

Higher education innovatics: management of innovation in the sphere of higher education and science

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Abstract

The purpose of the article is the development of the concept and fundamentals of the innovatics of higher education, further development, and improvement of higher education innovatics, the definition of directions, and management of innovations in the field of higher education and science. Higher education innovatics, proposed by the authors, studies and summarizes theoretical issues and practices of implementing and managing innovation activities of higher educational institutions, scientific institutions, organizations and management bodies associated with the higher education system. This article analyzes innovative changes in the higher education system caused by the environment of academic capitalism. Among them: basic issues of the organizational theory of higher education innovatics; 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; the role of the state in the management of innovation activities in the field of higher education and science; types of innovations in the higher education system that can lead to innovative changes; innovations of economic and market type in higher education; innovations of organizational type in the higher education sphere; innovations of educational and pedagogical type in the system of higher education; means and tools for innovation management in education; problems of the forced or emergency distance learning, etc. Innovative activity in the field of higher education and science leads to serious innovative transformations both in the entire field of higher education and science, and in its subjects – universities, research institutes, and related organizations and institutions.

Keywords: *higher education innovatics; innovative development of higher education; academic capitalism; entrepreneurial university.*

I. Introduction

The environment of academic capitalism, encompassing almost the entire field of science and higher education, has greatly accelerated the commercialization of applied research and development results by universities and research institutes and has allowed these institutions to greatly benefit from their intellectual capital. This gave impetus to the development of progressive innovations and outstanding inventions. Since the adoption by the US government of the Bay-Dole Act (the Law on Patents and Amendments to the Trademark Act) on December 12, 1980, the era of rapid economic growth in the country began, which became a prerequisite for the phenomenon of “academic capitalism”. The “Bayh-Dole Act”, one of the best legislative acts in the United States law, “enables universities, nonprofit

research institutions and small businesses to own, patent and commercialize inventions developed under federally funded research programs within their organizations.” (Ezell, 2019).

Earlier higher education and science belonged to the non-commercial sphere of intellectual activity of society and were called upon to find, generate and disseminate knowledge for the benefit of all mankind. Further, in the environment of academic capitalism higher educational institutions (HEIs) and scientific institutions (SIs) have transformed from “temples of knowledge” into participants in the market of educational and scientific services with strict market economic rules.

Having studied and analyzed a significant amount of useful information about the emergence and impact of academic capitalism on the socio-economic and public-humanitarian sphere of human activity, its positive impact on the emergence and spread of innovative activity in the field of higher education and science, the authors proposed to create and introduce a new scientific and applied direction-higher school innovation (Romanovskii, 2012). Higher education innovatics is designed to systematize a comprehensive study of innovative changes in the field of higher education and science with the aim of their further dissemination in the systems of higher education and science of various countries (Romanovskyi & Romanovska, 2020).

1.1 The fundamentals of the study

The fundamental foundations of the theory of academic capitalism, the theory of innovation, innovation management, academic or university entrepreneurship, and innovation activity in higher education and science are considered in the different works, which 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 building an innovative model of the higher education and science system aimed at creating a knowledge society.

According to Slaughter & Leslie (1997), “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.” 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 the 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.” (Slaughter & Leslie, 1997). Note that the “term *academic capitalism* was first introduced by E.J.Hackett to denote important structural changes in science.” (Hackett, 1990).

“*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." (Leslie, Oaxaca & Rhoades, 2001).

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 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". (Schumpeter, 1934). 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*." (Fagerberg, 2008). Also, Schumpeter (1976) and Mensch (1979) introduced the term *innovation* into scientific circulation, which was defined as the embodiment of scientific discovery in new technology or product.

Different surveys of the literature in the sphere of innovation have found a great number of varieties of definitions. Thus, "in 2009, Baregheh et al. found around 60 definitions in different scientific papers" (Baregheh, Rowley & Sambrook, 2009) "while a 2014 survey found 41 ones" (Edison, Ali & Torkar, 2014). Based on their survey, Baregheh 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, services or processes, in order to advance, compete and differentiate themselves successfully in their marketplace" (Baregheh, Rowley & Sambrook, 2009).

In an industry review of how the software industry defines innovation, the following definition was found to be the most comprehensive, based on the definition of the leadership of the Organization for Economic Co-operation and Development – OECD:

"Innovation is production or implementation, assimilation and use of new products with added value in the economic and social spheres; updating and expanding products, services and markets; development of new production methods; and the creation of new control systems. This is both a process and a result." (Edison, Ali & Torkar, 2014).

"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." (Edison, Ali & Torkar, 2014)

"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 a product, process, market or organizational innovation)." (Edison, Ali & Torkar, 2014)

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.” (Rogers, 2003).

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.” (Drucker, 2002).

Theoretical foundations of innovation, innovative development, and innovation management include a global study of innovation management 2006-2016 given in the book (The Quest for Innovation, 2006), in an article (Chen, Viardot & Brem, 2019), and the papers (Bouwer, 2015: 2017).

In his comprehensive book, F. Damanpour “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.” (Damanpour, 2020).

This research is based on the following “conceptual foundations of innovative development of higher education: a) the H.Etzkowitz's concept of innovative development of society by the *triple helix* model (Etzkowitz, 2003; 2008; 2019; Viale & Etzkowitz, 2010; [Dzisah & Etzkowitz, 2012](#); Cadourin et al., 2019), 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) B. Clark's concept of transformational changes of conventional universities into innovative universities focused on in-house entrepreneurial activities (*business universities*) (Clark, 1998; 2000; 2004), 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).” (Romanovskyi & Romanovska, 2020).

Also, the authors paid great attention to the following problems of innovation: a) “State strategies and innovations in higher education.” (Vught, 1989) b) “Promoting innovation in higher education.” (Haddawi & Igel, 2006) c) “The emergence of a real opportunity for the commercialization of R&D results, which led to the rapid development of university and academic science and technology.” (Slaughter & Rhodes, 2009) d) “Global innovation in teaching and learning in higher education.” (Lane & Lake, 2019) e) “Understanding innovation in higher education.” (Taimi & Lanford, 2016) f) “Pedagogical practice and pedagogical innovations.” (Vieluf et al., 2012) “The role of innovation in education.” (Blouin et al., 2009) and others.

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 innovation theory and practice 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*. (Romanovskyi & Romanovska, 2020).

1.2 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 (Altbach, 2008). 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 solve the problems of both 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.

The authors believe that “to build 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 are 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.” (Romanovskiy & Romanovska, 2020).

1.3 Statement of the problem

According to the authors, “innovation in higher education studies, systematizes and expands interdisciplinary scientific and applied fields in higher education and science.

Innovation in higher education studies the innovative transformations of subjects of higher education and science in the context of academic capitalism.” (Romanovskiy & Romanovska, 2020).

This study is devoted to the study of the processes of innovative development of the higher education system in Ukraine and other countries during the formation of the knowledge society.

“The spread of market mechanisms in all spheres of social, economic and humanitarian activities of mankind, the emergence of the phenomenon of academic entrepreneurship, the commercialization of knowledge and R&D requires the development and scientific substantiation of the theory and practice of innovative development of higher education and science.” (Romanovskiy & Romanovska, 2020).

The novelty of the research lies in identifying areas of practical implementation of innovative changes, searching, studying, and choosing relevant ways, indicating methods and mechanisms for innovative transformation of the higher education sector as a whole, as well as its constituent parts – HEIs, SIs, organizations, and institutions related to higher education and science sphere.

2. Analysis of recent studies and publications

Among the latest publications on innovations in higher education, the following works seem to be interesting. In the work of Blass and Hayward (2014) "Innovation in higher education; will there be a role for "the academe/university" in 2025?" the authors "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, Swanger (2016) "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 full report reference, specially prepared for the 2nd Summit of the Global Education Industry, held on September, 26-27, 2016 in Jerusalem, "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." (OECD, 2016). "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, supported by an innovation-friendly business environment and policies, will industries start to engage in risk-intensive research and development (Qureshi et al., 2020). Governments can support this by fostering a climate of entrepreneurship and innovation in education." Also, the report underlines that: "Innovation in the public sector in general, and education in particular, could be a major driver for significant welfare gains. Governments provide a large number of services in OECD countries and these services account for a considerable share of national income." (p. 13).

The article of Serdyukov (2017) is devoted to the problem of innovation in American higher education. Analyzing publications of American experts in the field of higher education and innovation, studying the existing situation with regards to innovations in higher education institutions, he made several valuable conclusions and recommendations. The paper is based on a literature survey and author research. The author emphasizes that "Actually US education badly needs effective innovations of scale that can help produce the needed high-quality learning outcomes across the system. The primary focus of educational innovations should be on teaching and learning theory and practice, as well as on the learner, In the parents, community, society, and its culture. Technology applications need a solid theoretical foundation based on purposeful, systemic research, and sound pedagogy. One of the critical areas of research and innovation can be costly and time efficiency of the learning." Some practical recommendations are given in this paper: "how to create a base for large-scale innovations and their implementation; how to increase the effectiveness of technology innovations in education, particularly online learning; how to raise time and cost efficiency of education."

Unbundling is the process by which products previously sold together are separated into their component parts. In his work McCowan (2017) notes that "unbundling is the process by which products previously sold together are separated into their component parts." The author states that in "higher education there is a dynamic separation of teaching and research. This dynamic 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 of Jakovljevic (2018) 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: a) TAR model; b) A stakeholder model; c) The structural model; d) Governance structured models and e) Triple helix and quadruple helix innovation models." In the book (Mandel, 2018) the modern problems of pedagogical science and education are studied. In their book, Branch et al. (2018) 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.

In the article "On academic capitalism" Jessop (2018) is considering "the increasing trend toward academic capitalism and profit-oriented entrepreneurial practices in the fields of education and research discusses in the work. 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 of Somers et al. (2018) "provides a definition of academic capitalism and overview of the research literature, presents 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 his work Münch (2020) describes the most important "features of academic capitalism and their impact on science, as well as on the evolution of scientific knowledge; notes that academic capitalism is located in the intersection of scientific research, economic profit maximization and innovation policy; 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 discoveries that can be turned into patents and profitable goods."

The book "The International Encyclopedia of Higher Education Systems and Institutions." edited by editors-in-chief Teixeira and Shin (2020) includes most topics from higher education and is available for comparison with other sources. The book examines the problems of higher education in the twenty-first century, analyzes the changes that have taken place and new challenges that may face future scientists and possible research directions.

In their article, Muftahu and Jamil (2021) considered that "one of the most difficult tasks in HEIs is to implement effective and constructive changes in the already functioning system." They point out, that the "resistance and unwillingness of the members of the institution are the main obstacles for the institution to implement the necessary changes." The authors suggest "how to facilitate the flow of knowledge and adopt an innovative way of thinking in the context of higher education or higher education institutions." The paper also analyzes "three areas of a comprehensive implementation plan or change management: structure, culture, and strategies." The authors propose their program to manage changes. They explain "how a change initiative can be undertaken in a higher education institution in the context of the flow of knowledge and the adoption of innovative thinking. The main

message of this publication is that, according to the authors, the institutional mission, vision, and priorities must be clearly understood by every employee in order to support and promote change and innovative thinking."

In the paper which contributes to the discourse on the future of learning in higher education the author Stoten (2021) "focuses on the utility of the MBA as a management qualification to those that adopt a more holistic perspective of the development of managerial capability in an uncertain and volatile world."

In their research, Mazzioni et al. (2021) analyze the degree of interconnectedness of processes with organizational innovations, with efficiency in the field of products, market, technical and other innovations, and with social and environmental sustainability. The authors "proposed a theory that allowed us to understand the mechanisms of this relationship by analyzing the impact between innovation and sustainability mediated by efficiency." (p. 527).

The study of Mayhew et al. (2021) has the purpose "to test the effectiveness of a theoretically developed pedagogical exercise designed to help students develop their innovation capacities during a single-semester course." Researchers "organized the theoretical perspectives and empirical literature base through the use of two broad categories: innovation capacity theory and pedagogical frameworks, respectively." Authors stress that "good teaching is the crucial link between the aspirations of undergraduate education and their subsequent realizations; between collegiate environments and desired outcomes".

The author of the next study Tan (2021) suggests that "thinking can be perceived as an ambiguous task that allows for different interpretations. From the students' point of view, reflection was often characterized as a product that was one-layer (not repetitive) and monologic, rather than iterative and dialogical." Also, he points out "the need for a deeper understanding of the student's point of view and its consideration in context in order to develop a teaching methodology that would better support and strengthen the reflective approach to learning."

The series of publications are devoted to the problems of organizing the distance learning education process in the pandemic period of COVID-19. For example, in works "Coronavirus and Higher Education Resources" (2020), "Guidance for Interruptions of Study Related to Coronavirus (COVID-19)" (2020), Grajek (2020), and Hodges et al. (2020) the authors study the information, communication, organizational and pedagogical problems of organizing distance learning in periods of natural disasters and force major conditions. In the context of the Covid-19 pandemic, one of the noteworthy innovations is Active Learning Classes (Copridge et al., 2021), helping teachers and their students "to provide: teacher visibility and presence, better feedback and learning, and personal conversations and student dialogue."

3. Purpose of the article

The main purpose of this article the authors consider further development of the theory and practice of interdisciplinary scientific and practical direction of innovations in higher education and science, as well as the definition of objectives, directions, and features of innovative transformations in this sphere. An important research problem is the effective organization of management in the field of innovative transformations in the main components of the higher education and science sphere – universities, SI, and related organizations.

It is known that the issues of pedagogical innovation theory (Khutorskoy, 2005; Polyakov, 2007) are studied at the Institute of Educational Innovations of the Russian Academy of Education in Khutorskoy scientific school.

However, unlike pedagogical innovations, university innovations are the result of the development of academic capitalism and studies mainly both its market innovation processes spreading to the sphere of higher education and their impact on the socio-economic sphere of society.

4. Methodology and the research methods

The authors carried out the research necessary for the development of higher education and science in Ukraine and other post-Soviet and developing countries.

The research was carried out as follows: a) a comprehensive and targeted literary and documentary search was carried out; c) the main directions of the search are highlighted: academic capitalism; academic (university) entrepreneurship; innovative development of society according to the "triple helix" model; a variety of innovative models, directions and ways of implementing innovative transformations in the field of higher education and science.

In the course of the study: a) the main types and directions of innovations in the field of higher education and science were determined; b) Research publications, experimental and supporting materials were examined, providing an overview of the wide and complex range of university innovations and their real cost-effectiveness; c) Useful links were found, a bibliography of articles and books published on the topic of entrepreneurial universities and university innovation, including fundamental resources and recent work; d) Academic entrepreneurial activity of American, British, European universities and universities in other countries was analyzed and compared with the Ukrainian one.

The University Entrepreneurship Framework and an innovative approach to international cooperation have been tested and used in Ukrainian public and private universities.

The research information base consists of legislative and regulatory acts, reports and official publications of state and international organizations, expert assessments of rating agencies, monographic literature, materials of scientific conferences, publications of leading cited journals, electronic Internet resources, and scientific reports. leading universities in the world. A literature review was used, including data collection, data analysis, interpretation of data from US and UK reports a) US – Small Business Administration (SBA); National Institute of Standards and Technology (NIST); Association of University Technology Managers (AUTM); Association of University Companies (UNICO); Association for Relations with the Research Industry of Universities (AURIL); b) the UK – The Orchard Network, Business Across Borders Affiliate Network, DTI Global Watch Service; Knowledge transfer networks; United Kingdom Science Parks Association (UKSPA); British Technology Group and Innovation Policy Platform (IPP), developed by the World Bank Group and the Organization for Economic Co-operation and Development (OECD).

All figures presented in the article (Fig. 1 – Fig. 9) were developed by the authors.

The authors used a dialectical approach to analyze and comprehend the content and features of the innovative development of higher education based on the phenomenon of academic (university) entrepreneurship. In the article, academic entrepreneurship is considered as an economic category in the system of socio-economic ties and relations of an integrated economic system in a modern knowledge society. The conditions for the formation of academic entrepreneurship, the features, and essence of university entrepreneurship, and its impact on the competitiveness of the economies of countries have been investigated using abstraction methods, systemic-structural and theoretical-informational methods. Also, the methods of analysis in synthesis were used to study and form the directions and ways of innovative development of the sphere of higher education and science, as well as its constituent parts - universities and research organizations.

5. Presentation of the main research material

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, 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. (Clark, 1998; 2000; 2004).

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 the 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 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. (Bower & Christensen, 1995). Such models of innovations can be used: radical, incremental, architectural, or modular. (Henderson & Clark, 1990). Also, innovation can be used for profit generation (commercial), or non-for-profit purposes: social, sustainable, or green innovation and responsible innovation. (Schiederig, Tietze & Herstatt, 2012; Blok & Lemmens, 2015).

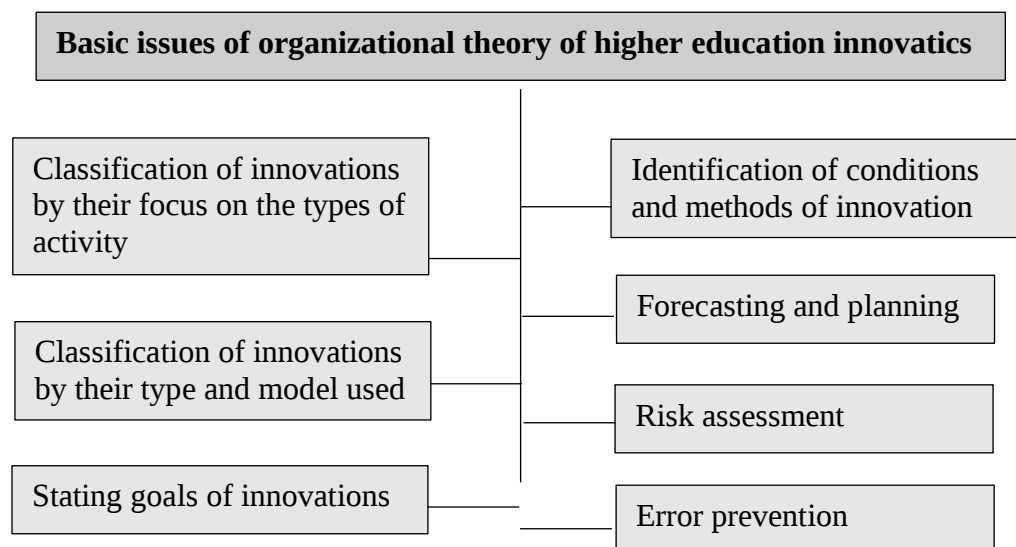


Fig. 1. The basic issues of the organizational theory of higher education innovatics

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 relations, and innovation culture of the subjects of this field. This sphere is including all higher educational institutions, scientific institutes, 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 future publications, authors will consider the main provisions concerning innovation policy, innovation relations, and innovation culture of HEIs 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, SIs, 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).

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. Also, it is very important for the country's population to understand and support the goals and directions of innovation in the field of higher education and science.

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 certifies the necessity and importance of intensifying the processes of search and formation of new knowledge and identification their scientific, technical, and applied significance for the further socio-economic development of society, science, and technology

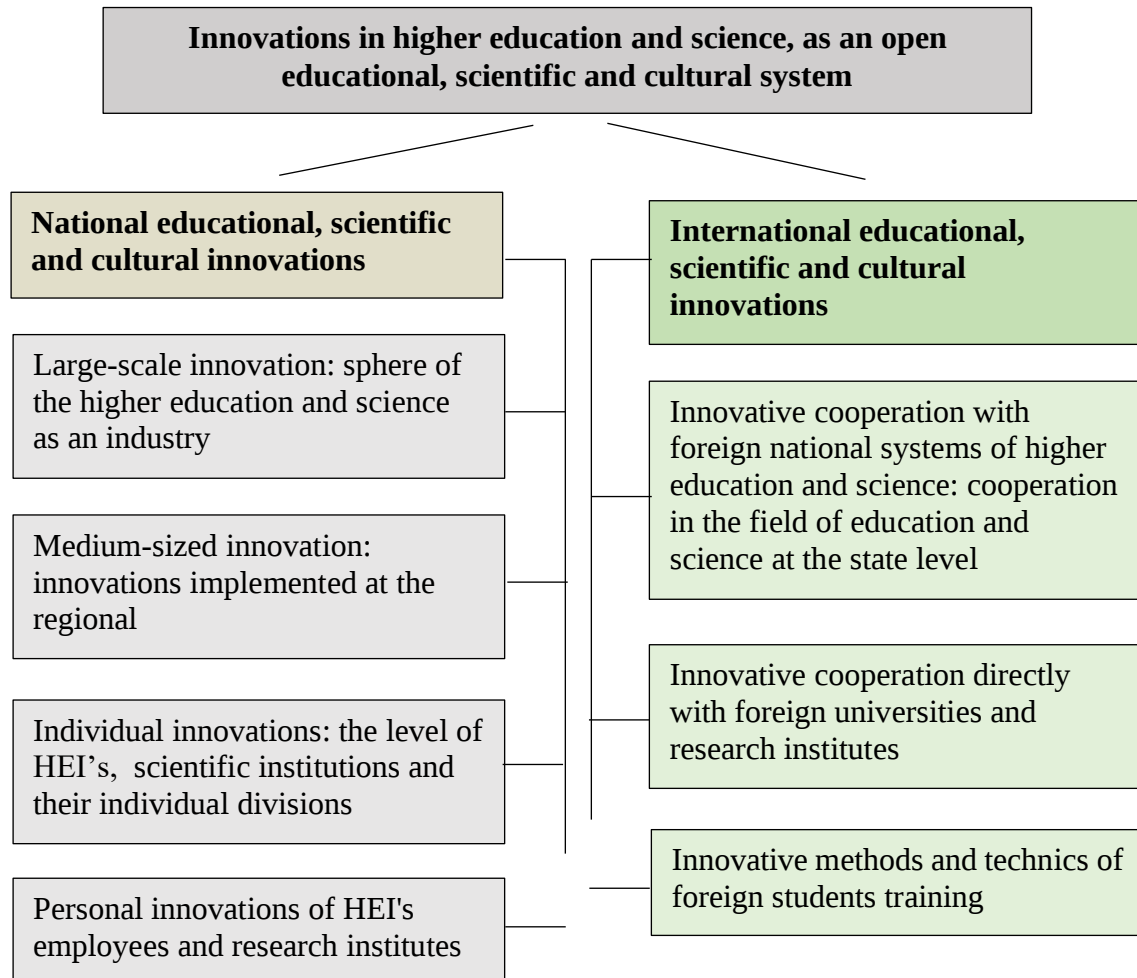


Fig. 2. National and international components of the innovations in the sphere of higher education and science, as an open educational, scientific and cultural system

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.

The authors identified the general “orientation of processes of innovative activity in the field of higher education and science on objects and subjects of innovative transformations. Innovative activities in the field of higher education and science are aimed at:

1. Search, formation, accumulation, and analysis of new knowledge.
2. Use and commercialization of basic R&D results applied research, design, development, and implementation of new equipment and technologies.
3. Transformation of scientific research and development, other scientific and technological achievements into new or improved products, technologies, services introduced to the market, into a new or improved technological process used in practice, or a new approach to social services.
4. Academic (university) entrepreneurship, technology transfer, formation of start-up and spin-off structures.
5. Formation of entrepreneurial mentality and corporate entrepreneurial culture in subjects of

innovative activity in the system of higher education.

6. The use of new tools, methods, and technologies to accelerate the economic growth of society
7. Formation of intellectual and formation of human capital.
8. The formation of an innovative climate in the system of higher education and science, the development of higher education innovatics as a scientific-applied and practical direction of transformation and improvement of the sphere higher education and science.” (Romanovskiy & Romanovska, 2020).

Also, the authors determined the “influence of processes of innovative activity in the field of higher education and science on objects and subjects of innovative transformations. Thus, the “innovative activity in the field of higher education and science affects the objects and subjects of innovative activity for the formation of:

1. Innovative programs and projects.
2. New knowledge and intellectual products, educational and scientific services.
3. Innovative infrastructure in the field of higher education and science in the national system of the socio-economic and public development, security of human life, support of academic (university) and intellectual entrepreneurship.
4. New organizational and technical solutions of economic, administrative, commercial, or other (non-production) nature, which significantly improve the structure and quality of the national system of the socio-economic and public development as well as the security of human life (non-productive and social spheres).
5. New experimental samples and innovative solutions of engineering and technical nature, innovative technologies for the production of new products (services).
6. Academic (university) entrepreneurship, technology transfer, formation of start-up and spin-off structures.
7. Innovative mechanisms: a) formation (formation) of markets for educational and scientific services; b) training of labor resources of the necessary qualification; c) education of employees' entrepreneurial mentality and integrated corporate entrepreneurial culture.” (Romanovskiy & Romanovska, 2020).

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 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:

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

State measures should also ensure that:

- a) capital inflows to innovative development of higher education;

- b) a high level of innovation is required;
- c) training a sufficient number of engineers, scientists and management personnel;
- d) 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. 3):

1. To determine the technological and economic main goals, and develop 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



Fig. 3. The most important tasks of the state in the management of innovation activities in the field of higher education and science

concept of innovative development of society by the "triple helix" model (Etzkowitz, 2003; 2008; 2019; Viale & Etzkowitz, 2010; [Dzisah & Etzkowitz](#), 2012; Parveen et al., (2015) ; Cadorin et al., 2019).

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 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. The authors argue that innovations in the field of higher education and science must link to lead to innovative changes. It is reasonable to consider HEI's 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.

Innovations in higher education and science can lead to innovative change. These can be innovations of the following types (Fig. 4): economic and market; technological; organizational; structural and pedagogical; educational and pedagogical.

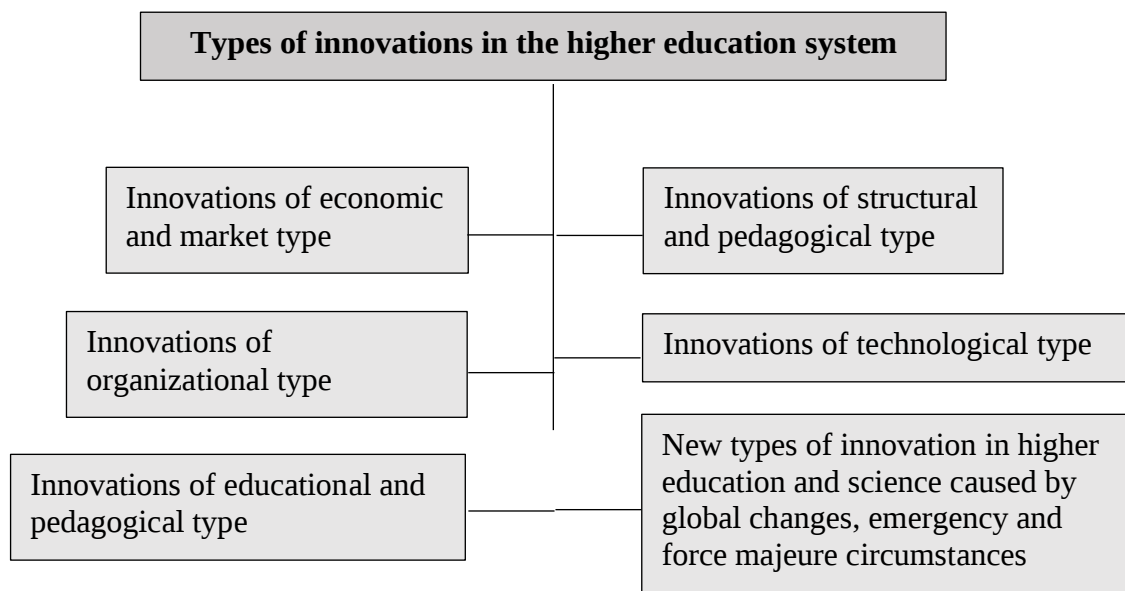


Fig. 4. Types of innovations in the higher education system that can lead to innovative changes

Most of them are either directly or indirectly initiated by academic capitalism.

The authors determined that *“Innovations of economic and market type* (Fig. 5) united novations caused by the scientific, technical, industrial, and economic development of society and the spread of market economic relations in all areas of socio-economic activity of mankind, the commercialization of educational and scientific and technical activities of HEI and all higher education (*innovations of economic and industrial development, depending on market requirements*).” (Romanovskii, 2012).

Economic and market innovations include such innovations that allow reducing the budget funding for higher education and science to obtain the necessary resources not only for survival but also for the prosperity of HEI. They are:

1. New forms and types of financing of education and crediting of educational services, educational institutions of various types, statutory (including – educational, R&D, technological and cultural) activity of educational institutions; diversification of funding sources; formation of various funds, grants, endowment institute.

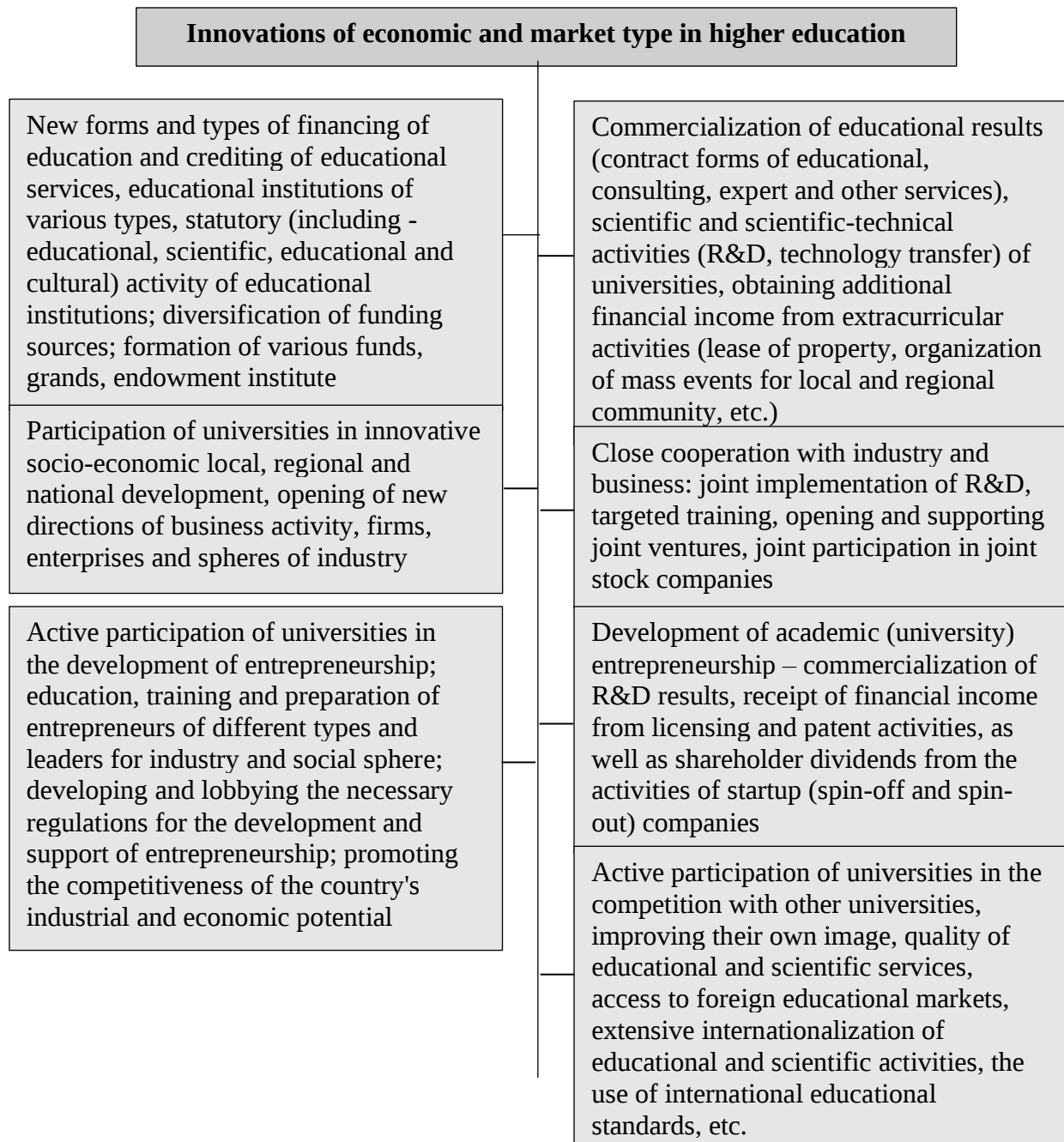


Fig. 5. Innovations of economic and market type in higher education

2. Commercialization of educational results (contract forms of education, educational, consulting, expert, and other services), scientific and scientific-technical activities (R&D, transfer of technology) HEI, obtaining additional financial income from extracurricular activities (lease of property, organization of mass activities for local and regional communities, etc.).
3. Participation of HEI in innovative socio-economic local, regional and national development, the opening of new directions of business activity, enterprises, and spheres of industry.
4. Close cooperation with industry and business: joint implementation of R&D, targeted training, opening, and supporting joint ventures, joint participation in joint-stock companies.
5. Active participation of HEI in business development; education, training and preparation of entrepreneurs of different types and leaders for industry and social sphere; developing and lobbying the necessary regulations for the development and support of entrepreneurship;

promoting the competitiveness of the country's industrial and economic potential.

6. Development of academic (university) entrepreneurship - commercialization of R&D results, receipt of financial income from licensing and patent activities, as well as shareholder dividends from the activities of startup (spin-off and spin-out) companies.

7. Active participation of HEI in competition with other HEIs, improvement of own image, quality of educational and scientific services, access to foreign educational markets, wide internationalization of educational and scientific activity, use of international educational standards, etc.

Note that *innovations in economic and industrial development, dependent on market requirements*, are the most painful, debatable, and unacceptable for a significant number of educators and scientists. The intrusion of market mechanisms into the academic sphere contradicts in many respects the notion of “pure science and education”, which are independent of financial interventions and financial pressure. However, it is also clear that in the context of total commercialization of all spheres of human life, global financial crises, and the constant reduction of funding for science and education (and especially higher education), the question of “to be or not to be” really faces a significant number of HEIs and research institutions, and also a large number of educators and scientists in all countries of the world. In those countries where education and science are supported, the necessary conditions have already been created for their civilized alternative financial support.

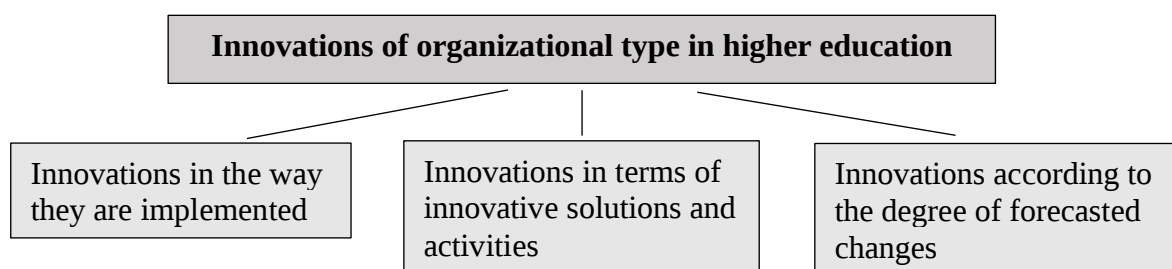


Fig. 6. Innovations of organizational type in the higher education system

The authors emphasize that “*Innovations of technological type* are innovations in the system of education and pedagogical activities caused by the development of science and technology, search and acquisition of new knowledge, dissemination (transfer) and introduction of new knowledge and new technologies, application of innovative information technologies, computer equipment, remote forms of training, web design, use of information and communication networks, Internet and Intranet, information and innovation management, as well as innovation marketing (*innovations of scientific and technological progress*).

Innovations of organizational type (Fig. 6) are:

a) planned, systematic, periodic, urgent, sudden, spontaneous, random innovations (innovations in the way they are implemented); b) innovations local, mass, global, etc. (innovations in the scope of innovative solutions and activities); c) innovations that correct, modify, improve, modernize, radical, revolutionary, etc. (innovations according to the degree of predicted changes).

Innovations of educational and pedagogical type (Fig. 7) are:

a) innovations in the educational process, training course, in the field of education, at the level of the education system, in the management of the educational process (education), etc. (*innovations in the pedagogical process*);
b)

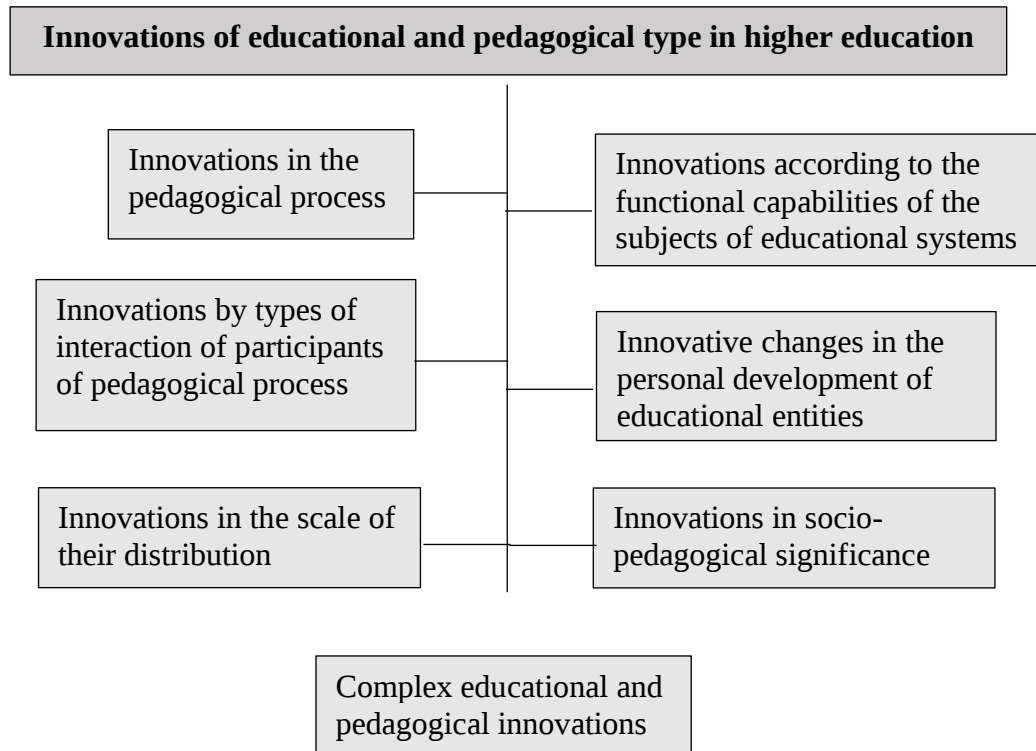


Fig. 7. Innovations of educational and pedagogical type in the system of higher education

- c) innovations in the educational process, training course, in the field of education, at the level of the education system, in the management of the educational process (education), etc. (*innovations in the pedagogical process*);
- d) innovations in collective and group education, in individual types of education (under the guidance of a teacher), tutoring, alternative, family education, etc. (*innovations by types of interaction of participants in the pedagogical process*);
- e) innovations in the development of certain abilities of students, teachers, educators, namely: development and improvement of their knowledge, skills, abilities, competencies, etc. (*innovative changes in the personal development of educational entities*);
- f) innovations-conditions that ensure the renewal of the educational environment, socio-cultural conditions, etc.; innovations-educational products (pedagogical tools, projects, technologies, etc.); managerial innovations – new solutions in the structure of educational systems and management procedures that ensure their functioning (*innovations in the functionality of the subjects of educational systems*);
- g) innovations in the activities of one teacher, methodological association of teachers, at school, in a group of schools, in the region, at the state level, at the international level, etc. Innovations in the activity of one HEI teacher, faculty and of all HEI, all HEI of the region, state, at the level of the system of international higher education (*innovations on the scale of their distribution*);
- h) innovations that combine different types of pedagogical innovations in the education system and are innovations in educational institutions of a certain type, for specific professional and typological groups of teachers (*innovations in socio-pedagogical significance*);
- i) innovations that combine different types of pedagogical innovations in the education system (*comprehensive educational and pedagogical innovations*).” (Romanovskii, 2012).

The authors defined that "*Innovations of structural and pedagogical type* are innovations in the formation of goals, objectives, and content of education (teaching and education), informs, methods, techniques, in learning technologies, in teaching aids, in the diagnostic system, in control, in the evaluation of results, etc. (*innovations in the structural elements of educational systems*).

Innovative information technologies, information and innovation management, as well as innovative marketing are widely used in the management of innovation in education and uniting in the group of means and tools for innovation management in education." (Romanovskii, 2012). (Means and tools for innovation management in education are given in Fig. 8).

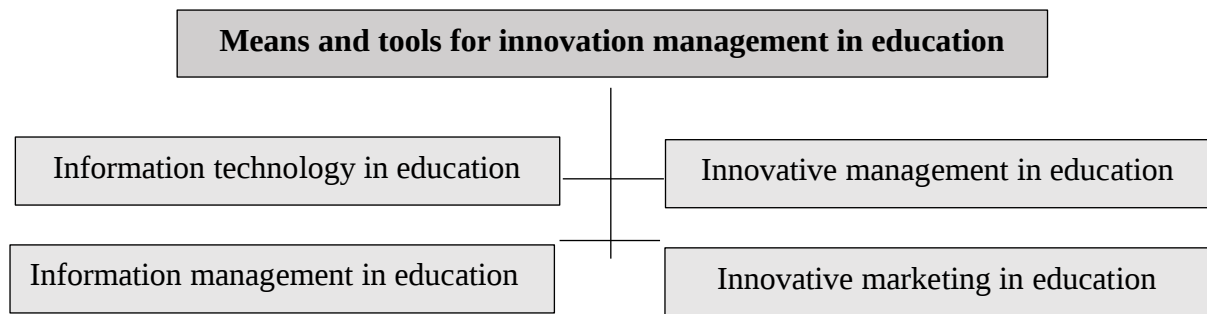


Fig.8. Means and tools for innovation management in education

They can take place in almost "all types of the above pedagogical innovations in the education system, which can lead to innovative changes to achieve new quantitative and qualitative parameters of education.

Information technologies in education use computer technology, Internet and Intranet, remote methods of organization and management of educational activities, are used to develop a variety of information retrieval systems and information, advertising, and marketing materials (using web design).

Information management in education, based on the use of information technology, is a subsystem of decision-making and aims to manage the processes of creation, processing, and distribution of information in the field of education. One of the main functions of information management in the field of education is to develop an organizational structure that would provide timely and objective information in the right place, at the right time, and in a convenient way to make effective decisions. The introduction of information management in education is dictated by the following circumstances: scientific and technical development of society, integration and effective use of funds for development, application and effective use of information technology (set of information resources, tools, methods, and technologies that contribute to the effective management of educational activities). including – development and implementation of management decisions in the field of education); the need to integrate all the data that determine the efficiency and effectiveness of the education system as a whole and each of the educational entities (its components)." (Romanovskii, 2012).

Innovative management in education "is a system of strategic management of innovation processes in order to study the main directions of educational, scientific, technical, and industrial activities and justify a set of measures for the implementation of innovation strategy. Its tasks are:

- a) development of plans and programs of innovative activities in the field of education;
- b) development and implementation of a unified innovation policy in the field of education;
- c) training of scientific and pedagogical specialists and providing all areas of educational activities;
- d) providing educational activities with the necessary resources (material, labor, financial, information);
- e) planning and selection of the best projects of educational innovations (innovations) and control over its development;

f) creation of special groups of management and control over innovation activities in the field of education at all stages.

Innovative marketing in education ensures the effectiveness of the educational system and educational institutions in the market of innovations in education, aimed at forming or identifying demand for educational services in order to best meet market demands and the needs of society. Innovative marketing is based on the use of new ideas for educational services and technologies that best contribute to achieving the goals of the education system and individual educational institutions.

Innovative marketing in education is a function of innovation management in education. It begins with the search for new ideas for educational services and technologies that can best meet existing and potential demands with their subsequent materialization and commercialization and ends with the stage of saturating the life cycle of innovation. Carrying out marketing researches is necessary for the purpose: studying a conjuncture of the market of educational services; identification of inquiries, tastes, and preferences of consumers of educational services; forecasting the dynamics of demand for educational innovations; developing a marketing strategy for innovation in education, etc.

The purpose of innovative marketing in the field of education is to achieve the final practical result of innovation. It is focused on: gaining a certain market share of educational innovations in accordance with the long-term goal for which the innovative project was developed; integrating research, production, and marketing activities into the educational management system; the long-term perspective, which requires marketing research, obtaining on their basis innovations that ensure highly efficient economic activity in the field of education, adapting to the requirements of potential consumers of innovation in education with a simultaneous targeted impact on their interests.” (Romanovskii, 2012). Let us consider in more detail the content of innovations of the types discussed above, as well as some possible areas of practical innovation in higher education and science.

Innovations of scientific and technological progress. These “may include: a) use of information technologies in the process of innovation management of the education system (including – HEI as a subject of the higher education system): information and innovation management, as well as innovation marketing; b) organization of distance learning – implementation of distance courses (disciplines, subjects from the curriculum), automated control of students' knowledge (testing), teleconferences and Internet conferences and seminars based on online information technologies, software platforms such as Blackboard, etc., use of local intranet communication systems, etc.; c) use of information technology in the educational process: learning web design and the use of IT technology in professional activities, including e-business, automation of research and design, automation of decision-making and production processes, information technology in business, management, marketing, etc.; d) organization of distance learning courses according to the scheme: invitation of foreign specialists – teachers of foreign HEI for teaching (reading) introductory (instructional) lectures → distance learning of the discipline (course) → remote 3-4 intermediate tests in the presence of a dean's representative → conducting the final exam according to the course (subject) - remotely, in the presence of the dean (deputy dean) → remote assessment → enrollment (entry) of the assessment in the electronic record book (transcript) of the student; e) the use of the latest methods and technologies in the implementation of universities and other HEI and research institutes of basic and applied research; search, comprehension, and dissemination of new knowledge; design and construction of new equipment; development and transfer of new advanced technologies; implementation of R&D results for local (local), regional and national socio-economic innovation development; f) creation and launch of new spin-off and startup companies by research business universities.” (Romanovskii, 2012).

Innovations in the structural elements of educational systems.

“The main purpose of such innovations is the training (education and upbringing) of a modern specialist of international level, who: is fluent in the national, state (Ukrainian) language, foreign languages – English and second (European or Eastern), Russian; has the necessary professional knowledge and skills; can use a computer, information technology, and software; can work in a team; have high moral and ethical principles and humanistic beliefs; focused on a healthy lifestyle and environmental behavior; patriotic and ready for integration into the international community.

The following new progressive tendencies in forms, methods, receptions, and technologies of training are important for improvement and increase of efficiency of experts training:

- a) organization of included training – study abroad: study of courses according to the curricula of American or other foreign HEI, theoretical and practical (industrial) internship in foreign (abroad) and joint (with foreign and Ukrainian capital) companies, firms, corporations, financial institutions, enterprises;
- b) organization of international theoretical and practical seminars for students, scientists, teachers, and staff on business management, the role of leadership in socio-political life, and economic activity of the world with the invitation of foreign experts;
- c) invitation of specialists from foreign countries to deliver individual lectures, lecture series, and teach courses according to the curriculum in English or other languages.

The practice of combining different types of HEI in training, research and production complexes, and technology parks is also very important for the integration of scientific, pedagogical and logistical potential, and the introduction of innovations in education, science, and technology, development of new technologies, and new knowledge.” (Romanovskii, 2012).

The authors also highlight innovations related to the pedagogical and educational processes. *“Innovations in the pedagogical process.* Such innovations include:

- a) introduction of a system of credit-module training, intermediate (3-4 times during the semester) testing for each course (discipline) with the issuance of an integrated assessment for the entire passed (mastered) course (discipline).
- b) maintaining an electronic transcript (transcript) of each student, abandonment of the practice of *rearranging* unsatisfactory grades (scores) from exams (exams, tests, tests) with the right to re-listen to the course (discipline).
- c) organization of the educational process on the principles of interdisciplinarity and multidisciplinary. This allows HEI students to plan their workload and time in such a way as to gain more useful knowledge, to choose at will those additional courses (disciplines) in which there is a need, to receive (if necessary) a related (second) profession (specialization).

Innovations by types of interaction of participants of the pedagogical process. The use of the latest information technologies, Internet and Intranet networks, distance learning systems in HEI lead to the reformatting of the division of students from academic study groups, courses (in their usual sense) into virtual temporary units (individual choice of students). Depending on the students' choice, they can study remotely or individually (individually) or in a group (collectively). You can study remotely both at HEI and at home.

Innovative changes in the personal development of educational entities. This type of innovation includes new forms and methods of testing the knowledge, skills, and abilities of pupils, students, teachers; continuous improvement of knowledge of HEI graduates, employees, and teachers through continuous training and professional development throughout life; organization of systematic exchange of students and teachers between domestic and foreign HEI, as well as - exchange of HEI experience of different countries; invitations for teaching activities - lectures, seminars and workshops of famous

scientists, specialists in various fields of economics, successful entrepreneurs; organization of theoretical and practical training of students in real conditions of economics, research and economic activity.

Innovations in the functionality of educational systems.

Innovations-conditions that ensure the renewal of the educational environment, socio-cultural conditions, innovations-educational products, and management innovations may include:

- a) organization of the educational process according to the curricula of leading HEI economically developed countries. From business – entrepreneurship, marketing, and management (including management in the field of international business) – primarily in the American BBA and MBA programs, as well as curricula and HEI programs of other countries (UK, Germany, France, Spain, Scandinavia countries, Benelux countries, etc.);
- b) combining Ukrainian standard curricula with the curricula of leading foreign HEIs in order to integrate the best achievements of domestic and foreign higher education systems in a specific field of knowledge, science, and technology;
- c) democratization of the educational process, providing students with greater opportunities for free choice of disciplines from the curriculum, expanding the list of disciplines of free choice of students and HEI in the curriculum;
- d) involvement of student assets of HEI and the public in the process of improving the educational process and statutory activities of the institution.

Innovations in the scale of their distribution. It is desirable to innovate in the activities of each teacher of a particular educational institution, and all educational institutions: in the region, at the state level, at the international level (innovations and innovations in the activities of each HEI teacher, faculty, all HEI, all HEI region, state, at the level of the international higher education system).

Innovations in socio-pedagogical significance. Important at the present stage of globalization of the world economy and social globalization processes is the creation of innovative international temporary teams of teachers. This primarily applies to Ukrainian HEIs. Invitation of well-known specialists in various fields of knowledge, science, and technology will improve the quality of the educational process, encourage students to learn English (international language of business, science, and technology) and other foreign languages, allow them to communicate freely with colleagues from abroad, read foreign literature in the original, independently study the world's scientific and technological achievements.

The complex or *comprehensive educational and pedagogical innovations* that combine different types of pedagogical innovations in the education system include creation of innovative educational institutions: virtual HEI; open HEI; international (joint) institutions, including – institutions of international education; creation of international education programs, based on a combination of foreign and domestic curricula and programs with teaching disciplines in both native, national language and foreign (English or other) language; creation of innovative educational programs based on interdisciplinary and multidisciplinary curricula, new information technologies, distance and open learning, individualization and intensification of learning.” (Romanovskii, 2012).

Innovations in the way they are implemented. It is advisable to carry out planned, systematic, and periodic educational innovations, namely:

- a) introduce new technologies, develop new and improve basic educational technologies, organize the educational process and research activities in HEI;
- b) develop new forms, methods, and content of education, respond flexibly to the demands of social development, the market of educational services, the requirements of economics and production.

The following innovations are also important.

“Innovations in terms of innovative solutions and activities. Innovations should take place both in individual departments of educational institutions and in educational institutions as a whole. Innovations in public, municipal, and private HEIs contribute to the spread of innovations throughout the education system.

As for *innovations according to the degree of forecasted changes*, all types of innovations that lead to the further development of science and technology, the formation of a modern specialist of international level are necessary.

Innovations of economic and industrial development, depending on market requirements, create new opportunities, forms, and sources for further development and support of the education system, its structural components, the opening of new specialties, professions in educational institutions, promote compliance of education, research, and educational-cultural services to the market needs of society. These include:

- a) participation of private capital in the creation and financing of educational institutions of various levels, educational and research programs, lending to students and researchers;
- b) creation of new (own) educational institutions for corporations, companies, productions, and enterprises in vocational training, advanced training, provision of related professions;
- c) creation of the latest training, research, and production complexes (with the participation of various types of HEI, research institutions, and industrial enterprises), technology parks, etc.;
- d) development of academic (university) entrepreneurship: interest and stimulation of teachers and scientists to carry out research, discoveries and inventions, disclosure of information on the results of R&D, their patenting and licensing for further practical implementation;
- e) commercialization of educational results: contractual forms of providing educational, consulting, expert, and other professional services;
- f) commercialization of the results of scientific and scientific-technical activity of HEI through patenting and licensing of discoveries, inventions, other important results of R&D; technology transfer; formation and launch together with industrial enterprises (business structures) of new companies (spin-off, spin-out, startup), etc.” (Romanovskii, 2012).

It is also worth emphasizing that these innovations can be of the following types:

- a) radical (basic) innovations – revolutionary changes in the development of technology and society, the formation of new industries;
- b) increasing, modifying innovations – improving the properties of existing equipment, technologies, and services.

From the above, we can conclude that “innovation in higher education is a process of creating, implementing and disseminating in the practice of higher education new ideas, tools, scientific, pedagogical, organizational and managerial and economic methods and technologies, which increase the achievement of structural components of the higher education system and its transition to a qualitatively higher level. This activity is aimed at building a knowledge society with an innovation-oriented type of economy and is related to formation and accumulation of new knowledge; use and commercialization of research and development results; transformation of scientific research and development, other scientific and technological achievements into new or improved products, technologies, services introduced to the market, into new or improved technological processes used in practice, or new approaches to social services; formation of intellectual and formation of human capital; the use of new tools, methods, and technologies to accelerate the economic growth of society.” (Romanovskiy & Romanovska, 2020).

From this point of view, innovative activities in the field of higher education, science, educational, scientific, and cultural services have a socio-economic essence, combines a set of organizational, economic, and social actions aimed at creating a knowledge society with the innovation-oriented type of economy. Such innovative activity is associated with the formation, capitalization, and commercialization of intellectual products – knowledge, technology, educational and scientific services, etc. and is one that should develop faster, contributing to real reform and renewal of education according to new requirements, demands, and challenges of society and time. One of its most important components is the innovative activity of entrepreneurial universities, which is essentially “academic” or university entrepreneurship, characteristic of the new capitalist environment – “academic capitalism”.

Information technologies and information management in higher education and science are the most important components of means and tools for innovation management in education. It is the distance learning methods and online learning technologies implemented with the help of the Internet that allowed all of humanity to maintain the possibility of communication and created the conditions for communication during the COVID-19 pandemic. Specialists of the higher education system, science and engineers, and technologists in a short time created and implemented innovative methods of online communication and online management, which saved the world economy and helped the world community to overcome the problems with COVID-19 and recover.

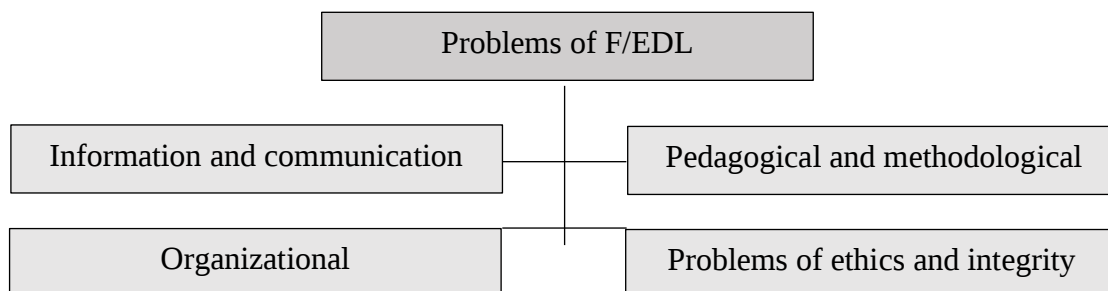


Fig. 9. Problems of the forced or emergency distance learning

New types of innovation in higher education and science are caused by global changes, emergency 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 ([Coronavirus and Higher Education Resources](#), 2020; [Guidance for Interruptions of Study Related to Coronavirus \(COVID-19\)](#), 2020; Grajek, 2020; Hodges et al. 2020). 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 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 online courses and distance teaching (training by professors) and

distance learning (studying by students) of these courses. 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. 9).

6. Conclusions and recommendations

Higher education is associated with all spheres of human life because literate and trained people are needed for life. Thus, the innovation of higher education is one of the most interdisciplinary scientific and applied areas in the system of the diverse knowledge of mankind.

Innovative activity in the field of higher education and science leads to serious innovative transformations both in the entire field of higher education and science and in its subjects – universities, research institutes, and related organizations and institutions. Innovation activities, initiated and directed by academic capitalism in the field of higher education and science, are primarily aimed at commercializing the results and expanding the economic activity of universities and research institutes, and only with a focus on social and socio-humanitarian problems of society. The state initiatives in the field of innovative management of higher education and science in each country are designed to strengthen the social, non-profit component of innovation in this area.

Further expedient research in the field of innovation in higher education is the study of the “human factor” during the period of innovation, namely: innovation policy, innovation relations, and innovation culture of subjects of higher education and science. The study of innovation in this area can be interesting and useful for a wide range of researchers since this area includes all higher educational institutions, scientific institutions, and organizations, as well as legal entities involved in the educational and scientific sphere. It should be noted that the problems of innovation policy, innovation relations, and innovation culture of universities and research organizations that find themselves in the conditions of academic capitalism require careful further research. And the formation of a corporate innovative culture of employees of all levels of higher education and science in the conditions of academic capitalism can be decisive in the implementation of the necessary innovative changes.

Reference

- Altbach, F. (2008) The complex roles of universities in the period of globalization. *Higher Education in the World* 3, pp. 5–14. URL: https://www.researchgate.net/publication/277128834_The_complex_roles_of_universities_in_the_period_of_globalization/stats.
- Baregheh, A., Rowley, J., & Sambrook, S. (2009) “Towards a multidisciplinary definition of innovation”. *Management Decision*. 47(8): 1323–1339. URL: https://www.researchgate.net/publication/41104662_Towards_a_Multidisciplinary_Definition_of_Innovation.
- Blass, E., & Hayward, P. (2014) Innovation in higher education; will there be a role for “the academe/university” in 2025? *European Journal of Futures Research*, 2(1), 9 p. URL: https://www.researchgate.net/publication/271632090_Innovation_in_higher_education_will_there_be_a_role_for_the_academeuniversity_in_2025.
- Blok, V., & Lemmens, P. (2015) [The Emerging Concept of Responsible Innovation. Three Reasons Why It Is Questionable and Calls for a Radical Transformation of the Concept of Innovation](#). Responsible innovation 2: Concepts, Approaches and Applications. Chapter 2. *Springer International Publishing*, pp. 19–35. URL: https://www.researchgate.net/publication/274085469_The_Emerging_Concept_of_Responsible_Innovation_Three_Reasons_Why_It_Is_Questionable_and_Calls_for_a_Radical_Transformation_of_the_Concept_of_Innovation

- [Blouin](#), R.A., [Riffée](#), W.H., [Robinson](#), E.T., [Beck](#), D.E., [Green](#), C., [Joyner](#), P.U., [Persky](#), A.M., & [Pollack](#), G.M. (2009) Roles of Innovation in Education Delivery. *Am J Pharm Educ.*, 73(8), 154. URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2828315/>.
- [Bower](#), J.L., & [Christensen](#), C.M. (1995) *Disruptive Technologies: Catching the Wave*. Harvard Business Review (January–February). URL: <https://hbr.org/1995/01/disruptive-technologies-catching-the-wave?registration=success>
- [Bouwer](#), L. (2015) Capabilities-Driven Innovation Management Framework: Crossing the Innovator's Chasm. Conference: International Association for Management of Technology 2015. Cape Town, South Africa. URL: https://www.researchgate.net/publication/278016420_Capabilities-Driven_Innovation_Management_Framework_Crossing_the_Innovator's_Chasm
- [Bouwer](#), L. (2017) The Innovation Management Theory Evolution Map (Working Paper). Innovation Management Research Institute (IMRI), 7 April. URL: https://www.academia.edu/32687747/The_Innovation_Management_Theory_Evolution_Map
- [Branch](#), J., [Hørsted](#), A., & [Nygaard](#), C. (2018) New Innovations in Teaching and Learning in Higher Education (Learning in Higher Education series). Libri Publishing, 480 p.
- [Cadorin](#), E., [Klofsten](#), M., [Albahari](#), A., & [Etzkowitz](#), H. (2019) Science Parks and the Attraction of Talents: Activities and Challenges / [Eduardo Cadorin](#), [Magnus Klofsten](#), [Alberto Albahari](#), [Henry Etzkowitz](#) // *Triple Helix Journal*, September 2019, Pp.: 1-33. URL: https://www.researchgate.net/publication/336278817_Science_Parks_and_the_Attraction_of_Talents_Activities_and_Challenges.
- [Chen](#), J., [Viardot](#), E., & [Brem](#), A. (2019) Innovation and innovation management. The Routledge Companion To Innovation Management, Routledge, pp. 3-36. URL: https://www.researchgate.net/publication/331189067_Innovation_and_innovation_management
- [Clark](#), B.R. (1998) Creating Entrepreneurial Universities: Organizational Pathways of Transformations. Oxford, Pergamon-Elsevier Science, 180 p.
- [Clark](#), B.R. (2000) Collegial Entrepreneurialism in Proactive Universities: Lessons from Europe. Change: The Magazine of Higher Learning, 32(1), 10-19. URL: <https://www.tandfonline.com/doi/abs/10.1080/00091380009602704>.
- [Clark](#), B.R. (2004) Sustaining Change in Universities. Continuities in Case Studies and Concepts. The Society for Research into Higher Education & Open University Press, England, McGraw-Hill, 232 p.
- [Copridge](#), K.W., [Uttamchandani](#), S., & [Birdwell](#), T. (2021) Faculty Reflections of Pedagogical Transformation in Active Learning Classrooms. *Innovative Higher Education*, 46 (2), 205-221. URL: <https://link.springer.com/article/10.1007/s10755-021-09544-y>
- [Coronavirus and Higher Education Resources](#) (2020) *Bryan Alexander blog*, March 17. URL: <https://bryanalexander.org/coronavirus/coronavirus-and-higher-education-resources/>. Retrieved 30.11.2020.
- [Damanpour](#), F. (2020) Organizational Innovation: Theory, Research, and Direction. Rutgers University, USA, EdgarOnline Business Collections. URL: https://www.researchgate.net/publication/342788468_Organizational_Innovation_Theory_Research_and_Direction
- [Devyatkina](#), M.A., [Miroshnikova](#), T.A., [Petrova](#), Yu.I. et al. (2006) Innovatsionnaya politika vysshego uchebnogo zavedeniya [Innovation policy of higher education institutions]. Moscow, Publ. ZAO "Izdatelstvo "Ekonomika", 178 p. (In Russ.) URL: <http://www.economizdat.ru/shop/product/400>
- [Drucker](#), P. (2002) "The Discipline of Innovation." *Harvard Business Review*. August 2002. URL: <https://hbr.org/2002/08/the-discipline-of-innovation>.
- [Dzisah](#), J., & [Etzkowitz](#), H. (2012) The Age of Knowledge: The Dynamics of Universities, Science and Societies. Leiden-Boston, Brill, 360 p.
- [Edison](#), H., [Ali](#), N.B., & [Torkar](#), R. (2014) Towards innovation measurement in the software industry. *Journal of Systems and Software*, 86(5), 1390–1407. URL: <https://torkar.github.io/pdfs/jss-edisonNT13.pdf>.
- [Etzkowitz](#), H. (2003) Innovation in Innovation: The Triple Helix of University-Industry-Government Relations. *Social Science Information*, 42(3), 293-337. URL: https://www.researchgate.net/publication/249733214_Innovation_in_Innovation_The_Triple_Helix_of_University-Industry-Government_Relations.
- [Etzkowitz](#), H. (2008) The Triple Helix: University-Industry-Government Innovation in Action. New York & London: Routledge, Taylor & Francis Group, 164 p.
- [Etzkowitz](#), H. (2019) Is Silicon Valley a global model or unique anomaly? *Industry and Higher Education*, 33(2), 83-95. URL: <https://journals.sagepub.com/doi/abs/10.1177/0950422218817734>.

- Ezell, S. (2019) The Bayh-Dole Act's Vital Importance to the U.S. Life-Sciences Innovation System *Information Technology and Innovation Foundation (ITIF)*, March 4. URL: <https://itif.org/publications/2019/03/04/bayh-dole-acts-vital-importance-us-life-sciences-innovation-system#:~:text=The%20Bayh%2DDole%20Act%2C%20signed,used%20to%20control%20drug%20price> .
- Fagerberg, J. (2008) A Guide to Schumpeter, pp. 20-22. URL: https://www.researchgate.net/publication/270794018_A_Guide_to_Schumpeter .
- Grajek, S. (2020) How Colleges and Universities Are Driving to Digital Transformation Today / by Susan Grajek, *EDUCAUSE Review* Special Report (January 27, 2020) URL: <https://er.educause.edu/articles/2020/1/how-colleges-and-universities-are-driving-to-digital-transformation-today> .
- Guidance for Interruptions of Study Related to Coronavirus (COVID-19) (2020) *Federal Student Aid, Information for Financial Aid Professionals (IFAP)*, March 20. URL: <https://ifap.ed.gov/electronic-announcements/030520Guidance4interruptionsrelated2CoronavirusCOVID19> . Retrieved 29.11.2020.
- Hackett E.J. (1990) Science as a vocation in 1990s: The changing organizational culture of academic science. *Journal of Higher Education*, 61(3), 241-77. URL: <https://www.tandfonline.com/doi/abs/10.1080/00221546.1990.11780710>
- Haddawy, P., & Igel B. (2006) Fostering Innovation in Higher Education https://www.researchgate.net/publication/228862454_Fostering_Innovation_in_Higher_Education . Retrieved 11.01.2021.
- Henderson, R M., & Clark, K.B. (1990) Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. *Administrative Science Quarterly*. 35(1), 9. URL: https://www.jstor.org/stable/2393549?read-now=1&refreqid=excelsior%3Adcdd4a70be00a1fc9b085add516785d7&seq=2#page_scan_tab_contents
- Hodges, C., Moore, S., Locke, B., Trust, T., & Bond, A. (2020) The Difference Between Emergency Remote Teaching and Online Learning. *EDUCAUSE Review*. March 27. URL: <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning> . Retrieved 29.11.2020.
- Jakovljevic, M. (2018) A model for innovation in higher education. *South African Journal of Higher Education*, 32(4), 109-131. URL: <https://www.journals.ac.za/index.php/sajhe/article/view/2432>.
- Jessop, B. (2018) On academic capitalism. *Critical Policy Studies*, 12(1), 104-109. URL: <https://doi.org/10.1080/19460171.2017.1403342>
- Khutorskoy A.V. (2005) *Pedagogicheskaya innovatika: metodologiya. teoriya. praktika: Nauchnoye izdaniye [Pedagogical innovation: methodology, theory, practice: scientific publication]*. Moscow, Publ. UNTs DO, 222 p. (in Russ.) URL: http://www.khutorskoy.ru/books/2005/ped_innovat/index.htm .
- Layne, P.C., & Lake, P. (2019) *Global Innovation of Teaching and Learning in Higher Education: Transgressing Boundaries (Professional Learning and Development in Schools and Higher Education)*. Springer, 369 p.
- Leslie L., Oaxaca R., & Rhoades G. (2001) Technology Transfer and Academic Capitalism. *AAAS Science and Technology Policy Yearbook*. pp. 261-277.
- McCowan, T. (2017) Higher education, unbundling, and the end of the university as we know it, *Oxford Review of Education*, v. 43, i. 6, p. 733-748. July, 2017. URL: <https://doi.org/10.1080/03054985.2017.1343712>
- Mandel B. R. (2018) *Sovremennyye problemy pedagogicheskoy nauki i obrazovaniya: uchebnoye posobiye dlya obuchayushchikhsya v magistrature [Modern problems of pedagogical science and education: a textbook for students in the master's program]*. Moscow, Berlin, Direkt-Media. 303 p. (in Russ.). URL: https://fileskachat.com/download/68276_b6072fc79f34bf6c7e05bde5042371cc.html
- Mayhew, M.J, Selznick, B., Zhang, L., Barnes, A., & Mangia, S. (2021) Teaching Innovation Capacities in Undergraduate Leadership Courses: The Influence of a Short-Term Pedagogical Intervention *The Journal of Higher Education* <https://www.tandfonline.com/doi/pdf/10.1080/00221546.2021.1876480?needAccess=true>
- Mazzioni, S., Magro, C.B.D., Pico, J.D., & Johann, G.B. (2021) The Power of Innovation on Performance and Socio-Environmental Sustainability. *International Journal for Innovation Education and Research*, 9(5), 515-533. URL: <https://www.ijer.net/ijer/article/view/3119/2145>
- Mensch, G. (1979) *Stalemate in technology : innovations overcome the depression*. – Cambridge, Mass.: Ballinger Pub. Co., 241 p.
- Muftahu, M., & Jamil, H. (2021) Sustainable knowledge flow and innovation in higher education: the implementation of change management in universities. *International Journal of Innovation and Sustainable Development*, 15(2). URL: <http://www.inderscience.com/offer.php?id=114328>

- Münch, R. (2020) Academic Capitalism. Oxford University Press. Published online: 09 May 2016 & 30 April 2020. URL: <https://oxfordre.com/politics/view/10.1093/acrefore/9780190228637.001.0001/acrefore-9780190228637-e-15> . Retriever 12 January 2021.
- OECD (2016) Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills, OECD Publishing, Paris, 150 p. URL: <http://www.oecd.org/education/ceri/GEIS2016-Background-document.pdf> .
- Parveen, S., Senin, A. A., & Umar, A. (2015). Organization culture and open innovation: A quadruple helix open innovation model approach. *International Journal of Economics and Financial Issues*, 5. <https://www.econjournals.com/index.php/ijefi/article/view/1399>
- Polyakov S.D. (2007) Pedagogicheskaya innovatika: ot idei do praktiki [Pedagogical innovation: from idea to practice]. Moscow, Pedagogicheskij poisk, 2007, 167 p. (in Russ.) URL: <https://www.twirpx.com/file/427278/>.
- Qureshi, M. I., Parveen, S., Abdullah, I., & Dana, L. P. (2020). Reconceptualizing the interventions of open innovation systems between the nexus of quadruple organization cultural dynamics and performance. *Quality & Quantity*, 1-21. <https://doi.org/10.1007/s11135-020-01078-3>
- Rogers, E. M. (2003) Diffusion of innovations (5th ed.). New York: Free Press, 576 p. URL: <https://books.google.com.eg/books?id=9U1K5LjUOwEC&printsec=frontcover&hl=ru#v=onepage&q&f=false> .
- Romanovskii, A. (2012) Types and features of the innovations in the system of higher education *The Kazakh-American Free University Academic Journal*, 4, 43-57. URL: <http://www.kafu-academic-journal.info/journal/4/>
- Romanovskiy, O., & Romanovska, Yu. (2020) Higher educational innovatics as the newest interdisciplinary direction of higher school and higher education science. *Interdisciplinary Studies of Complex Systems*, 17(2020), 83–101. URL: https://www.researchgate.net/publication/358111111_Higher_education_innovatics_as_the_newest_interdisciplinary_direction_of_higher_school_and_higher_education_science .
- Schiederig, T., Tietze, F., & Herstatt, C. (2012) *Green innovation in technology and innovation management – an exploratory literature review*. *R&D Management*. 42(2), 180–192. URL: <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1467-9310.2011.00672.x>
- Schumpeter, J.A. (1934) The Theory of Economic Development: An Inquiry into Profits, Capital, Credits, Interest, and the Business Cycle. Transaction Publishers, Piscataway, 255 p.
- Schumpeter, J.A. (1976) Capitalism, Socialism and Democracy. Routledge, 437 p.
- Serdyukov, P. (2017) Innovation in education: what works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning*, 10(1), 4-33. URL: <https://www.emerald.com/insight/content/doi/10.1108/JRIT-10-2016-0007/full/pdf?title=innovation-in-education-what-works-what-doesnt-and-what-to-do-about-it> .
- Slaughter, S., & Leslie, L. (1997) Academic capitalism. Politics, Policies, and the Entrepreneurial University. Baltimore, MA, The John Hopkins University Press, 276 p
- Slaughter, S., & Rhoades, G. (2009) Academic Capitalism and the New Economy. Markets, State and Higher Education. The Johns Hopkins University Press, 384 p.
- Somers, P., Davis, C., Fry, J., Jasinski L., & Lee, E. (2018) Academic capitalism and the entrepreneurial university: some perspectives from the Americas // *Rotero, Joaçoba*, v. 43, n. 1, p. 21-42, jan./abr. 2018. URL: https://www.researchgate.net/publication/324458855_Academic_capitalism_and_the_entrepreneurial_university_some_perspectives_from_the_Americas
- Stoten, D.W. (2021) Educating for future complexities in management – a vision for the future MBA. *Innovative Practice in Higher Education*, 4(2), 153-179
- Swanger, D. (2016) Innovation in Higher Education: Can Colleges Really Change? Fulton-Montgomery Community College, NY, 58 p. URL: <https://www.fmcc.edu/about/files/2016/06/Innovation-in-Higher-Education.pdf> Retrieved 10.01.2021.
- Tan, S.Y. (2021) Reflective learning? Understanding the student perspective in higher education *Educational Research*, 63(2) URL: <https://doi.org/10.1080/00131881.2021.1917303>
- Teixeira, P.N., & Shin, J.C. (2020) The International Encyclopedia of Higher Education Systems and Institutions. URL: <https://doi.org/10.1007/978-94-017-8905-9> .
- The Quest For Innovation (2006) A Global Study of Innovation Management 2006-2016. American Management Association, 86 p. URL: https://www.amanet.org/assets/1/6/hri_innovation.pdf

- Tiemey, W.G., & Lanford, M. (2016) Conceptualizing Innovation in Higher Education, 40 p. URL: https://www.researchgate.net/publication/303208037_Conceptualizing_Innovation_in_Higher_Education/stats.
- Viale, R., & Etzkowitz, H. (2010) The Capitalization of Knowledge. A Triple Helix of University–Industry–Government. Edward Elgar Publishing, 368 p.
- Vieluf S., Kaplan, D., Klieme, E., & Bayer, S. (2012) Teaching Practices and Pedagogical Innovations: Evidence from TALIS. OECD Publishing, 169 p. URL: [https://www.oecd.org/education/school/TalisCeri%202012%20\(tppi\)--Ebook.pdf](https://www.oecd.org/education/school/TalisCeri%202012%20(tppi)--Ebook.pdf)
- Vught, F. van. (1989) Governmental Strategies and Innovation in Higher Education (1989) Michigan University, Jessica Kingsley Pub., 232 p.

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