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Higher Education Innovatics: The Role of Innovative Environment in Transformation of the Sphere of Higher Education and Science

Innovative transformations in the field of higher education and science, as a rule, take place within the framework of an innovation policy determined by the leaders of this field. It should be noted that innovation policy in the field of higher education is the link between the policy of research and scientific (scientific and technical) activities, the search and dissemination of knowledge, education and training of qualified specialists in the field of technological development, industrial policy, and environmental policy.

Innovation policy in the field of higher education and science is one of the main components of the state socio-economic policy of social development and is aimed at creating favorable conditions for bringing new ideas created in this area to the market.

The article is devoted to the further development of the theoretical foundations of innovation in higher education. The main issues of the organizational theory of innovation in higher education are considered; national and international components of innovation in the field of higher education and science, as an open educational, scientific and cultural system; orientation and influence of innovation processes in the field of higher education and science on objects and subjects of innovative transformations; the most important tasks of the state in the management of innovative activities in the field of higher education and science; activities promoted by innovators in higher education; innovative environment.

The main directions of the innovative policy of the entrepreneurial university and innovative relations in the field of higher education and science are studied.

The problems of compulsory or emergency distance learning are also analyzed.

Keywords: higher education innovatics, innovative policy, innovative environment, management of innovation activities.

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1. Introduction

During this study, a large amount of useful information was obtained about the positive impact of academic capitalism on the social-economic and social-humanitarian spheres of human activity. Analyzing the impact of academic capitalism on the development of academic or university entrepreneurship and further promoting the spread of innovation in higher education and science, the authors proposed to create and introduce a new scientific and applied field, namely: higher education innovatics [1–2]. The idea of creating this new scientific and applied field is based on the following task: “higher education innovation is designed to systematize a comprehensive study of innovative changes in higher education and science to further disseminate them in higher education and science systems of different countries.”

Let us consider some publications that contain the fundamental foundations of the theory of academic capitalism, the theory of innovation, innovation management, academic or university entrepreneurship, innovation activity, innovation policy, and innovative environment — the main factors of innovative management in higher education and science innovative transformation. These works formed the basis of the theory and practice of the multidisciplinary direction of higher education innovatics. Within the framework of higher education innovatics, the authors will consider the types, varieties and direction of innovative (transformational) changes in the field of higher education and science. The main goal of all such changes is to build an innovative model of the higher education and science system aimed at creating a knowledge society.

According to S. Slaughter and L. Leslie [3], the essence of “academic capitalism” is the transformation of scientific and teaching activities into a kind of entrepreneurship: the implementation of research projects is directly dependent on the receipt of

cash subsidies from individual corporations: “Academic capitalism deals with market and market-like behaviors on the part of universities and faculty” [3, p. 21]. Within the framework of “academic capitalism”, the activities of research institutes and centers within the university structure are aimed at increasing the potential for public application of knowledge. The authors give the following interpretation of definition of academic capitalism: “To maintain or expand resources, faculty increasingly had to compete for external dollars that were tied to market-related research, which was referred to variously as applied, commercial, strategic and targeted research, whether these monies were in the form of research grants and contracts, service contracts, partnerships with industry and government, technology transfer, or the recruitment of more and higher fees-paying students. We call institutional and professorial market or market-like efforts to secure external monies academic capitalism” [3, p. 17]. Note that the term “academic capitalism” was first introduced by E. J. Hackett [4] to denote important structural changes in science.

“Academic capitalism” sets new directions for the development of modern higher education and manifests itself on three levels: institutional, departmental, individual. Academic capitalism at the institutional level is realized against the background of changes in the funding of higher education institutions, the reduction of public funding and the need to find sources of additional funds. The study of academic capitalism at the departmental level is of interest because it is here that various activities are carried out, employees adapt to new values. At the individual level, within the framework of academic capitalism, there is a revision of the distribution of time between the main activities of the teaching staff: teaching, research, services [5].

In its essence, the environment of academic capitalism, which has covered the sphere of higher education and science (as well as all other social, public

and humanitarian spheres of human activity) with market and market-like relations, is also a new phenomenon in the general system of capitalism. It was in the environment of academic capitalism that the powerful innovative development of both the socio-humanitarian and industrial spheres of human activity began. Accelerated innovation has spawned the digital revolution and has become an objective reality for today's globalized world.

The complete description of innovation processes was done by J. Schumpeter: he analyzed the “new combinations” of changes in the development of economic systems. He added a definition of innovation as “new combinations” of new or existing knowledge, resources, equipment and so on [6, p. 65]. Also, he underlined that innovation needs to be distinguished from invention: he saw innovation as a specific social activity (function) carried out within the economic sphere and with a commercial purpose, while inventions in principle can be carried out everywhere and without any intent of commercialization. For Schumpeter innovations are novel combinations of knowledge, resources etc. subject to attempts at commercialization (or carried out in practice). This “combinatory” activity he labeled “the entrepreneurial function” and the social agents fulfilling this function “entrepreneurs” [7, p. 21]. Also, Schumpeter [8] and Mensch [9] introduced the term “innovation” into scientific circulation, which was defined as the embodiment of a scientific discovery in a new technology or product.

Surveys of the literature on innovation have found a great number of variety of definitions. Thus, in 2009, Baregheh et al. found around 60 definitions in different scientific papers [10, p. 1325], while a 2014 survey found 41 [11, p. 1394]. Based on their survey, Baragheh et al. attempted to define a multidisciplinary definition and arrived at the following definition:

“Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate

themselves successfully in their marketplace" [10, p. 1394].

In an industrial survey as to how the software industry defined innovation, the following definition, given in 2010 by Crossan and Apaydin and built on the Organization for Economic Co-operation and Development (OECD) manual's definition, was considered to be the most complete:

"Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and the establishment of new management systems. It is both a process and an outcome" [11, p. 1400–1401].

Two main dimensions of innovation were degree of [novelty] (i.e. whether an innovation is new to the firm, new to the market, new to the industry, or new to the world) and types of innovation (i.e. whether it is product, process, market or organizational innovation) (ibid, pp. 1394–1395).

Well-known and influential scholar Everett Rogers offered the following description of an innovation: "An innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption" [12, p. 12].

Peter Drucker defined the essence of innovation as follows:

"Innovation is the specific function of entrepreneurship, whether in an existing business, a public service institution, or a new venture started by a lone individual in the family kitchen. It is the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating wealth" [13].

Theoretical foundations of innovation, innovative development and innovation management, include a global study of innovation management 2006–2016 given in the book [14], in an article [15] and the papers of Bouwer [16–17].

In the comprehensive book Dampour [18] synthesizes research from the past 50 years of innovation studies, addressing the main elements of innovation and providing a connected perspective on innovation within organizations. The author provides an overview of key concepts, terms and theory, explores the generation and adoption processes of technological and nontechnological innovations, and examines innovation activity and internal mechanisms and procedures in organizations.

This research is based on the following conceptual foundations of innovative development of higher education:

- H. Etzkowitz's concept of innovative development of society by the "triple helix" model [19–24], which is successfully used in many developed countries (USA, UK, Canada, Australia, Japan, Germany, Sweden and many other countries of the EU) and in the developing world (China, Russia, Brazil, some other South American countries, etc.);
- B. Clark's concept of transformational changes of conventional universities into innovative universities focused on in-house entrepreneurial activities ("business universities") [25–27], which has been validated in higher education systems in many countries of different continents (North and South America, the United States of America, Western Europe, Japan, Africa).

The authors also paid great attention to the problems of innovation of:

- governmental strategies and innovation in higher education [28];
- fostering innovation in higher education [29];
- real opportunity to commercialize R&D results emerged, leading to rapid development of university and academic science and technology [30];

- global innovation of teaching and learning in higher education [31];
- conceptualizing innovation in higher education [32];
- teaching practices and pedagogical innovations [33];
- roles of innovation in education delivery [34], etc.

For more than 50 years the sphere of higher education and science has been subject to various innovative changes, the direction of which depends on the goals set by the innovators. Since almost all areas of social, economic, and public-humanitarian activities of mankind are connected with the sphere of higher education and science, it is advisable to investigate, identify, and group innovations according to the areas of application and the tasks assigned to them.

To systematize and comprehensively study the theory and practice of innovation in the field of higher education and science, the authors of this article have developed and proposed a new scientific and applied multidisciplinary direction — "higher education innovatics" [1–2].

1.1. Relevance of the topic

Higher education plays a crucial role in the development of human society, both historically and in modern conditions. The integrated role of universities in the period of globalization is presented in the publication [35]. Universities are the engines of socio-economic development of societies and their national institutions. They play a central scientific role in society, in the multiplication, preservation and dissemination of knowledge, and are defined as intellectual centers and international organizations. It is the universities that must ensure the accessibility of higher education and the fair provision of educational services to all layers of the population. Universities should both solve the problems of general education and develop economic science and academic (university) entrepreneurship. They must realize their historical prospects

for the further development and improvement of humanity. Therefore, the broad and purposeful introduction of innovations, best practices, techniques and technologies in the field of higher education and science should ensure the implementation of the integrated role of universities in the period of globalization.

Building a knowledge society with an innovation-oriented type of economy in any country requires fundamental reform of its socio-economic and humanitarian spheres, innovative development of the system of higher education, science and scientific and technical activities. At the same time, a reasonable combination of the best foreign experience with national traditions is necessary. The priority of the state policy of innovative development of higher education requires the early introduction of innovative entrepreneurship of various types and organizational and legal forms. At the same time, the basis of economic reform and the main lever in the new model of the economy is the activation of all types of entrepreneurship, including innovative academic or university entrepreneurship, as an integral socio-economic process. Accelerated creation, development and implementation of innovations in higher education and science, promotion of innovative methods, technologies, and innovative entrepreneurship is especially important in the period of search for new economic models and strategies that will contribute to the accelerated development of the social and economic system. In this regard, it is necessary to study and develop the theory of innovation in higher education, to determine the types and directions of innovations for the early implementation in this area.

1.2. Statement of the problem

The interdisciplinary scientific-applied direction in the field of higher education and science — “higher education innovatics” study, systematize and further disseminate

innovative transformations of subjects of higher education and science in the conditions of academic capitalism. The spread of market mechanisms in all spheres of socio-economic and humanitarian activities of mankind, the appearance of the phenomenon of academic entrepreneurship, commercialization of knowledge and R&D need to develop and scientifically substantiate the theory and practice of innovative development of higher education and science. It is necessary to contribute to the practical implementation of innovative changes, to find, investigate, and implement appropriate directions, ways and mechanisms of innovative transformation of the higher education sector in general, and its subjects — of higher educational institutions, organizations and bodies related to higher education.

2. Analysis of recent studies and publications

Among the latest publications on innovations in higher education, the following works seem to be interesting.

In “Innovation in higher education; will there be a role for “the academe/university” in 2025?” Eddie Blass and Peter Hayward [36] presents five scenarios for the future of higher education underpinned by drivers of funding, the ownership and exploitation of ‘research’, the provision of good ‘teaching’, and the potential missing link of social innovation development. The authors emphasize that by refocusing on facilitating social innovation, the university can find a new means of adding value to society that will sustain its existence beyond 2025.

In his paper Dustin Swanger [37] explores the current state of higher education and the pressures facing colleges. He also explores innovation and some of the challenges to innovation in higher education, as well as

some of the successes. This paper will recommend some changes that can be implemented on any campus to improve outcomes and efficiencies.

The background report to the second Global Education Industry Summit, held in Jerusalem on 26–27 September 2016 [38], covers the available evidence on innovation in education, the impact of digital technologies on teaching and learning, and the role of digital skills and the education industries in the process of innovation, using data from OECD surveys. Innovation will be essential to bring about qualitative changes in education, as opposed to the quantitative expansion seen so far. These changes are needed to increase efficiency and improve the quality and equity of learning opportunities. Education can also foster innovation in society at large by developing the right skills to nurture it. These skills, including critical thinking, creativity and imagination, can be fostered through appropriate teaching, and practices such as entrepreneurship education. Governments should develop smart innovation strategies for education with the right policy mix to give meaning and purpose to innovation, including creating an innovation-friendly culture. Understanding the education industries better, including their market structures and innovation processes, would help to create a more mature relationship with the education sector. Innovation in the industry — which develops the products and services that could drive innovation in schools — does not happen in isolation from what is happening in the education sector. Only when there is an innovation-friendly culture in education systems, supported by an innovation-friendly business environment and policies, will industries start to engage in risk-intensive research and development. Governments can support this by fostering a climate of entrepreneurship and innovation in education.

The article of P. Serdyukov [39] is devoted to the problem of innovation in American higher education. Analyzing the publications of American ex-

perts in the field of higher education and innovation, studying the real state of affairs with the use of innovations in higher education institutions, he notes the following: "Unbundling is the process by which products previously sold together are separated into their component parts." In work [40], the author states that in higher education there is a dynamic separation of teaching and research. This dynamic separation was driven primarily by financial motivation and was driven by the commercial sector, but also had pedagogical motivation through an emphasis on personalization and employability. The article presents a theoretical analysis of the trend and proposes new conceptual tools with which to map regulatory implications.

The article [41] is devoted to the institutional innovation and some models of innovation in higher education. The author concludes that contemporary innovation research informs us of models and the nature of innovation and its basic facets:

- TAR model;
- a stakeholder model;
- the structural model;
- governance structured models and
- triple helix and quadruple helix innovation models.

In the book [42] the modern problems of pedagogical science and education are studied.

In their book Branch, et al. [43] are presenting primary examples of innovative teaching and learning practices in higher education. The book is truly international, containing contributions from Australia, Denmark, England, Hong Kong, Italy, Qatar, Scotland, South Africa, Tasmania, Vietnam, and USA. Although the educational contexts are very different across these countries, there appears to be a striking similarity in the approach to innovative teaching and learning.

The following works are devoted to a critical study of the problems of academic capitalism.

The increasing trend toward academic capitalism and profit-oriented entrepreneurial practices in the fields

of education and research is discussed in the work [44]. This occurs as universities, in different ways and subject to greater or lesser financial, administrative, and ideological pressures, act less like centers of disinterested education and research and more like economic enterprises that aim to maximize their revenues and/or advance the economic competitiveness of the spaces in which they operate.

The article [45] provides a definition of academic capitalism, presents an overview of the research literature, outlines the prospects for academic capitalism in the Americas, and discusses the implications of academic capitalism for Latin America. Estimates are given of what is useful in academic capitalism for Brazil.

In the work [46] the author: a) describes the most important features of academic capitalism and their impact on science, as well as on the evolution of scientific knowledge; b) notes that academic capitalism is located in the intersection of scientific research, economic profit maximization, and innovation policy; c) examines the institutional conflicts of interest associated with corporate research funding. He argues that academic capitalism is a unique hybrid that combines the scientific search for truth and the economic maximization of profit, and turns universities into enterprises competing for capital accumulation, and enterprises into knowledge producers looking for new discoveries that can be turned into patents and profitable goods.

The series of publications is devoted to the problems of organizing distance learning education process during the COVID-19 pandemic. For example, in works [47–50] the authors study the information, communication, organizational and pedagogical problems of organizing distance learning in periods of natural disasters and for-major conditions.

3. Purpose of the article

The main purpose of the article is to further develop the theory and prac-

tice of the interdisciplinary scientific and practical direction of "higher education innovatics", to determine the tasks, directions, and features of innovative transformations in the field of higher education and science. An important issue of the research is the effective organization of management in the field of innovative transformations, innovation policy, and innovation relations in the subjects of higher education and science — universities and research institutes.

As it is well-known, the issues of the theory of "pedagogical innovatics" [51–52] are studied at the Institute of Educational Innovations of the Russian Academy of Education at the Khutor-skoy Scientific School.

However, unlike pedagogical innovation, higher education innovation is the result of the development of academic capitalism and studies mainly both its market innovation processes that have spread to the field of higher education and their impact on the social-economic sphere of society. The authors consider the further development and dissemination of the theory and practice of innovative development of higher education institutions, formulated in the work [53], to be a very important task of the innovatics of higher education and science. No less important is the theory and practice of the development of innovative corporate culture in the subjects of higher education and science — universities and research institutes.

4. Research methods and methodology

The authors used such research methods as:

- dialectical approach to the analysis and understanding of the content and features of innovative development of higher education under the influence of market relations of academic capitalism and university entrepreneurship;
- analysis of innovative transformations as economic categories in the system of socio-economic relations

and relations of the integral economic system of the modern knowledge society;

- methods of abstraction, system-structural and information-theoretical approaches are used to study the conditions for the formation of new innovative forms of university entrepreneurship, the features and essence of university entrepreneurial activity;
- critical study of the impact of innovative transformations and academic entrepreneurship on the financial stability of higher educational institutions;
- methods of analysis and synthesis are used to study various innovative approaches and technologies in higher education and to form a holistic picture of the complex innovative activities of subjects, objects, and the higher education system as a whole.

The research methodology includes:

- methods of empirical research of innovations in the field of higher education, including: observation, experiment, comparison, measurement, and comparison;
- statistical methods of scientific description and study of various innovative phenomena in the system of higher education, allowing quantitative (numerical) expression;
- critical study and awareness of the concept of innovation in higher education;
- analysis of literary sources, including electronic and computer tools; comparison and verification of the feasibility or necessity of introducing various types of innovations, analysis of their effectiveness, and the possibility of spreading and implementing them to objects and subjects of the higher education system; forecasting ways to form new innovative approaches, methods, and technologies; integration of research results and formation of scientific-theoretical, methodological, and practical provisions of a new direction-innovation of higher education.

5. Presentation of the main research material

5.1. Innovative activity in the sphere of higher education and science

As higher education innovatics is a branch of knowledge aimed at studying, creating, explaining, and effectively implementing innovations in the sphere of higher education and science, the authors will consider the main results of their research of types of innovations in higher education and science and direction of their implementation as the practical use of innovatics theory and practice.

The core of higher education innovatics as a science is the general organizational theory of innovation with a focus on application in the sphere of higher education and science including academic or university entrepreneurial activities.

The object of research in the higher education innovatics is the process of conducting innovations in the sphere of higher education and science; the subject is the theoretical, methodological, and organizational bases for implementing this process; the product is a system of scientific and practical provisions that ensure the development, implementation, and support of innovations in the sphere of higher education and science, as well as their explanation and foresight.

The basic issues of organizational theory of higher education innovatics include (Fig. 1):

- classification of innovations in the sphere of higher education and science by their focus on the types of activity;
- classification of innovations by their type and model used;
- stating their goals;
- identification of conditions and methods of innovation;
- forecasting and planning;
- risk assessment;
- error prevention.

There are two general types of innovation: sustaining innovation or disruptive innovation [54].

Such models of innovations can be used: radical, incremental, architectural or modular [55].

Also, innovation can be used for profit generation (commercial) or for non-for-profit purpose: social, sustainable or green innovation and responsible innovation [56–57].

The organizational theory of higher education innovatics covers such groups of problems as:

- scientific (basic and applied);
- educational and pedagogical;
- managerial;
- technological;
- informational;
- legal;
- organizational;
- financial and economic;
- socio-psychological and cultural;
- personnel (HR).

The latter group is of particular importance and results in the basic principle of innovation. Innovations are formed and implemented by people (personnel). Therefore, the main actor in any innovation process is a person and the basic principle of higher education innovation can be formulated as follows: the effectiveness of the innovation process in the field of higher education is ensured by managers and participants in this process, their creative potential, energy, and talent. Since the innovation process in the field of higher education takes place at different levels, accordingly, managers and participants in this process should be persons who are endowed with appropriate official powers, as well as have the desire and internal strength to experiment, a vision of the problem and prospects, creativity, the courage to take responsibility for the development and implementation of changes, and other properties and character traits necessary for innovation. The ability to work in an ever-changing world is a necessary quality for both senior management personnel, as well as for specialists of all other management levels.

A very important reflection of the crucial importance of innovation in the field of higher education and science is the innovation policy, innovation

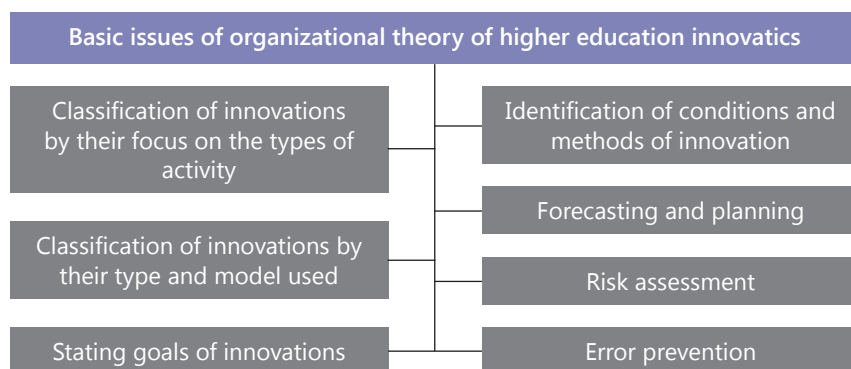


Fig. 1. The basic issues of organizational theory of higher education innovatics

relations, and innovation culture of the subjects of this field. This sphere includes all higher educational institutions, scientific institutes and organizations and legal entities involved in the educational and scientific sphere. The problems of innovation policy, innovation relations, and innovation culture of the subjects of higher education and science — universities, scientific (research) institutions and other organizations related to these areas, which find themselves in the conditions of academic capitalism, require further research. Also, in our opinion, a very important issue for further research is the formation of a corporate innovation culture of employees at all levels of higher education and science in the conditions of academic capitalism. In the future publications, the authors will consider the main provisions concerning innovation policy, innovation relations, and innovation culture of higher educational institutions on the example of innovation-oriented entrepreneurial universities.

Innovations in higher education and science, as an open educational, scientific and cultural system, should be classified according to their complexity, significance, and functional purpose. For example, large-scale innovations are aimed at improving the efficiency of higher education as an industry that is part of the socio-economic and public-humanitarian complex of the entire country. Innovations implemented at the regional level are medium-sized.

Individual innovations are carried out at the level of HEIs, scientific institutions and their individual divisions.

Taking into account the level of significance, it is advisable to distinguish international and national educational, scientific and cultural innovations that are aimed at services in the field of education, science, and culture by their scope of application (Fig. 2).

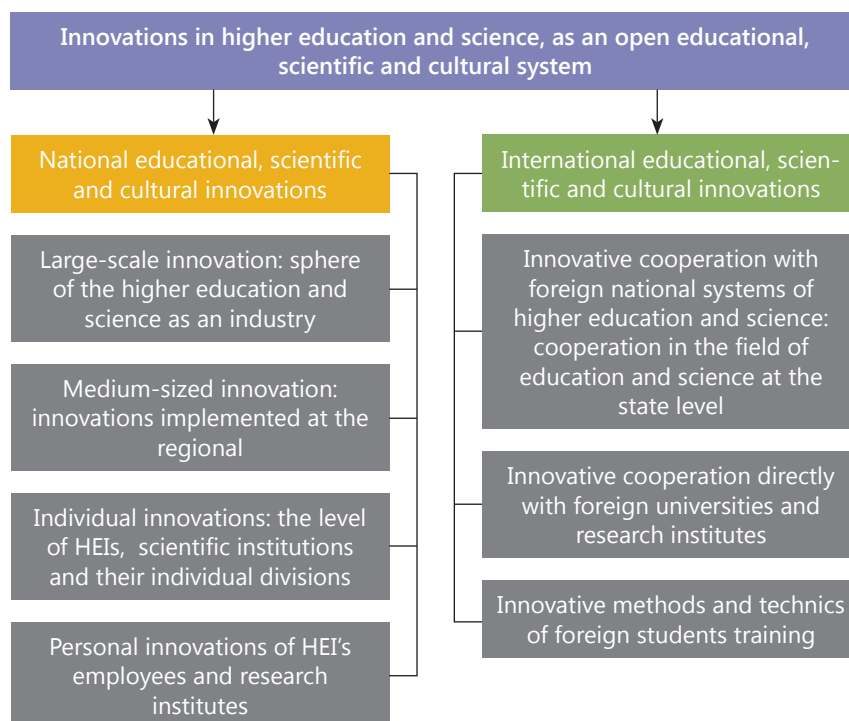


Fig. 2. National and international components of the innovations in the sphere of higher education and science, as an open educational, scientific and cultural system

The problem of innovation management in the field of higher education is not to optimally implement individual innovative projects, but to build structural-transformational innovative techniques and qualitative structures of new mechanisms, methods, and forms of activity. At the same time, the primary principle of the process of organizing innovation activities in the higher education system is the purposefulness and specificity of innovations. The goal system should have a well-built hierarchical structure.

Analysis of the direction and impact of innovation processes in the field of higher education and science on the objects and subjects of innovative transformations (Fig. 3, Fig. 4) certifies the necessity and importance of intensifying the processes of search and formation of new knowledge, identifying their scientific, technical, and applied significance for the further socio-economic development of society, science and technology.

That is, the development of mechanisms for effective search and further accelerated use of new knowledge is the core of innovative transformations both in society as a whole and in its individual branch — the system of higher education and science. In the field of higher education, new socio-economic mechanisms of innovation activity should certainly include university or academic entrepreneurship, the latest methods of accelerated transfer of technologies, the formation of start-up and spin-off business structures, and so on.

Innovative changes in the field of higher education and science occur at the state, industry, regional, and domestic (at the level of subjects of the higher education and science system) levels. State support is the foundation of innovation in the sphere of higher education and science. State administration of scientific, technical, and innovative activities in the sphere of higher education and science is an integral part of the country's socio-economic strategy. So, it should be carried out by means of:

- monitoring and analysis of the state of achievements of the world and national systems of higher education,

- science and technology, technologies, and innovations;
- development of an image of the future (expected) state of the higher education system, its provision with the necessary scientific, technical, and human resources;
- justification of key areas of development of the higher education system in the short, medium, and long term;
- creation and support of innovation infrastructure, including its environmental component;
- legal support of state support for innovation activities;
- financial support for priority areas of innovative development of the sphere of higher education and science;
- targeted funding for education and basic research.

State measures should also ensure:

- capital inflows to innovative development of higher education;
- a high level of innovation is required;
- training a sufficient number of engineers, scientists and management personnel;

- facilitating access of national higher education and science to foreign markets.

The role of the state in the management of innovation activities in the field of higher education and science is an important task of the state. For the state, it is necessary to solve the following most important tasks (Fig. 5):

1. To determine the technological, economic and main goals and a plan for macroeconomic transformations that will mobilize society with a single focus on innovative development.
2. Creating the necessary conditions that best contribute to the innovation and investment process.
3. Combining the efforts of government agencies with business to support innovative initiatives of higher education and science subjects, stimulating innovation management in this area, and spreading innovations in this industry. Support and practical implementation of H. Etzkowitz's concept of innovative development of society by the H. Etzkowitz "triple helix" model [19–24].

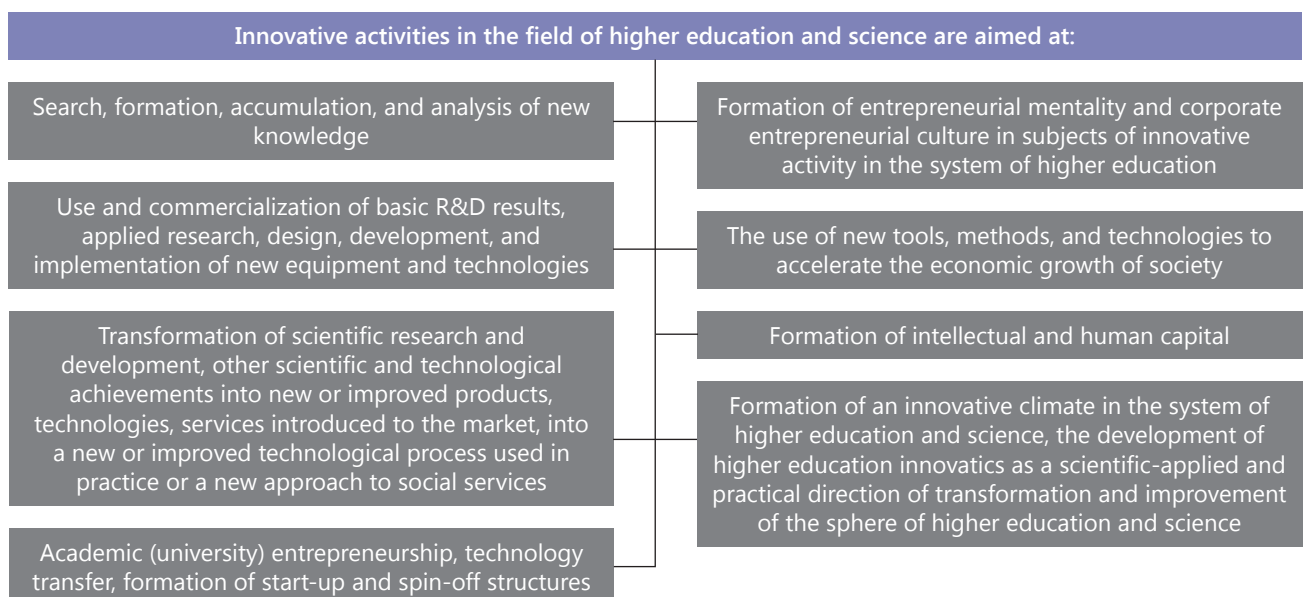


Fig. 3. Orientation of processes of innovative activity in the field of higher education and science on objects and subjects of innovative transformations

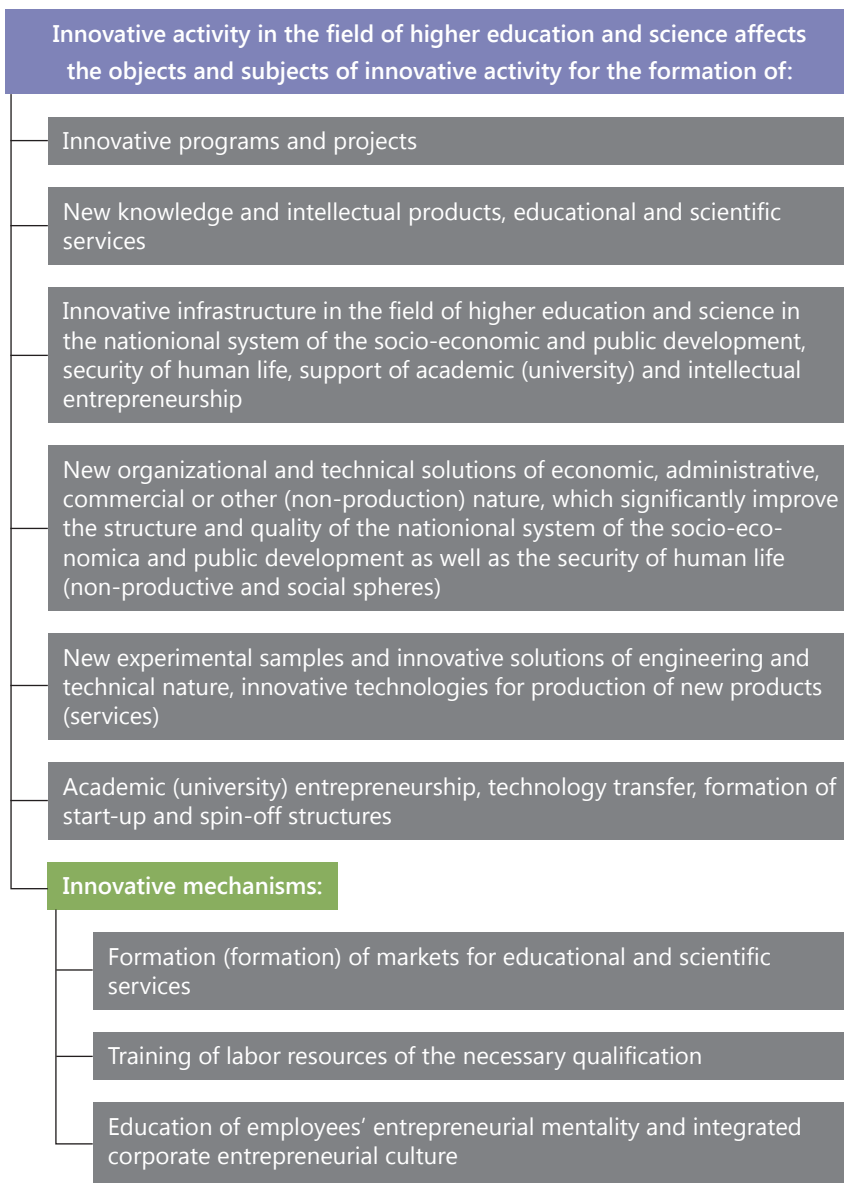


Fig. 4. Influence of processes of innovative activity in the field of higher education and science on objects and subjects of innovative transformations

4. To use and improve the advanced world experience in the field of innovative development of the sphere of higher education and science.

Innovation management should turn into a consolidated interaction of government and business mechanisms. Creating conditions for achieving agreement between the interests of the state and the employee in the

field of higher education and scientific and technical activities is the main task of the state level of management. This level becomes strategic, giving tactical and operational control to new innovative individual firms and specialized structures in the field of higher education and science.

At the same time, academic or university entrepreneurship was noted as one of the main motivators and

engines of innovation in the sphere of higher education and science.

Summarizing the results of a comprehensive study of the phenomenon of academic (university) entrepreneurship the authors noted that entrepreneurial institutions of higher education implement their activities in higher education in the current market laws of the economic system, interacting with internal forces of society (with response to its challenges and inquiries) under the influence of globalization pressure of the world community. Innovations in the higher education system should directly lead to innovative changes. It is reasonable to consider HEIs' innovative activity in the higher education system as an economic category related to the capitalization and commercialization of intellectual products — knowledge, technology, educational and scientific services, etc.

5.2. Innovative environment factor in the innovatics of higher education

Further development of the sphere of higher education and science directly depends on the quality of innovation policy and the intensity of innovation in this area. The main role is played by the human factor, which creates an innovative environment and uses the necessary innovative technologies, methods, techniques, and approaches.

Analyzing publications on this topic, it can be noted that the article [58] examines some of the issues of innovation policy of heads of the higher education system and universities in the process of constructing innovative ecosystems as an environment for the development of higher education and science.

Significant is the work [59] on how governments and leaders focus (and should focus) on competency building (including education, training, skills, and practical experience) in the design and implementation of innovation policies. "Competencies should be defined as a set of knowledge, skills and experience that people and orga-



■ Fig. 5. The role of state in the management of innovation activities in the field of higher education and science

nizations have. They can be considered as a set of acquired methods and inclinations to perform a specific activity, which often includes a certain set (analytical, physical, etc.) techniques and methods; and based on a certain level of past experience. Further, competencies are the result or outcome of the process to which people or organizations are exposed (learning scheme and/or series of new tasks). The literature usually distinguishes between different types of competencies: managerial competencies or skills; competencies in science, technology, engineering and mathematics (STEM); or more general social and communication competencies."

The article offers a typology of internal and external, and individual and organizational sources of competencies related to innovation. This is necessary to examine the most common initiatives that governments are taking in this regard. The paper highlights three common shortcomings and imbalances in innovation systems in terms of education, training, and skills: a) insufficient level of competencies in the system, b) time lag between short-

term needs of firms in specific competencies, and c) long time required for their development, and imbalance between internal and external sources of competence in firms. A set of general criteria for restructuring policy instruments to address these tensions and imbalances has been developed by the authors.

In the publication [60] the authors believe that higher education in the 21st century faces global forces that require innovative research, innovative pedagogy, and innovative organizational structures. A theoretical understanding of innovation is essential for the further development of higher education and science. The authors set out such a conceptual framework based on innovative literature in various academic disciplines. Thus, there are four inevitable trends in higher education that can lead to innovative responses. Working definitions of creativity, innovation, and entrepreneurship are generated by clarifying several terms related to innovation. The concepts of sustainable and destructive innovations are discussed. This shows how change and innovation have been

a constant feature of higher education since its inception. Three aspects of innovation are considered — diversity, intrinsic motivation, and autonomy. These aspects have a positive effect on the ability of people in higher education to be innovative. It then examines three complementary concepts — time, efficiency, and trust — that are important for careful consideration of innovation in an institutional setting.

Further, if we turn to the United States, we get confirmation that the American system of higher education is considered to be an important factor in national economic, scientific, and social progress. More than four thousand public and private institutions of higher education, awarding degrees and professional qualifications, significantly improve the quality of their educational and scientific activities by using innovative technologies, methods, techniques, approaches, and solutions.

Due to the increasing complexity of production processes in all spheres of human activity, the demand for higher, professional, and special technical education is constantly growing. Experts published before the COVID-19 pandemic estimated that the number of full-time students was expected to be over 23 million by 2025 [61].

Over the past 20 years, growth in college enrollment has come mainly from non-traditional students (i.e., students who do not enroll in college immediately after high school and students who do not attend college full-time), who now account for about 40 percent of all students.

The serious problem of expanding access arises after decades of skyrocketing tuition fees. The reasons for this escalation are many, from unprecedented competition for outstanding faculty and student talent, to administrative bloat, changing student tastes, and transforming their status from diligent knowledge consumers to market consumers demanding more services, and reducing the teaching load of full-time teachers. Despite higher income from tuition, many colleges and universities are under severe financial pressure because operating costs rise

faster and government support for government agencies declines. In this sector, innovation is critical to meet US needs in the coming years.

Innovation in US higher education can be defined as the introduction of new methods and customs to improve the efficiency of production [62].

For most teaching and learning-oriented sectors, this means recruiting students and providing them with degree opportunities (ultimately with the hope of nurturing productive and successful citizens), which is the result of some kind of learning process coupled with a range of operational support services. Innovation is possible with both learning and operational support, and involves creativity, risk taking and experimentation at the institutional level.

Whether a HEI or another organization innovates depends on a mix of factors, including the availability of new technological opportunities, and the market and social context in which they operate. Labor intensive industries innovate using a number of approaches, including:

- the use of information technology;
- different work strategies, such as greater differentiation of job roles, the use of contingent workers, and creative compensation schemes;
- re-engineering of key processes, for example, through subcontracting;
- emphasis on core mission and separation of support activities.

Federal policy plays a critical role in promoting innovation in higher education through funding levels and regulations, as well as the broader regulatory environment that affect learning and operations.

The authors made recommendations in three major areas: reworking student financial aid, creating a regulatory framework conducive to institutional experimentation, and generating new exemplars for wider adoption [61].

Analyzing the data from many scientific sources and summarizing the results of their own research, the authors propose to consider activities

promoted by higher education innovatics (Fig. 6) and innovative environment of these activities (Fig. 7).

Innovation in higher education should comprehensively promote such activities:

All these activities take place in such an innovative environment.

One of the tools of innovation management in the sphere of higher education and science is the innovation policy (policy of innovation). As it is known, the innovative policy is the state policy directed on control and maintenance of balance between the rights of owners of the information and necessity of innovations and technical progress. On the other hand, innovation policy is also a link between research and technological development policy and industrial policy. It is aimed at creating favorable conditions for bringing ideas to market.

The authors suggest that innovation policy in the sphere of higher education is the link between the policy

- of research and scientific (scientific-technological) activities;
- of search and dissemination of knowledge;

- of education and training of qualified specialists — on the one hand;
- of technological development;
- of industrial policy;
- of environmental policy — on the other hand.

In general, innovative policy in the sphere of higher education is one of the main components of state socio-economic policy of society development and is aimed at creation of favorable conditions for bringing new ideas created in this sphere to the market.

In this case, the following levels can be considered: state; industry (the sphere of higher education and science); regional or local; subjects of industry subordination (universities, colleges, different educational institutions or scientific institutions, other organizations of the system of higher education and science, etc.) [53]. When considering a university or research institute, it is necessary to distinguish between external and internal innovation policies.

External innovation policy is a joint, coordinated by the team line of behavior of the university or research insti-

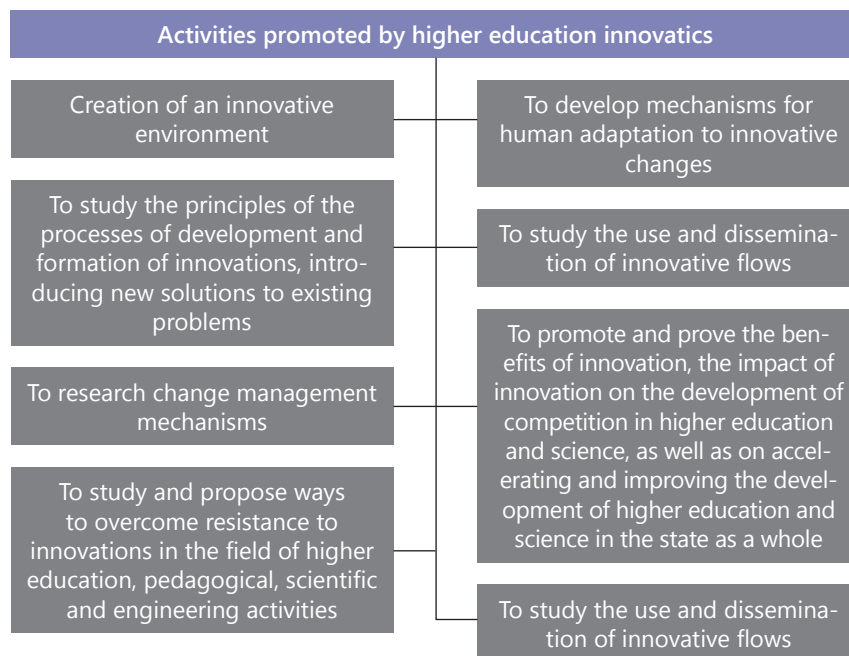


Fig. 6. Activities promoted by higher education innovatics

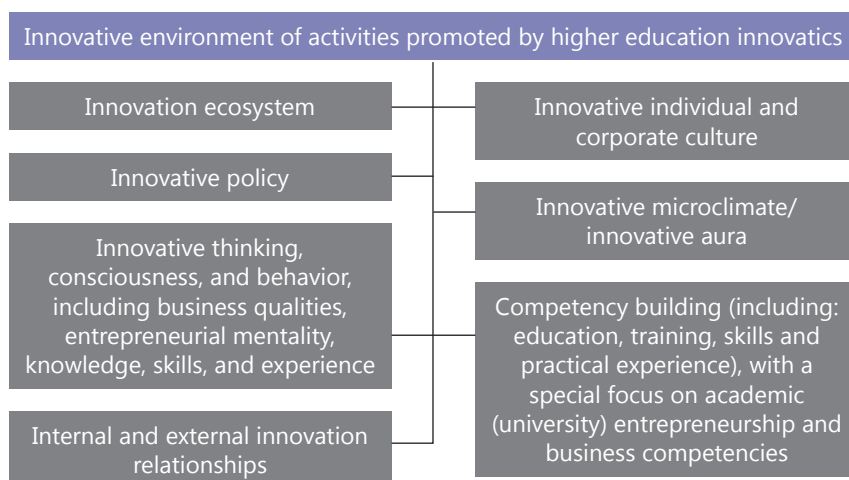


Fig. 7. Innovative environment of activities promoted by higher education innovatics

tute in the market of educational and scientific services, determines priority innovation projects and that leads to an increase in the level of development of the university or research institute.

Internal innovation policy is the regulation of personnel behavior aimed at the innovative type of development of the university (research institute). The essence of staff behavior is determined by the relations that develop between employees in the innovative field of activity of a university or research institute. In general, the innovation policy of a university or research institute is a guide to the selection of priority areas of the innovation process, the development and implementation of innovative plans and projects, the formation of the necessary relations between employees in the university (research institute). By its type, the innovation policy of a university or research institute can be different: narrowing (reduction); stable functioning; growth (expansion).

The policy of narrowing (reduction), stable functioning or growth (expansion) is based on the analysis of the goals of the university or research institute, which is defined as the specific final state (final position) of the university or research institute, or the desired result.

In determining the purpose contraction (decrease) in the final state (position) of the university or research

institute is seen in sustaining, maintaining production volumes of research and educational services, the share of developed market of such services, wages and number of workers or in the gradual slowdown in the growth of production volumes of research and educational services, hoping for the possibility of advancement in the future. The goals of narrowing (reduction) are chosen by universities and research institutes operating in unfavorable conditions. Investments in innovative projects in this case are either absent or random. It is a survival policy.

The innovation policy of stable functioning provides for comprehensive improvement and improvement of the quality of educational and scientific activities through the introduction of innovative methods and technologies. At the same time, there are no plans to increase or decrease the scope of statutory activities. Targets for growth (expansion) suggest a positive trend, the difference between them depends on their content and they can be aimed at:

- achieving a high level of educational, scientific, methodological and technological development, which is manifested in the state of the implemented educational and scientific processes and training technologies — in the degree of their novelty, quality, economy, productivity, progressiveness;

- achieving a high level of economic development of a university or research institute, which is manifested in increasing the competitiveness of educational and scientific products and services, increasing its market share, expanding volumes, improving financial results and financial condition;
- achieving a high level of social development of a university or research institute, which is revealed in the socialization of the results of activities and increasing the role of a person — the humanization of the management process.

Investments in innovation in the growth policy are regular and have a clear focus that characterizes the innovation policy. Innovative growth policy is characterized by external (socialization of performance results) and internal (humanization of the management process) social orientation.

Innovative growth policies can be extensive or intensive, risky or moderate, and allow for the use of alternative sources of financing and investment.

The main principles of the external innovation policy of the sphere of higher education and science and its structural units — universities and research institutes are:

- the unity of scientific and educational processes, administrative and managerial activities and their focus on the economic, social and spiritual development of society;
- optimal combination of state regulation and budget financial support with self-government and self-earning funds;
- formation of innovative projects in priority areas of research defined by the state and regional innovation and scientific and technical policy;
- support of leading scientists, research teams, scientific and scientific-pedagogical schools capable of providing advanced level of education and scientific research, development of scientific and technical creativity of young people;
- conducting a full cycle of research and development, ending with the

- implementation of ready-made services and products, the formation of startups (spin-off and spin-out);
- support for entrepreneurial activity in the scientific field, wide commercialization of R&D results;
- internationalization of education with the subsequent integration of science and education into the international community;
- formation of network structures in the organization of innovative and scientific-technical activities; formation of the world base of scientific knowledge.
- Internal innovation policy should be formed and implemented on the basis of the following principles:
- continuous development of the innovative potential of the university or research institute, which is necessary for the implementation of innovations;
- integrated implementation of innovations, in which all types of innovations are closely interrelated and mutually promote each other;
- creation of a structural unit responsible for the formation and implementation of innovation policy, strategy;
- staff mobilization, maximum use of financial, material and intellectual resources for the implementation of innovation;
- material, moral and social encouragement of innovation activity;
- risk accounting and assessment.

The innovation policy of an entrepreneurial university, as a tool for managing its development, is a decisive factor in innovation activity, one of the important elements of the innovation process in the university, research institutes, etc. This policy should promote the disclosure of innovative potential, the creation of innovative-active, effective behavior of personnel.

The innovation policy of an entrepreneurial university should take into account the specific features of the activity of an educational institution focused on academic entrepreneurship. The main components of the innovation policy of an entrepreneurial university are:

1. Environment:
 - external-favorable, neutral, unfavorable:
 - › regional (municipal) level;
 - › regional (municipal) level;
 - › national level;
 - › international level;
 - internal.
2. The goal of university development:
 - narrowing (decreasing);
 - growth (expansion):
 - › extensive;
 - › intensive.
3. The attitude to risk:
 - risky;
 - moderate (moderate).
4. Field of activity:
 - educational;
 - scientific (scientific and technical);
 - cultural and educational activities;
 - administrative and managerial support;
 - financial;
 - academic and entrepreneurial;
 - related business (provision of various paid services);
 - economic, commercial, auxiliary, and other types of university activities;
 - sports, leisure, everyday life, extra-curricular activities of the university.
5. The nature of innovation selection:
 - selective;
 - indicative;
 - comprehensive.
6. Sources of funding for universities:
 - budget;
 - extra-budgetary;
 - your own;
 - multi-channel system for finding, attracting and accumulating funds.
7. The method of forming the innovation policy of universities:
 - traditional;
 - intuitive;
 - scientifically based.
8. The nature of the implementation of the innovation policy of universities:
 - stable;
 - unstable.
9. The degree of entrepreneurship implementation:
 - low (medium);
 - high.
10. Expected results of the implementation of the innovation policy of universities:

- innovative development of higher education institutions;
- innovative development of the region;
- local, regional and national economic growth.

The external and internal policies of universities are understood in the same way as for enterprises (organizations). The feature of modern exterior innovation policy of the university is implementation of advanced foreign experience of leading universities in the world for international education, internationalization of higher education, the introduction of distance learning, partnerships with foreign universities and sharing them with students and teachers. The same applies to exchanges with entrepreneurial universities.

Extensive innovation policy is a policy of changes in the direction of quantitative development of certain characteristics of the activities of universities that are amenable to innovation.

Intensive innovation policy — is the policy of changes in the direction of qualitative improvement of the relevant characteristics.

In terms of risks, a moderate innovation policy is typical for universities.

Taking into account the specifics of the activities of universities, risk-taking can only be carried out in scientific activities (research and implementation of the results of the latest scientific and technical developments and technologies). But the university must develop a risk management program. Among the methods of risk management, preference should be given to risk insurance and the distribution of responsibility of the participants (main performers) of the innovation project. Indicative innovation policy means that the university should develop in accordance with the civil and public indicators (standards, norms) established by the society. Selective innovation policy means development in the priority areas defined by the external innovation and industrial policy of the state and the region.

The traditional approach to the formation of innovation policy means that it does not take into account the requirements of the external environment, qualitative changes in the internal environment, and the level of development of the university itself. The intuitive approach involves the development of an innovation policy by one person based on intuitive feelings. A science-based innovation policy is a collective social process of improving the activities of universities based on established traditions, advanced foreign experience, trends in the development of the university and the country, with mandatory consideration of national characteristics.

The innovation policy of the entrepreneurial university can include such main directions (Fig. 8):

- educational (organization of the educational process, provision of statutory educational services, development of educational technologies, organization of methodological work, etc.);
- scientific, scientific and technical (organization of scientific research in priority areas of science and technology, automation and informatization of all areas of the university, implementation of design work, development of new equipment and high technology);
- cultural and educational (upbringing, education of children, parenthood, cultural and educational work with students, organization of socio-humanitarian and socially useful activities of students and teachers, providing patronage assistance to schools, participation in charitable projects, etc.);
- administrative and managerial (making administrative and managerial decisions at different levels of management of the university: rectorate → deans → departments → executors; councils → implementation of council decisions);
- financial (new forms of using financial savings; expanding sources of financial resources, funds; new methods and measures to preserve and increase the financial resources of the university);
- academic-entrepreneurial (patent and licensing activities, technology transfer and dissemination of new knowledge, commercialization of R&D results, creating of new technologies and startups);
- economic (administrative and economic activities), commercial (obtaining additional income through: commercial use of real estate and material and technical means of the university; organization on commercial terms of related and additional educational and scientific services, professional advice and expertise; provision of premises and equipment for forums, conferences, seminars on a rental basis; production and sale of souvenir products of the university; organization on contractual terms of publishing activities for internal and external customers, etc.), auxiliary and other (by type of activity of the university);
- sports (organization of sports competitions, leisure time for students and teachers, health promotion and life improvement of students and teachers);
- cooperation with the "outside world" (business contacts with customers and consumers of educational and scientific services, commercialized R&D results, representatives of the state (government), industry (business), presence in the markets of educational and scientific services, participation in competition with other universities and scientific (research) institutes;
- extracurricular activities of the university (organization of different competitions, cultural events, humanitarian and international programs).

Budget innovation policy is one that is fully funded from the budget of all levels: state, regional, and municipal. Extra-budgetary innovation policy is financed from the financial resources of extra-budgetary funds, firms, enterprises, organizations and institutions, the population, sponsors, and foreign sources. With its own funding, the university carries out innovative activities at the expense of earned funds (financial resources). A multi-channel innovation policy implies that funding comes from all the sources listed above, and financial resources (loans) from banks can also be attracted.

By the nature of implementation, an innovation policy can be stable, that is, one that is implemented in accordance with the adopted program and plans of innovation activity, or unstable, that is, implemented to the extent of objective and subjective necessity.

Innovation policy can be based on a low (medium) or high degree of entrepreneurship implementation in higher education institutions. Budget (state, municipal) universities with substantial state support can afford to use only some types of entrepreneurship (marketing, advertising, and search for customers of educational and scientific services and potential employers

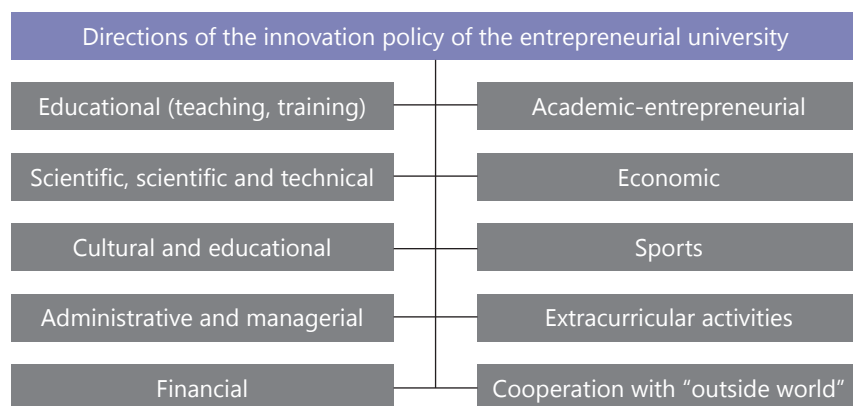


Fig. 8. The main directions of the innovation policy of the entrepreneurial university

for graduates). For private educational institutions, entrepreneurship is the main tool for implementing statutory activities.

In practice, it is possible to conduct external intensive, moderate in degree a sustainable innovation policy based on a multi-channel (multi-resource) financing model and effective statutory business activities. The internal policy should correspond to the external one. Otherwise, the university will not only not be able to develop, but may even cease its activities.

It is expected that the results of the implementation of the innovation policy of universities can be both the internal innovative development of universities, and the innovative development of the region, local, regional and national economic growth. The introduction of innovations in industry (business) can be carried out through the transfer of innovative technologies, the transfer (transplantation) of new types of industry, the opening of new firms and companies (startups), the improvement and innovative transformation of existing industrial facilities, and so on. Together with the perfect academic entrepreneurial activity that allows commercializing the results of R&D, local, regional and national innovative development is a significant contribution of universities to the socio-economic improvement of society.

Any process corresponds to certain relationships that develop between its participants. Innovation policy is characterized by innovative relations that should be implemented by the subjects and objects of management.

The subject of management relations is the active link that influences these relations; the object of management relations is the passive part of the relationship, perceives the influence and is exposed to it. In this sense, any subject (carrier) of managerial relations is to some extent both an active and a passive link. The subjects (carriers) of innovative relations of higher education are all members of society, social groups, social structures that are somehow related to the field of education, science and production. They

can be individual and associated (collective).

The University can also act as the subject and the object of interaction with the external environment at the macro, meso, and micro levels (from the perspective of the innovative relationship to the environment and the importance of action, as well as on spatial scope and effect of the action). From the standpoint of macroeconomics, universities themselves, which are the institutional links of the formal education system, can also act as subjects of innovative relations. At the same time, they act as control objects. A university can act as an economic entity in the scientific and production complex, in the regional educational system, and in the system of continuing education, entering both internal (internal university, internal-institute, internal-corporate) and external management relations with the environment. At the micro level, the subjects of innovative actions are the heads of universities, the structural unit responsible for innovation policy. The objects of management are, on the one hand, innovation activities, on the other — the entire staff of the university. Actually, innovation relations arise between people about the formation and implementation of innovations. At the same time, the processes associated with the production and reconstruction of the new (new knowledge, new products or services, new management combinations, new social relations) or simply with the introduction of changes in the already known, existing, should not be spontaneous, unconscious, but necessarily consciously put on a scientific basis and have the character of specialization. Since then, when innovative relations become such that they are constantly reproduced, we can talk about a special type of managerial relations — innovative relations that are present in any sphere of human life, including in higher education and science.

In the higher education, there are innovative relations of both objective and subjective nature (Fig. 9). They are implemented through the interests of the subjects and objects of higher education.

Objective innovative relations in education are socially and economically dependent, directed by the interests of society and dependent on it. These include:

- innovative economic, including innovative market (innovative entrepreneurial);
- innovative pedagogical;
- innovative managerial, including innovative organizational;
- innovative financial;
- innovative operations with property.

The subjective innovative relations include innovative psychological and innovative moral, affecting feelings, emotions and subjective ethical assessments of people. They also include the relationship of innovative corporate culture.

Innovation-psychological, in particular, is the psychological contour of relations that express the psychology of economic entities and the university. For example: the expectation, patience, and remaining confidence in the authorities on the part of the scientific and pedagogical corps regarding the fair distribution of the rich in their potential and at the same time limited resources.

They are an important part of the socio-psychological relationships that remain in the field of education last, when everything else disappears. Teacher, scientist — these are the professions in which the primary importance is the vocation, talent, talent, desire to create and serve humanity. These professions will be alive as long as a person lives.

Relations of innovative corporate culture or innovative-moral relations are such relations between people that can be evaluated from the point of view of good and evil (for example, it is honesty, reliability of social relations of economic entities). The innovative corporate entrepreneurial culture of the university is important (see below). Also, innovative moral and ethical norms of relations in educational institutions are very important, which can act as a guard against abuse and corruption.

All the above-mentioned types of innovative relations in education are carried out in the system of reproduction of goods and resources, sectoral, regional and intersectoral relations: between the spheres of economy and society, between education and society.

Changes in innovation and economic relations in higher education, carried out on a systematic scientific basis, accelerate social progress. Other types of innovation relations, especially innovation-financial and innovation-management relations, can and should contribute to such progress by synchronizing innovative changes. These types of relations are typical for both the external and internal innovation policy of the university.

The new types of innovation policy in higher education and science are caused by global changes, emergencies, and force majeure circumstances. Forced or emergency distance learning (F/EDL) is a temporary transition of teaching to an alternative mode due to crisis circumstances. This type of training is extraordinary and is characterized by the fact that: first, online learning is becoming the main type of teaching and learning, but not all teachers and students of many universities around the world are ready to constantly work on the internet remotely. Secondly, the educational and methodological support of training courses for use exclusively online has not been massively developed and implemented in the higher education system of many countries. Third, after the end of the crisis circumstances, most universities in the world will return to the usual classroom hybrid full-time and distance learning, which the vast majority of students and teachers dream of. The innovation of F/EDL lies in the instant transition from the usual form of university education, based on direct classroom face-to-face contact between teachers and students, to the remote location of students from teachers and classrooms on university campuses. In addition to an insufficiently developed educational and methodological base, a successful educational process can be hindered by students' lack of control during testing

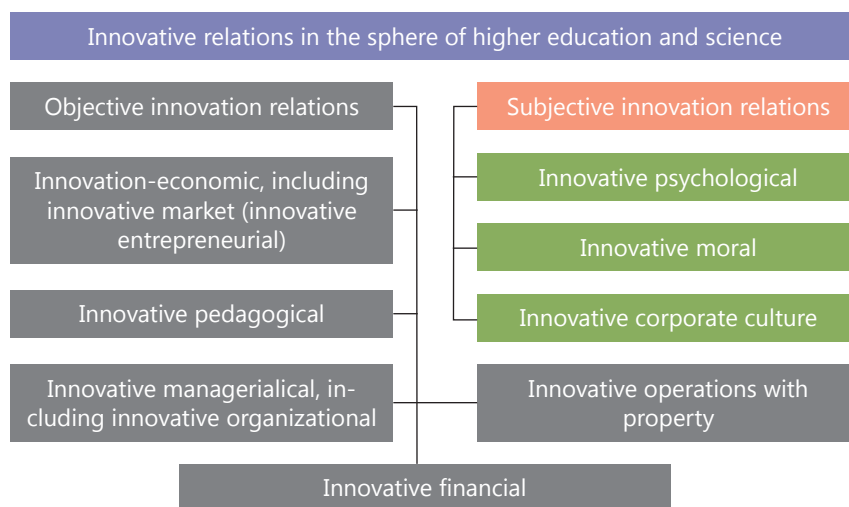


Fig. 9. Innovative relations in the sphere of higher education and science

and passing exams online. New technological and methodological developments are needed to solve these problems. The main feature of F/EDL is the difference between the delivery of on-line courses and distance teaching — training with the help of professors, and distance learning — learning of courses by students studying themselves. For the successful organization of long-term online training, it is necessary to simultaneously solve problems of information and communication nature, organizational, pedagogical, and methodological nature, as well as problems of ethics and integrity in the process of independent training of students and monitoring their progress (Fig. 10).

6. Conclusion

Academic capitalism makes the innovative development of higher educa-

tion and science real and inevitable. For a better understanding of the promising directions of such development, both theoretical research and practical experiments are required, as well as the creation of fundamental knowledge in this area.

It is the innovatics of higher education that aims to combine theoretical research and practical experience in order to better understand the essence of innovation in higher education and science. The study examines some of the main issues of the organizational theory of innovatics in higher education, the orientation of innovation processes in the field of higher education and science to objects and subjects of innovative transformations, the impact of innovation processes in the field of higher education.

In the system of higher education and science, objects and subjects of innovative transformations are high-

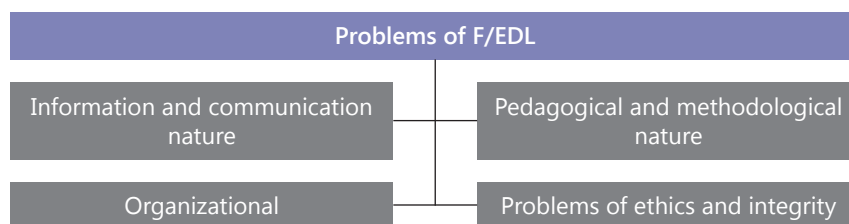


Fig. 10. Problems of the forced or emergency distance learning

lighted, the most important tasks of the state in the management of innovations in the field of higher education and science are considered, as well as the activities promoted by innovators in the field of higher education and the innovation environment around them.

The analyzed main directions of the innovation policy of the entrepreneurial university and innovative relations in the field of higher education and science can form the basis of the scientific and practical direction of research — innovatics of higher education. The problems of competencies underlying innovation policy in the field of higher education and science deserve further research.

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Інноватика вищої освіти: роль інноваційного середовища у трансформації сфери вищої освіти і науки

Інноваційні перетворення у сфері вищої освіти та науки, як правило, відбуваються в рамках інноваційної політики, яка визначається лідерами цієї сфери. Слід зазначити, що інноваційна політика у сфері вищої освіти є сполучною ланкою між політикою досліджень та науковою (науково-технічною) діяльністю, пошуком та розповсюдженням знань, освітою та підготовкою кваліфікованих фахівців у галузі технологічного розвитку, промислової політики та екологічна політика.

Інноваційна політика у сфері вищої освіти та науки є однією з основних складових державної соціально-економічної політики суспільного розвитку та спрямована на створення сприятливих умов для виведення на ринок нових ідей, створених у цій сфері.

Стаття присвячена подальшому розвитку теоретичних засад інноватики вищої освіти. Розглянуто основні питання організаційної теорії інноватики вищої освіти; національна та міжнародна складові інновацій у сфері вищої освіти та науки, як відкритої освітньої, наукової та культурної системи; орієнтація та вплив процесів інноваційної діяльності у сфері вищої освіти та науки на об'єкти та суб'єкти інноваційних перетворень; найважливіші завдання держави в управлінні інноваційною діяльністю у сфері вищої освіти та науки; діяльність, яку просувають інноватори у сфері вищої освіти; інноваційне середовище.

Вивчаються основні напрямки інноваційної політики підприємницького університету та інноваційних відносин у сфері вищої освіти та науки.

Також аналізуються проблеми примусового чи екстреного дистанційного навчання.

Ключові слова: інновація вищої освіти, інноваційна політика, інноваційне середовище, управління інноваційною діяльністю.