages of the EU, features and advantages of institutional tools to support innovation in Europe, as well as to support the proposals for improvement of innovation-oriented model of Ukraine's economic development.

A number of works by foreign scientists, such as B. Asheim, S. Borrás, H. Brekzík, C. Edquist, A. Isaksen, Ch. Carlsson, R. Kamagni, K. Ketels, P. Krugman, B. Lundwal, A. Malmberg, J. Metcalfe, N. Mussis, R. Nelson, M. Porter, R. Florida, K. Freeman, etc. are dedicated to the study of theoretical principles, up-to-date models and strategies of innovative development. Comprehensive analysis of tools of innovation policy in the context of economic globalization is given in the scientific works of domestic economists, in particular: L. Antoniuk, M. Voinarenko, D. Lukianenko, S. Kolodynskyi, A. Mokii, I. Peleshchak, A. Poruchnyk, Ye. Saveliev, C. Sokolenko, L. Fedulova, V. Chuzhykov, I. Yashchyshyna, etc.

At the same time, in-depth research is needed not only by the current format of innovation policy of the European integration community, but

also by the evolutionary process of its formation, which will fix key determinants of progressive improvement of EU innovation policy, its qualitative and quantitative parameters, as well as peculiarities of introduction of polystructural regional institutional model of coordination of innovative development of EU members. Therefore, the article is aimed to study the key stages of the evolution of innovation policy of the European Union, the conditions and factors of transformation of its priorities, as well as to assess the main advantages and disadvantages of implementing its polystructural integration model.

### **Overview of qualitative transformation of EU innovation policy**

The launch of a homogeneous economic space within the European Union has led to the convergence of most areas of economic policy of member states, the introduction of supranational tools for coordinating the actions of governments and the support of a common market for the integration community. The EU's current innovation and technological policy, which was not immediately focused on supporting business innovation, has passed for quite a long development period, because in the postwar period the efforts of the EU founding countries were aimed at uniting of national research credentials in basic science, i.e. in the pre-market stages of scientific development, and only in the late 1980s – early 1990s, the technological needs of European industry sector were clearly declared at the supranational level.

In course of its development, the EU's innovation policy has gone through several qualitatively heterogeneous stages, which tended to the interaction of a number of elements, the combination of which ensured the definition of scientific, technological and innovative models of this policy<sup>3</sup>. The first stage, the "period of great science," lasted from the first half of the 1950s to the mid-1980s; the second is "the period of framework programs for the development of science and technology" – from the mid-1980s to the early 2000s; the third is the "formation of a European research area", which has been lasting from the early 2000s to this date.

The integration context of the initial stage of EU science policy development determined the importance of "Great Science" – a concept that reflected the implementation of major international projects by combining the scientific resources of the member states of the integration group<sup>4</sup>. During this period, EU research policy was based on

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<sup>3</sup> *Burmich, O.S., O.D. Lukianenko, Y.G. Panchenko, and V.I. Chuzhykov. Tekhnologichna Modernizaciya v Evropeiskiy Ekonomici. Kyiv: KNEU, 2013. [In Ukrainian].*

<sup>4</sup> *Borras S. The innovation Policy of the European Union. From Government to Governance. Cheltenham: Edward Elgar, 2003. P. 45.*

both basic and applied research with a practical focus. At the same time, scientific education and training of specialists capable of conducting systematic research in various fields of knowledge were of paramount importance. In turn, this requires increased investment in scientific infrastructure and sufficient fixed costs to maintain its competitive level.

With the development of the EU framework programs in science and technology segments, the scientific policy of the integration community is being transformed: it takes the features of production effectiveness, characterized by the identification of strategic industrial sectors efficient development of which can provide significant competitive advantages in a globalized environment. The deepening of the scientific division of labor with the increased focus of some countries on various technological fields of knowledge requires the strengthening of international scientific and technical cooperation and the formation of a favorable environment for technological development of production and service sectors of the economy. In this context, the harmonization of technological standards within the integration group becomes an important component of both the technological policy itself, and the fundamental factor in the development of the common market of goods and services. The awareness by the governments of most EU member states of the integration benefits of the open model of innovation explains the priority of technology transfer and commercialization of newly developed technologies implemented in the model of community technology policy.

The current, highest stage, according to S. Borras, is an innovation policy, which reflects innovation activity as a regular process, the need for which is a critical requirement for the development of the knowledge economy. Reliable protection of intellectual property rights, strong development of infrastructure for commercialization of new knowledge, bioethics and consideration of social values are inseparable components of this type of policy. Together, these components are necessary to ensure a system of continuous generation and commercialization of innovations. Under these conditions, small and medium-sized companies will play an important role in the EU's innovation policy, which due to their flexibility will not only perform the social function of introducing new places of employment, but also in the context of the post-Fordist paradigm of flexible specialization will become an integral part of the cutting-edge economic tool for developing innovative products.

### **Introduction of the foundations of common EU research policy**

The initial stage of EU science and technology policy began in the early 1950s before the adoption of the basic documents on the European

Economic Community. At that time, large-scale international cooperation projects were being implemented, and sites of "great science" were being launched. Scientific cooperation of that period had a number of distinctive features:<sup>5</sup>

- focus on basic and applied research, rather than on technological developments;
- attracting direct state funding for small private allocations;
- non-military vector of research;
- large-scale scientific facilities and laboratory projects;
- predominance of interstate rather than supranational relations in the system of political management of scientific and technical cooperation.

According to the authors, the formation of the European Organization for Nuclear Research – CERN (Conseil Européen pour la Recherche Nucléaire<sup>6</sup>) in 1954 marked the beginning of a long way to develop a common European research policy. At that time, nuclear energy was considered an advanced innovative type of energy resources that was to determine the future economic success of European countries. Nuclear energy has proved to be only one of the areas of research of this organization, which has become the world's most powerful research center in molecular physics.

In 1957, with the signing of the Treaties of Rome, nuclear research got a boost within Euratom and the Joint Research Center. The latter had an exact list of functions in this area of research strategically important for the community, namely<sup>7</sup>:

- increasing the level of nuclear safety, in particular: safety of nuclear reactors and nuclear fuel;
- increasing the level of civil protection and safety of nuclear facilities;
- implementation of advanced research in the nuclear field in order to introduce common standards for the functioning of the nuclear energy market;
- promoting the improvement of EU policy in the field of nuclear safety and security management.

The scope of the Joint Research Center (JRC) has significantly expanded compared to *CERN*, and tended to provide scientific and technical advice to official EEC institutions in developing a rationale for the instruments of the full range of supranational policies. The center is defined as a direct instrument of scientific and technical policy

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<sup>5</sup> *Borras S.* The innovation Policy of the European Union. From Government to Governance. Cheltenham: Edward Elgar, 2003. P. 45.

<sup>6</sup> Later the name was changed for *Organisation européenne pour la recherche nucléaire*, but it was decided to keep the original abbreviation *CERN* given its melodiousness.

<sup>7</sup> *Moussis N.* Access to European Union: law, economics, policies. Antwerpen: Intersentia, 2013. URL: [http://europedia.moussis.eu/books/Book\\_2/6/18/02/04/?all=1](http://europedia.moussis.eu/books/Book_2/6/18/02/04/?all=1).

of the integration community; accordingly, all JRC projects are fully funded by the EU budget (mostly these are diversified interdisciplinary studies). Normally, the JRC projects account for about 20 percent of the EU's research budget. According to its legal status, the JRC<sup>8</sup> is an autonomous Directorate-General of the European Commission, as it acts as the EU's main research and reference center. The center has significant international scientific resources and infrastructure, most of which are located in European cities: Ispri (Italy), Gili (Belgium), Petteni (Netherlands), Karlsruhe (Germany) and Seville (Spain)<sup>9</sup>.

The mission of the JRC is to provide scientific and technical support in the development, implementation and monitoring of common EU policies. In the context of its key mission, the Joint Research Center has a number of tasks, including:

- coordinates research work carried out in the member states of the group;
- in a timely manner responds to new needs and requirements of the subjects of implementation of common EU policies;
- focuses on social problems that have an experimental component and European significance;
- promotes the development of cooperation with research centers, universities, industry sector, representative bodies of EU countries, third countries and international organizations.

To ensure the effective operation of the Center, the members introduced the networks of cooperation with public and private institutions of member states through the development of research networks, joint technological projects, academic exchanges, etc.<sup>10</sup> The accumulation of a critical mass of intellectual resources allows the JRC to effectively complement the indirect tools for the development of science and technology existing in the EU (since 1984) by substantiating the scientific basis for decision-making in relevant fields of supranational regulation<sup>11</sup>. Thus, the principles of selection of JRC research projects are their relevance to the supranational level of regulation of the EU economy, as well as subsidiarity, which determines the rationale for intervention in a particular field at the EU level. The JRC support is particularly valuable in the areas of its special competence, where it has the relevant research infrastructure, as well as

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<sup>8</sup> *Moussis N.* Access to European Union: law, economics, policies . Antwerpen: Intersentia, 2013. URL: [http://europedia.moussis.eu/books/Book\\_2/6/18/02/04/?all=1](http://europedia.moussis.eu/books/Book_2/6/18/02/04/?all=1).

<sup>9</sup> On the reorganization of the Joint Research Centre: Decision of the European Commission № 96/282/Euratom of 10 April 1996. *Official Journal*. 1996. № L107 (30.4.1996). P. 12–15.

<sup>10</sup> European Commission. "Fulfilling the JRC's mission in the European Research Area: Communication from the Commission to the Council and the European Parliament № COM (2001) 215 final of 20.04.2001". Brussels, 2001. URL: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52001DC0215&from=EN>.

<sup>11</sup> *Moussis N.* Access to European Union: law, economics, policies . Antwerpen: Intersentia, 2013. URL: [http://europedia.moussis.eu/books/Book\\_2/6/18/02/04/?all=1](http://europedia.moussis.eu/books/Book_2/6/18/02/04/?all=1).

in the areas where, according to the founding treaties, the Center is empowered to substantiate scientific approaches on implementing EU common policies and tasks, which require neutral and unbiased approach to national interests (development of common EU standards and technical standards). The key areas of the JRC competence are the following: energy, transport, environmental policy and climate change, agriculture and food security, health, consumer protection, ICT, reference materials, security and safety (including nuclear safety and nuclear security systems under the Euratom Research Program). Thus, the subject area of focus of the Center's research activities is determined by its pan-European identity, which ensures added value for the research development in the EU<sup>12</sup>. JRC implements two research programs: of the European Union and of the European Atomic Energy Community.

The analyzed stage of the EU innovative development tended to high-rate growth of its institutional structure. Thus, less than a decade after the launch of the Joint Research Center in 1965, a working group on scientific and technical research (PREST) was introduced in the EU to assist the Commission and the EU Council as part of the Medium-Term Economic Policy Committee. The Committee fixed seven priorities: high-performance computers, software standardization, electronic vehicles, gas turbine engines for trains, hovercraft, standardization of meteorological instruments, and air and water pollution control<sup>13</sup>. Later on, PREST was transformed into CREST — Scientific and Technical Research Committee aimed to ensure effective coordination of national policies and identification of projects affecting the interests of the Community in the field of science and technology. According to the Commission's proposal, the European Science Foundation was established in 1974 to oversee the development of basic research; in 1982, the Committee for the Development of Science and Technology in Europe (CODEST) was established; in 1984, the Industrial Research and Development Advisory Committee (IRDAC) was established.

### **Integration of technological needs of industry with the priorities of scientific and technological development of the European Union**

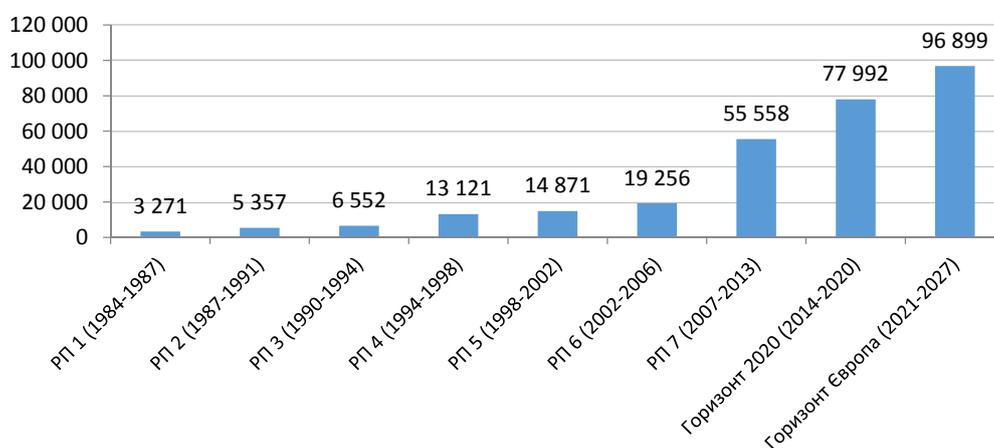
The beginning of a new phase in the European Community's innovation policy is often associated with the introduction of a new research coordination tool in 1984- the EU's multiannual framework

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<sup>12</sup> *Moussis N.* Access to European Union: law, economics, policies . Antwerpen: Intersentia, 2013. URL: [http://europedia.moussis.eu/books/Book\\_2/6/18/02/04/?all=1](http://europedia.moussis.eu/books/Book_2/6/18/02/04/?all=1).

<sup>13</sup> *Andrée D.* Priority-setting in the European Research Framework Programmes. Stockholm: VinnoVA — Swedish Governmental Agency for innovation Systems, 2009. P. 32.

programs for science and technology development, which are considered indirect regulatory instruments, as the research projects have since had to be funded according to the principle of complementarity, which provides for the mandatory supplement of the project budget with the beneficiary's funds. The introduction of the principle of complementarity of financial allocations in EU innovation policy was an important step, which significantly expanded the community's resources by attracting additional funding channels for research projects, as initially research was funded mainly by direct allocations from the EU budget through the Joint Research Center, Euratom and other direct instruments<sup>14</sup> of Community science and technology policy. In general, the framework programs have proven to be effective tools for promoting technological development, as evidenced by the constant growth of their budgets. R&D funding in the last seven-year programming period was a record high, reaching almost EUR 97 billion (Figure 1).



FP 1 (1984- 1987)	FP 2 (1987- 1991)	FP 3 (1990- 1994)	FP 4 (1994- 1998)	FP 5 (1998- 2002)	FP 6 (2002- 2006)	FP 7 (2007- 2013)	Horizon 2020 (2014- 2020)	Horizon Europe (2021- 2027)
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Fig. 1. Dynamics of EU Framework Programs for Science and Technology Development, EUR million (ECU)

Source: <sup>15</sup>

<sup>14</sup> Direct EU policy instruments are those programs or institutions whose activities are fully funded by the EU budget, without requiring contributions from the beneficiary.

<sup>15</sup> Developed by the authors based on: Borras S. The innovation Policy of the European Union. From Government to Governance. — P. 37; O'Donnell P, B. Deighton. Europe's Framework Programmes a Key Element of Research Policy in Europe. Horizon Magazine. — 2015. — Special Issue. — P. 6—7; European Union. Horizon Europe. Luxembourg, Luxembourg: Publications Office of the European Union, 2021. [https://ec.europa.eu/info/sites/default/files/research\\_and\\_innovation/funding/documents/ec\\_rtd\\_horizon-europe-overview.pdf](https://ec.europa.eu/info/sites/default/files/research_and_innovation/funding/documents/ec_rtd_horizon-europe-overview.pdf).

Until the mid-1980s, the EU faced unsystematic tools to support research, with focus on individual measures in the fields of agriculture, coal mining, energy, etc. Only at the end of 1982 the EU Council decided to start preparing the European Community Research Program in the field of information and communication technologies called ESPRIT<sup>16</sup> (support for information industries based on new electronic technologies). Together with RACE<sup>17</sup> (support for the development of cutting-edge advanced telecommunications systems, promotion of technical and industrial cooperation) and BRITE<sup>18</sup> (support for pre-competitive fundamental R&D in the fields not covered by ESPRIT and RACE, as well as pilot and demonstration projects), these instruments defined the basics of the EU's First Framework Program on the development of research and technology (1984-1987), which was the EU's response to the sharpening of competition with the United States and Japan<sup>19</sup>.

For the first time, a system-based approach to determining the added value of research projects at the Community level was proposed by the German Minister for Scientific Research, H. Riesenhuber. His requirements, which formed the criterion for selecting the priorities of the First Framework Program, later became known as the "Riesenhuber criteria" and for a long time fixed the conditions for the selection of research projects of interest at the Community level. The involving of the Community in the support of research projects under H. Riesenhuber was reasonable if:

- the research project was so large-scale that its implementation was beyond the power of an individual EU Member State;
- international studies could have a clear financial benefit from their joint conduct;
- research based on the complementary nature of the work carried out at national level in a particular sector enabled to achieve significant results within the EU on issues that would require large-scale encouraging of efforts of the scientific community;
- research has contributed to the consolidation of the common market, the integration of European science and technology, as well as the introduction of unified laws and standards.

Under the Second Framework Program (1987-1991), the Riesenhuber criteria were supplemented by the aspect of social cohesion, which supports research that "contributes to strengthening the economic and

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<sup>16</sup> Abbreviated from eng. *European Strategic Program on Research in Information Technology*.

<sup>17</sup> Abbreviated from eng. *R&D in Advanced Communications Technologies for Europe*.

<sup>18</sup> Abbreviated from eng. *Basic Research in Industrial Technologies for Europe*.

<sup>19</sup> *Andrée D.* Priority-setting in the European Research Framework Programmes. Stockholm: VinnoVA — Swedish Governmental Agency for innovation Systems, 2009. P. 9.

social cohesion of communities by promoting their harmonious and diverse development and maintaining coherence with technical and scientific quality."<sup>20</sup> The particular goal of the R&D was to strengthen the scientific and technical base of European industry, including small and medium-sized businesses, especially in strategic high-tech industries, as well as to encourage the growth of its international competitiveness<sup>21</sup>.

The Third Framework Program (1990-1994) had project selection tasks and criteria almost identical with the Second Program, but was supplemented by six special conditions:

- promoting the competitiveness of European industry sector while maintaining R&D support by the Community at pre-competitive stages;
- helping to solve problems by developing standards for the Common Market, thus ensuring a research base for the adoption of legislation;
- focus of plants and factories on transnational initiatives;
- introduction of the European aspect in the training of personnel involved in research and technological development;
- strengthening economic and social cohesion while ensuring the leading positions of research projects;
- due consideration to the need to preserve the environment and life quality<sup>22</sup>.

The amendment introduced by the Treaty on European Union in 1993 enabled to include in the framework programs all topics of interest to the integration community.

The priorities of the Fourth Framework Program (1994-1998) were also defined by an accurate number of criteria<sup>23</sup> according to which Community complementary funding was directed to large-scale research that was beyond the scope of individual countries; joint international research, which has obvious advantages, even taking into account the additional costs of international cooperation; complementary large-scale research; research that contributes to the formation of the EU Common Market and the introduction of common norms and standards; research that contributes to the economic and social cohesion of the Community and its harmonious development; projects that contribute to the encourage or improvement of European scientific and technological

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<sup>20</sup> *Andrée D.* Priority-setting in the European Research Framework Programmes. Stockholm: VinnoVA — Swedish Governmental Agency for innovation Systems, 2009. P. 18.

<sup>21</sup> Concerning the framework programme for Community activities in the field of research and technological development (1987 to 1991): Decision of the Council of the European Communities № 87/516/Euratom, EEC of 28.09.1987. *Official Journal of the European Union*. 1987. № L302 (24.10.1987). P. 1—23.

<sup>22</sup> Concerning the Framework Programme of Community Activities in the Field of Research and Technological Development (1990 to 1994): Decision of the Council of the European Communities № 90/221/Euratom, EEC of 23 April 1990. *Official Journal*. 1990. № L117 (08.05.1990). P. 32.

<sup>23</sup> Concerning the fourth framework programme of the European Community activities in the field of research and technological development and demonstration : Decision of the European Parliament and Council of the European Community № 1110/94/EC of 26 April 1994. *Official Journal of the European Union*. 1994. № L126 (1994). P. 5.

capacity, improve the coordination of national scientific and technical programs between the national and Community levels, as well as between the EU and foreign partners. It was further stated that the selected projects should contribute to the achievement of the common goals of the Community, in particular the sustainable development and improvement of the living standards of citizens.

The Fifth Framework Program (1998-2002) has already fixed three groups of project support criteria: the Community "value-added" criteria and subsidiarity (accumulation of a "critical mass" of human and financial capital through complementary knowledge and resources of member states; contribution to the implementation of Community policies; resolving issues at the Community level, or issues of standardization, or issues of developing the European area); criteria related to social goals (increasing employment; improving the quality of life and health; nature conservation); criteria for economic development and STP (sectors that grow and provide the basis for economic growth; sectors in which EU companies can and should increase competitiveness; areas with great scientific prospects)<sup>24</sup>.

The period of implementation of the first five framework programs (1984-2002) was quite homogeneous, as they were limited to providing additional to national programs sources of funding for international research projects. At the same time, there were no official instruments for the interaction of supranational EU institutions with national regulatory institutions in the field of science and innovation development. However, despite the lack of coordination between the national and supranational levels, these programs have had a significant and sometimes decisive impact (in particular in small European countries) on the technological development of individual sectors (primarily the pharmaceutical industry and the health care system). The structure of the framework programs was predominantly "topic"-based, except the fifth program, which reflected political (growth, life quality, human potential, etc.) rather than technological priorities combined with "key measures". Another reason for the sharp decrease in the number of FP5 topic-based priorities compared to FP4 was the EU Commission's efforts to improve the program management system. However, the regular reduction in the number of areas in practice did not significantly change the situation, as they were detailed on numerous topic-oriented research priorities.

In general, it can be stated that the topic-based structure of the framework programs has been very stable at the project level

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<sup>24</sup> Concerning the fifth framework programme of the European Community for research, technological development and demonstration activities (1998 to 2002) : Decision of the European Parliament and Council of the European Communities № 182/1999/EC of 22 December 1998. *Official Journal*. 1999. № L26 (01.02.1999). P. 7.

throughout the study period, despite the fact that the regular names of the subprograms or the main directions of the framework programs have changed significantly.

### **Transformation of the strategy of innovation and technological development of the EU**

At the beginning of the new millennium (at the European Council Summit in Lisbon, 2000) there was a radical revision of the strategy for the development of the integration group: the Summit adopted the economic strategy until 2010, based on the concept of increasing the European Union's international competitiveness and aimed at "introduction the most competitive and dynamic, knowledge-based economy, which tends to stable economic growth, with more high quality places of employment and social cohesion"<sup>25</sup>. One of the key priorities of the strategy was the formation of a common European area of research and innovation. The European Council Summit in Barcelona (2002) fixed the need to increase overall research spending from 1.9 to 3 percent of total EU's GDP by 2010. At the same time, private investment in the research work was to guarantee 2/3 of the increase in total spending on science.

Thus, the fundamental basis for the formation of the third stage in the evolution of EU science and technology policy was the concept of a single European Research Area (ERA), launched in 2000 as part of the EU's Lisbon Strategy for Competitive Development (2000-2010)<sup>26</sup>. Financial and organizational support for the initiative control was provided within the framework of the Sixth (2002-2006) and Seventh (2007-2013) Framework Programs for the development of scientific research and technology. The implementation of the principles and instruments of ERA operation remains the central focus segment at the current stage of implementation of the EU innovation policy with the following tasks:

- introduction of a single EU internal market for research, which ensures the unimpeded cross-border movement of scientists, knowledge and technology;
- introduction of a multilevel system of research management on the basis of enhanced interaction between supranational, national and regional levels of implementation of science and technology policy;

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<sup>25</sup> European Parliament. "Presidency Conclusions, Lisbon European Council, 23 and 24 March 2000". Luxembourg, 2000. [http://www.europarl.europa.eu/summits/lis1\\_en.htm](http://www.europarl.europa.eu/summits/lis1_en.htm).

<sup>26</sup> The Lisbon Strategy 2000 — 2010 An analysis and evaluation of the methods used and results achieved / R. Rodriguez, J. Warmerdam, C. E. Triomphe et. al. Brussels: European Parliament, 2010.

- implementation of framework programs and other tools to support research at EU level.

The key task of the ERA initiative was to prevent the fragmentation of research in the EU by optimizing its structure and eliminating duplication. For these reasons, the Sixth Framework Program has significantly expanded the tools of science integration, which now includes integrated projects (Integrated Projects), networks of cutting-edge innovation centers (Networks of Excellence), ERA-NET (European Research Area Network), an open method of coordination of technology policies of the member states (Open method of coordination – OMC), etc.

A good example of the integration of science of the European countries is the *ERA-NET*<sup>27</sup>, European Research Area Network – a project that promotes cooperation and coordination of research in the EU. The mission of the network is to ensure the best coherence and coordination of research programs within the European Research Area, as well as promoting the joint implementation of large-scale projects of scientific and technological development of the member states of the network. This network brings together national governments, financial institutions and research organizations by funding and coordinating of research networks at the national and regional levels, facilitating mutual access to national research programs, and providing tender notices for international science and technology projects, etc.

### **Introducing the foundations of a common EU research area**

The Sixth Framework Program launched the measures to introduce the foundations of a common EU research area at the level of supranational policy under a separate expenditure item. The Program used the open method of coordination, which introduced monitoring of the progress of member states in the process of achieving 3 percent of GDP for R&D expenditures. In the following framework programs, the EU's involvement in science and technology sector at both the program and political levels gradually expanded. Thus, the Seventh Framework Program (2007-2013) aimed to integrate the concept of ERA with other areas of EU supranational policy by promoting the formation of a knowledge-based society. Within this Program introduced the following four special subprograms<sup>28</sup>:

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<sup>27</sup> European Commission. “ERA-NETs”. Brussels, 2015. URL: [https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/era-net\\_en.htm](https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/era-net_en.htm).

<sup>28</sup> Concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013) : Decision of the European Parliament and Council of the European Communities № 1982/2006/EC of 18 December 2006. *Official Journal of the European Union*. 2006. №L 412/1 (30.12.2006). P. 5.

- "Cooperation", focused on stimulating scientific and technical cooperation between higher education institutions, industry sector, research centers and government agencies of EU member states and around the world;

- "Ideas", which aimed at triggering of creative European research conducted by individual groups of scientists, with the support of the latest developments in science, technology, engineering, social&economic and humanitarian fields;

- "People", which aims to promote the development of human potential for European research by supporting training programs, flexible approach of scientific and technical personnel and increasing the attractiveness of the scientist trade;

- "Capacity", which was created to improve research and innovation competencies within the EU by promoting the development of innovation infrastructure, knowledge-intensive clusters, research potential of regions, innovative SMEs, introduction of international science and technology policy.

In the budget of the Seventh Framework Program, the major allocations are budgeted to "Cooperation" sub-program (EUR 32.4 billion), EUR 7.5 billion – to "Ideas" program, EUR 4.7 billion – to "People" program, and EUR 4.1 billion – to "Capacity" program. Moreover, EUR 1.7 billion was allocated to the non-nuclear activities of the Joint Research Center.

In addition to the increased budget, the Seventh Framework Program also expanded the tools for integrating European science, which introduced Joint Technology Initiatives, European Technology Platforms, European Research Council, and ERA-NET PLUS Initiative. The program was mainly aimed at the convergence of science and technology policies at the level of the EU and national governments, therefore its basic tools were large-scale diversified cooperation measures, including:

- joint technological initiatives in such areas as innovative medicine, nanoelectronics, embedded systems, aeronautics, air traffic management, hydrogen and fuel cells, global environmental safety monitoring;

- European technological platforms, the research topics of which were fixed in cooperation with industry representatives;

- joint implementation of national research programs;

- development of pan-European infrastructure of research and innovation activities.

In 2010, the "Europe 2020" strategy launched "Innovation Union", the flagship initiative, which structurally included over thirty comprehensive measures to improve conditions and increase access to funding for research and innovation in Europe. This initiative is central to the implementation of "Europe 2020", the current EU strategy, as it

introduces the basis for the active transformation of innovative ideas into new goods and services, which contributes to economic growth and new places of employment. The "Innovation Union" flagship initiative aims to refocus research and innovation policy to address the following key challenges to European society: energy security, transport, climate change and resource efficiency, health, aging, environmentally friendly production methods, land resources management, while ensuring the transformation of innovative ideas into new products and services, the production of which contributes to the employment creation<sup>29</sup>.

### **Diversification of current innovation policy in the EU integration area**

The imperative to increase the competitiveness of European industry sector fuels the need in further diversification of tools and instruments for the implementation of current innovation and technology policy, which is no longer limited to basic research, but to a greater extent considers the needs of industry. In particular, the budget of the Seventh Framework Program has already significantly increased funding of innovation practices of SMEs by research centers and higher education institutions. Also, in parallel with the Seventh Framework Program, the Competitiveness and Innovation Framework Program was introduced in the same period (2007-2013), an innovation policy tool focused on the commercialization of new technologies. The Competitiveness and Innovation Framework Program fixed three priorities (promoting the growth of international competitiveness of European companies; development of information society; promoting the use of renewable energy sources and improving energy efficiency), each of which was implemented in a special subprogram with an appropriate budget estimate (Fig. 2).

The first area takes the form of a special Entrepreneurship and Innovation Programme, accumulating 60 percent of the total program budget, or EUR 2.17 billion. This area introduced such tasks as improving the access of small and medium enterprises to funding by forwarding venture investment instruments and credit guarantees to this sector; promoting entrepreneurship and innovation; development of a network of regional centers for business development and innovation; support for environmental innovation (EUR 430 million allocated specifically for this sub-priority); support for national policies aimed at promoting entrepreneurship and innovation.

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<sup>29</sup> European Commission. "Europe 2020: A strategy for smart, sustainable and inclusive growth: Communication from the European Commission № COM (2010) 2020 of 3.3.2010". Brussels, 2010. URL: <http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf>.

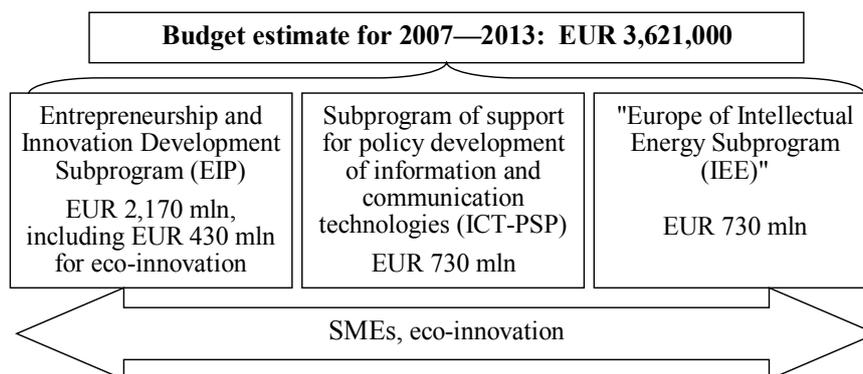


Fig. 2. Structure of Competitiveness and Innovation Framework Program (2007 – 2013)

Source:<sup>30</sup>

The special program for the development of entrepreneurship and innovation is implemented using four types of tools, namely:

- financial instruments: venture investments, credit guarantees, Business Innovation Support Scheme, High Growth and Innovative SMEs facility;
- organizational and advisory support for business development;
- promoting the development of innovative projects – clusters, technology transfer networks, innovation infrastructure, etc.;
- analysis, development and coordination of national innovative business policies.

The financial facility for providing funds is multilevel (Fig. 3): EU budget funds are accumulated in the European Investment Fund, which distributes them among financial intermediaries – banks, venture funds and guarantee companies.

To gain access to the program's funds, SMEs address the banks for medium- and long-term loans, as well as to venture funds, which provide funds in the form of investments in innovative projects on the basis of equity participation. To receive funds from the European Investment Fund (EIF), a company must apply to an accredited financial intermediary and monitor the criteria for participation in the programs and the application procedure. The EIF acts as a catalyst in the process of creating investment funds, as the fund attracts other investors; this allows venture funds to accumulate the critical amount of capital needed to start their activities.

<sup>30</sup> Developed by the authors based on: Competitiveness and Innovation Framework Programme (CIP) 2007-2013. European Commission: Web-site. — Text data. — European Commission, 2005-2016. — URL: [http://ec.europa.eu/cip/index\\_en.htm](http://ec.europa.eu/cip/index_en.htm). — (Last update: 03/09/2015). — Title from the screen.

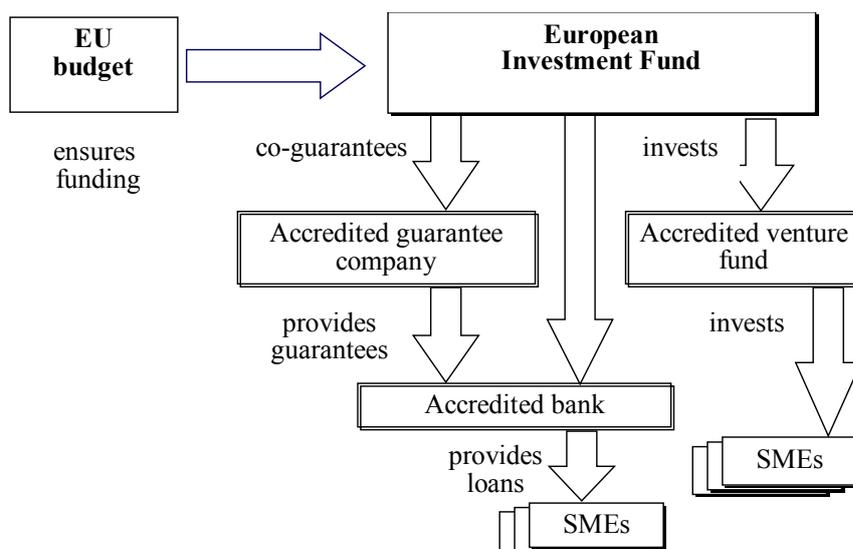


Fig. 3. Financial facility of Competitiveness and Innovation Framework Program (2007 – 2013)

Source:<sup>31</sup>

The Program of Entrepreneurship and Innovation Development is particularly aimed to support the ecological innovations, the priority areas of which are reduction of environmental pollution and resource use through the introduction of new production and management technologies that cut down the costs and decrease negative impact on the environment; promoting the development of new goods and services that do not pose a threat to nature, and supporting the development of relevant markets; voluntary initiatives on eco-innovation clusters and networks.

It is also worth noting that the EU structural funds played an important role in financing the development of innovative small and medium-sized enterprises within the scheduled financial period from 2007 to 2013 in the implementation of common regional and cohesion policy measures. The European Regional Development Fund has strongly funded many initiatives to support SMEs innovation practices, including:

- direct subsidies to support SMEs that provide sustainable employment in the region;

<sup>31</sup> Developed by the authors based in: Entrepreneurship and Innovation Programme (EIP). European Commission: Web-site. — Text data. — Brussels, 2006. — URL: [http://ec.europa.eu/cip/eip/index\\_en.htm](http://ec.europa.eu/cip/eip/index_en.htm)

- measures to support regional and local development, in particular supporting services for the development of enterprises, especially SMEs;
- assistance for R&D, especially for SMEs, and for technology transfer, development of cooperation links between SMEs, promotion of entrepreneurship and innovation practice through financial engineering tools;
- assistance to SMEs in the field of adaptation and effective use of ICT and commercialization of innovative ideas;
- helping SMEs to implement cost-effective natural resource management systems and technologies that reduce environmental pollution.

### **New "horizons" of innovation and technological development in Europe**

The latest phase in the development of innovation policy of the integration community is represented primarily by "Horizon 2020" (2014-2020) and "Horizon Europe" (2021-2027), the EU's Eighth and Ninth Framework Programs for the development of science and technology, which received unprecedented funding of EUR 78 billion and EUR 96.9 billion respectively (with due consideration to the lack of a recent UK contribution due to its withdrawal from the EU). In addition, the above-mentioned allocations, due to the multiplier effect resulted from the complementarity principle embedded in the financial practices of the Framework Programs, are expected to lead to an equivalent increase in private investment in research and innovation projects in the EU and associated countries<sup>32</sup>.

The mission of "Horizon 2020" was to develop the world's leading knowledge-based and innovation-based economy, making a significant contribution to the sustainable development of the community, while continuing the implementation of the European Research Area. The Framework Program tends to the significant strengthening of the complementarity of innovation policy tools with other supranational EU policies, as well as with national and regional regulatory initiatives. The key pillar was "Europe 2020", the comprehensive integration strategy, the implementation of strategic guidelines of which involved almost all instruments of "Horizon 2020".

The priorities of the Program include the development of an advanced research system and the introduction of competitive advantages of European science at the global level (subprogram

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<sup>32</sup> *Moussis N.* Access to European Union: law, economics, policies . Antwerpen: Intersentia, 2013. URL: [http://europa.europa.eu/books/Book\\_2/6/18/02/04/?all=1](http://europa.europa.eu/books/Book_2/6/18/02/04/?all=1).

estimated at EUR 24.4 million)<sup>33</sup>; ensuring the industrial leadership of EU member states by supporting business in the implementation of innovative projects (EUR 17 billion); substantiation of ways to overcome the key challenges to European society, identified in "Europe 2020" strategy with the support of all stages of the innovation process — from basic research to the introduction of innovative products and technologies (Fig. 4).

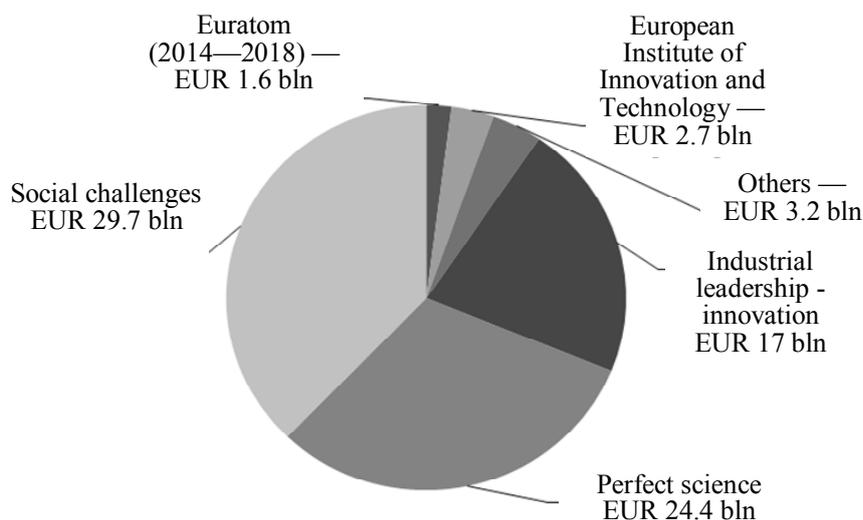


Fig. 4. Budget of "Horizon 2020", the EU Framework Program for Research and Technology Development (2014–2020)

Source:<sup>34</sup>

The European Atomic Energy Research and Development Program within 2014-2018 is a complement to "Horizon 2020", which aims to promote the development of nuclear research and training systems in this area, focusing on the continuous improvement of nuclear systems, security, protection of nuclear facilities, radiation protection, as well as the development of ways to decarbonize energy systems within the long term period in an efficient and safe way<sup>35</sup>. The budget of the program is

<sup>33</sup> *The European Union explained: Research and Innovation*. Luxembourg: Publications Office of the European Union, 2014. P. 6.

<sup>34</sup> Developed by the authors based on: On the Research and Training Programme of the European Atomic Energy Community (2014-2018) complementing the Horizon 2020 Framework Programme for Research and Innovation: Regulation of the Council of the European Union (Euratom) of 16 December 2013 № 1314/2013. *Official Journal*. — 2013. — No. L 347 (20.12.2013). — P. 948-964.

<sup>35</sup> On the Research and Training Programme of the European Atomic Energy Community (2014-2018) complementing the Horizon 2020 Framework Programme for Research and Innovation: Regulation of the Council of the European Union (Euratom) of 16 December 2013 № 1314/2013. *Official Journal*. 2013. № L 347 (20.12.2013). P. 948-964.

EUR 1.6 billion, while the structure of its distribution between the selected priorities is as follows:

- EUR 728 million have been allocated for indirect measures within the program for the development of research and pilot projects in the field of nuclear fusion;
- indirect measures to develop research and pilot projects in the field of nuclear fission, safety and radiation protection – EUR 315.5 million;
- direct measures (JRC operation) – EUR 559.5 million.

The further diversification of the EU innovation policy tools, as well as the approval of the European Research Area is evidenced by the institutional management model of the "Horizon 2020" Framework Program, which includes four key institutions: Research Executive Agency (REA); European Research Council (ERC); Executive Agency for Small & Medium-sized Enterprises (EASME); Innovation and Networks Executive Agency (INEA). In addition to its own institutional structure, the coordination of project activities under "Horizon 2020" is complemented by the functions of the EU Joint Research Center<sup>36</sup>, which focuses on the priorities of EU supranational policies and the social challenges they address. At the current stage, the conceptual basis of the JRC is "Europe 2020" strategy, as well as "Security and Citizenship" and "Global Europe" projects within the EU Multiannual Financial Framework Program for 2014-2020<sup>37</sup>.

The latest "Horizon Europe" Framework Program, approved by the EU within 2021-2027, has a budget of EUR 95.5 billion, distributed between four main sub-programs and fifteen expenditure items to cover all areas of research and innovation, namely: "Excellent Science", "Global Challenges and Competitiveness of European Industry", "Innovative Europe" and "Strengthening the European Research Area" (Table 1)<sup>38</sup>. The Program also addresses the pressing challenges of overcoming the effects of the COVID crisis: EUR € 5.4 billion is allocated for recovery of the eco-industry and the ICT sector under the EU's "Next Generation EU instrument".

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<sup>36</sup> *Moussis N.* Access to European Union: law, economics, policies . Antwerpen: Intersentia, 2013. URL: [http://europedia.moussis.eu/books/Book\\_2/6/18/02/04/?all=1](http://europedia.moussis.eu/books/Book_2/6/18/02/04/?all=1).

<sup>37</sup> Laying down the multiannual financial framework for the years 2014-2020: Regulation of the Council of the European Union (EU, EURATOM) №1311/2013 of 2 December 2013. *Official Journal*. 2013. № L347 (20.12.2013). P. 884—891.

<sup>38</sup> European Union. "Horizon Europe". Luxembourg, Luxembourg: Publications Office of the European Union, 2021. URL: [https://ec.europa.eu/info/sites/default/files/research\\_and\\_innovation/funding/documents/ec\\_rtd\\_horizon-europe-overview.pdf](https://ec.europa.eu/info/sites/default/files/research_and_innovation/funding/documents/ec_rtd_horizon-europe-overview.pdf)

Table 1

**THE BUDGET STRUCTURE OF THE "HORIZON EUROPE", THE EU FRAMEWORK PROGRAM FOR RESEARCH AND INNOVATION, FOR 2021-2027**

<b>Range of expenses</b>	<b>Allocations, mln euros</b>
"Excellent Science", inclusive	25,011
"European Research Council"	16,004
Measures under the Marie Curie Program	6,602
Development of research infrastructure	2,406
"Global Challenges and Competitiveness of European Industry", inclusive	53,516
Healthcare	8,246
Culture, creativity and an inclusive society	2,280
Public safety for society	1,596
Digitalization, industry sector and space	15,349
Climate, energy and mobility	15,123
Food, bio-economy, natural resources, agriculture and environment	8,952
Non-nuclear direct actions of the Joint Research Center	1,970
"Innovative Europe", inclusive	13,597
European Innovation Council	10,105
European innovation ecosystems	527
European Institute of Innovation and Technology	2,965
"Strengthening the European Research Area", inclusive	3,393
Involvement of stakeholders and experience exchange	2,955
Reforming and improving the European research and innovation system	438
<b>TOTAL</b>	<b>95,517</b>

*Source.*<sup>39</sup>

The financial capacity of the "Horizon Europe" Framework Program (2021-2027) is complemented by the budget of the Euratom Research Program for 2021-2025 of EUR 1.4 billion. The Euratom Program will fund research and educational practice in the field of nuclear research with a focus on the continuous improvement of nuclear safety and radiation protection. This program will also contribute to the goals of

<sup>39</sup> Developed by the authors based on: The European Union explained: Research and Innovation. — Luxembourg: Publications Office of the European Union, 2014.

"Horizon Europe". Thus, EUR 96.9 billion budget of both complementary programs is 30 percent higher than the budget of the previous "Horizon 2020" Framework Program less the share of UK beneficiaries in this program. The increased allocations on science and innovation in the EU budget shows a broad consensus among member states on the key role of research and innovation in greening, the digital transformation of the EU economy, and ensuring the integration community's readiness to overcome future crises.

The "Horizon Europe" financial regulations fixes a number of criteria and restrictions on the use of its budget, namely:

- at least 35 percent of the program budget is spent on tackling climate change;
- 70 percent of the budget of the European Innovation Council is spent on projects of small and medium enterprises;
- at least 3.3 percent of the program's allocations are aimed to measures to increase the participation of various stakeholders in the EU's research work and to exchange best practices;
- the program will support investments in "European Partnerships" (up to 50 percent of the budget of the "Global Challenges and Competitiveness of European Industry"), which are a form of cooperation with member state governments and business representatives to support individual research programs (up to 10 percent of the budget under the above segment for the first three years);
- the program budget includes a significant increase in spending on research and innovation in the field of ICT compared to the "Horizon 2020" Program;
- the amount of allocations for space exploration should be comparable to those allocated in the "Horizon 2020" Program;
- the participation of representatives of industry sector in the program should be maintained at the level not less than that provided by the budget of the "Horizon 2020" Program.

### **Conclusions**

The European Union's innovation policy has faced a long period of evolution – from cooperation within the large-scale international cooperative basic research projects, support for the development of strategic technologies for priority industrial sectors to the systemic field of structural model of innovation policy focused on the comprehensive promotion of continuous generation and commercialization of new technologies, infrastructure improvement of research and innovation segments, the development of collaborative platforms to attract stakeholders to the implementation of high-tech projects with a clear

division of goals and coordination of efforts at the supranational, national and regional levels of its implementation.

The constant increase of financial support for EU scientific and innovative development, diversification of institutional tools to support innovation, expanding the range of subjects of technological cooperation contribute to strengthening the common European research area, which leads to the introduction of unique competitive advantages of the integration community. The open model of the EU innovation practice introduces favorable opportunities for triggering of innovative development of economy of Ukraine, and effective positioning of domestic innovative companies in the international chains of high-tech business.

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