DOI: https://doi.org/10.30525/2256-0742/2024-10-4-331-342

THE INFLUENCE OF INNOVATICS OF HIGHER EDUCATION AND SCIENCE ON THE FORMATION OF A KNOWLEDGE SOCIETY IN UKRAINE

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Abstract. The *subject* of this research is to present and describe the impact of the mechanisms of higher education and science innovatics on the formation of the knowledge society in Ukraine. The *purpose* of this study is to analyse the pivotal role of higher education and science innovatics in the formation of a knowledge society in Ukraine, encompassing both the information and innovation societies. The research *methodology* employed in this study is based on an objective, standardised approach to the analysis of factual data on innovation activities in the field of higher education and science. This includes the development and implementation of innovation policy in higher education systems and in the world's leading universities, the latest published results of experiments, as well as materials from sources of scientific literature on innovation policy and innovation management in the field of building information and innovation societies interconnected with the knowledge society. *Results*. The authors formulate the necessary and sufficient conditions for rebuilding a knowledge society in Ukraine. The necessary conditions include the following: consolidation of all existing political forces in Ukraine, civil society and every individual around the idea of building a knowledge society in the country and overcoming significant corruption in all echelons of power; formation of public intolerance to manifestations of corruption and bribery by officials and all members of society. The accelerated post-war reconstruction and further development of Ukraine's industrial, production facilities, and economic infrastructure led to an expansion of the influence of the market economy on economic and social reforms. Furthermore, the advancement of science and education, along with the enhancement of the intellectual capacity of the Ukrainian population, has led to the creation and implementation of effective scientific and technical theoretical, methodological, and practical tools for the innovative development of higher education and science. Among the sufficient conditions are the following: a developed industrial and economic infrastructure, a developed intellectual civil society, a developed and flexible legal system, and a developed information and innovation base of society. The article also shows that in Ukrainian society, higher education and science are not only branches (spheres) of the national economy, but also human-oriented socio-economic processes that have social and economic components. It is therefore evident that the innovatics within higher education and science have a considerable influence on the country's socio-economic development. *Conclusion*. The article presents an overview of the areas in which innovative changes in higher education and science are taking place, influencing the formation of a knowledge society in Ukraine. These areas are of interest for further research and development in this sphere.

Keywords: knowledge society, information society, innovative society, innovatics of higher education and science, academic capitalism, academic (university) entrepreneurship.

JEL Classification: A23, I21, I25, O31, O32

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1. Introduction

For approximately three years, Ukraine has been experiencing a state of armed conflict and attempting to advance its socio-economic development. Prior to the commencement of hostilities, the Ukrainian nation had set itself the objective of establishing an innovative knowledge society. This was a challenging but crucial undertaking. The solution will facilitate Ukraine's integration into the community of economically developed states. This leads to the question of whether Ukraine has the potential to undergo a further transformation into a knowledge-based society with an innovative economy in the context of the modern global environment. Ultimately, in addition to a military victory, it is also necessary to restructure the mentality of the entire Ukrainian nation in order to successfully construct a new type of society. What is the required action for all Ukrainians in this regard? Furthermore, what prospects and opportunities exist for this in the context of modern and post-war Ukraine? It is similarly crucial to investigate the potential of innovation in higher education and science to drive and expedite transformative change in Ukrainian society, facilitating its transition into a knowledge-based economy.

This paper will briefly consider the concept of a knowledge society and its features, with a view to their construction in the context of modern Ukrainian realities. As evidenced by Phillips, Yu, Hameed, and El Akhdary (2017), the knowledge society is inextricably linked with both the innovative society and the information society. This connection is about the transformation of societies through the generation, dissemination and application of information and knowledge, with the objective of promoting innovation and economic development. Namely:

1. The term "information society" is used to describe a society in which information and communication technologies (ICT) play a significant role in social and economic activities. The concept emphasises the pervasive generation, distribution and utilisation of information.

2. The knowledge society is founded upon the information society, with a particular focus on the utilisation of information as a means of generating knowledge, innovation and social advancement. It is dependent on the advancement of education, the expansion of research, and the implementation of knowledge to address societal issues and generate economic prospects.

3. An innovative society emerges from the knowledge society, characterised by the constant creation of new ideas, products and services. It thrives on innovation, entrepreneurship and scientific growth, contributing to economic competitiveness and social transformation. The close relationship between these societies is realised in the following ways:

– The information society (Eckert, 2024) provides the infrastructure and digital tools to access and share data;
– the knowledge society Keller R. (2024) transforms this data into practical knowledge through education, research and technological advancement;
– an innovative society (Hallonsten, 2023) uses this knowledge to drive continuous innovation, economic growth and social progress.

In order to facilitate the reconstruction of a knowledge-based society in Ukraine, it is essential to establish a set of *indispensable criteria*:

1. Consolidation of all existing political forces in Ukraine, civil society and every person around the idea of building a knowledge society in the country.

2. The eradication of substantial corruption at all levels of authority, across all sectors of those in positions of influence, and the cultivation of a societal aversion to manifestations of corruption, bribery, and the abuse of office.

To do this, the following is required:
– Enshrining in the current legislation strict penalties for corruption, abuse and bribery;
– involvement of the public and the media in monitoring and highlighting the effectiveness of the application of these penalties.

3. Development of public rejection of unlawful actions related to violation of the current anti-corruption legislation.

4. The accelerated post-war reconstruction and further development of Ukraine's industrial and economic infrastructure expanded the influence of the market economy on economic and social reforms in the country.

5. Further development of science and education, improvement of the intellectual level of the population of Ukraine, creation and implementation of effective scientific and technical theoretical, methodological and practical tools for innovative development in higher education and science.

Next, the *sufficient conditions* for the formation of a knowledge society in Ukraine will be discussed:

1. Developed industrial and economic infrastructure.
2. Developed, intellectual civil society.
3. Developed and flexible legal system.
4. Developed information and innovation base of the society.

It is of the utmost importance that Ukrainian society comes to terms with the concept of an innovative knowledge society and accepts the necessity of creating an interconnected innovative economy and a knowledge economy. This will facilitate the promotion of overall economic and technological growth and development of the country. Furthermore, it is of great consequence to make considerable

efforts to implement this idea and to establish an advanced country with a high level of intelligence and production.

An innovative society is distinguished by a culture that fosters creativity and original thinking, as well as the ongoing development and implementation of novel ideas, technologies, methodologies, and techniques to address diverse scientific, technical, economic, and environmental challenges, with the objective of enhancing the quality of life. Such a society is typified by a culture that encourages and promotes creativity and original thinking across a range of activities, including technology, science, art, education, business and management. The objective is to facilitate the acquisition of new discoveries, achievements, progress and positive changes in the quality of life of society.

What should the concept of a "knowledge society" entail in the context of Ukraine?

The concept of the knowledge society is understood to describe a social model based on the transmission, creation, distribution and utilisation of knowledge within society. The concept is founded upon the indisputable significance of knowledge, information and education for the advancement and evolution of society (Van Dijk, 2020). A knowledge society is defined as a social model based on the transmission, creation, distribution and utilisation of knowledge for the benefit of all members of society (Phillips et al., 2017). In a knowledge-based society, information and knowledge become the primary resources that facilitate economic, social, and cultural advancement. This signifies a transition in focus from material resources to intellectual capital, creativity, innovation, and education, which are identified as the key drivers of growth.

The knowledge society is striving for the following:

– Support and develop the education system, encourage self-education and provide access to information for all members of society;

– support for the concept of lifelong learning and readiness to change to adapt to a rapidly changing world;

– stimulation of scientific, technical and humanitarian research, development of technologies and their application to improve people's lives and develop society;

– promotion of internationalisation of business relations, collaboration and international co-operation, networking, teamwork, exchange of ideas and co-operation between people and institutions to create and disseminate knowledge;

– recognition of the importance and value of cultural diversity, creativity and diversity of opinion in fostering innovation and development;

– protection of life on Earth, environmental protection measures, conservation of resources, maintenance of peace and mutual understanding between peoples, nations and ethnic groups.

This is precisely the vision of the "Ukrainian knowledge society" that should be realised.

The novelty of the work is that innovative changes in the system of higher education and science, studied from the perspective of market-oriented and social transformation, cover all spheres of life of the modern community and directly affect the further development of its components of interconnected societies - information, knowledge, and innovation. At the same time, the driving force behind the innovative development of the knowledge society (and the associated information and innovation societies) is the innovatics of higher education and science. Therefore, the following sequence of interrelated research topics will be considered:

1. The influence of the mechanisms of higher education and science innovatics on innovation processes in higher education and science systems.

2. The impact of the results of innovation processes in the systems of higher education and science on the formation of a new type of Ukrainian community consisting of a knowledge society combined with information and innovation societies.

2. Analysis of Recent Research and Publications

In examining the impact of innovations in higher education and science on the development of a knowledge society in Ukraine, the authors conducted an extensive review of relevant literature. Among the publications addressing the theoretical and methodological aspects of innovation in higher education and science, the following articles are particularly noteworthy. For example, Oleksandr Romanovskyi and Yuliia Romanovska (2020) put forth the proposal to introduce a novel scientific direction within the field of higher education, which they designate as the "Innovatics of Higher Education and Science" (IHE&S). In order to guarantee Ukraine's genuine European integration and enhance the scientific standard of Ukrainian higher education, it is essential to implement innovative methodologies and technologies. In order to gain a comprehensive understanding of the innovative directions of higher education reform, it is essential to establish a scientific apparatus, the IHE&S, which integrates the theoretical and practical aspects of the innovative development of the higher education and science system. The objective of the study (Romanovskyi, Romanovska, & Romanovska, 2021) is to examine the multifaceted nature of higher education as an integral component of the anthroposphere (technosphere). This entails identifying the primary fundamental objectives of innovative academic

(university) entrepreneurship, investigating the principal types of innovations instigated by academic capitalism within the higher education system, and classifying these innovations. Additionally, the study aims to ascertain the principal subjects of innovative activity within the realm of higher education and science, as well as delineating potential avenues for the continued advancement of higher education in Ukraine. The article (Romanovskyi, Romanovska, Romanovska, & El Makhdi, 2022) is dedicated to elucidating the concept of "higher education innovatics". The article goes on to analyse examples of the term "innovatics" being used in other areas and cases of application. The development of the contemporary theory of innovatics, pedagogical innovatics and innovatics as a novel set of competencies for innovative production managers is examined.

The following publications on the role of the Triple Helix in human life are of great importance for understanding the impact of university innovations on economic development in society. In evaluating the performance of the Triple Helix journal over the past three years, the authors (Amaral & Cai, 2023) observe a discernible trajectory in the direction of innovation and entrepreneurship research, with a notable shift towards: a) improvement of spiral models to better understand the behaviour of social and economic actors and, for example, how to measure three-way or more than three-dimensional relationships between them, b) development of practical and/or managerial methods and tools to improve the application of the model, c) and comparative research between countries and regions on science and technology policy, as well as innovation and entrepreneurship experiences. In publications such as Cai and Etzkowitz (2020), Cai and Amaral (2021), (2022) and Cai (2022), the theoretical and practical foundations of using the Triple Helix and other various spiral models to describe the behaviour of social and economic actors, measuring three-way or more than three-dimensional relationships between them, and their future development are considered.

In the publication (Bérubé, 2018), a prominent figure in the field of educational thought posits that the American university is mired in the past and proposes a revolutionary new approach to education in the context of the contemporary era of relentless change. As Katie N. Davidson posits in The New Education, this pedagogical approach is ill-suited to the demands of the contemporary gig economy. It should be noted that the term "gig economy" is used to describe a free-market system in which temporary positions are a common feature and organisations engage the services of independent workers for short-term assignments. From the Ivy League to community colleges, she introduces innovators who are redefining education in the modern context, with a focus on student-centred learning that values creativity in the face of change. The New Education demonstrates how students can be equipped with the skills and knowledge required to not only survive, but also to flourish in the face of future challenges.

The term 'innovation' is frequently misused and erroneously associated with the substantial alterations that typify the progression of technology and society. The objective of the authors of the paper (Cantamessa & Montagna, 2023) is to present a preliminary background on innovation as a social, economic, and technological phenomenon, its relationship with science, and the main public and private actors involved in the process. Additionally, the relationship between innovation and geography, as well as the potential negative implications of innovation from a social, ethical, and legal standpoint, are addressed in a cursory manner.

In their book (Charles, Ahoba-Sam & Manrique, 2021), the authors posit that universities occupy a distinctive and pivotal position within their respective cities and regions. They contend that these institutions serve to address the heterogeneous needs of their communities, thereby facilitating economic and social advancement. The book examines the nature of these impacts on a range of European universities in their regional contexts.

The publication (Eckert, 2024) examines the emergence of the information society within the EU policy framework. In the fight against rising unemployment in the 1990s, the EU embarked on an unprecedented job creation drive, leading to the adoption of a White Paper that introduced transformative concepts, including advocacy for a growing information society. The paper detailed the integration of ICT in various applications of public interest through telematics programmes.

In their book (Geuna & Rossi, 2017), the authors provide readers with a comprehensive understanding of the multifaceted ways in which universities contribute to economic development and growth. They elucidate the causal relationships between university activities and economic outcomes, employing up-to-date quantitative and qualitative data. They present theoretical tools and evidence to elucidate the manner and extent to which universities influence the economy, and they analyse and compare the strengths and weaknesses of specific university systems.

In light of the prevailing societal commitment to innovation and its considerable diversity, it can be argued that humanity's preoccupation with innovation, entrepreneurship and economic growth is both superficial and unsustainable. This is not a consequence of genuine innovation, which is a process that necessitates significant effort and a long-term dedication. In the view of Hallonsten (2023), the

concept of innovation has become a dominant ideology and myth, mobilised to support the drive for continuous economic growth in modern society. This paper addresses this issue and situates it within the theoretical framework of organisational sociology.

In the publication (Ibarra-Cisneros, Reyna & Hernández-Perlines, 2023), the authors note that universities are important generators and disseminators of knowledge and should also create conditions for the creation of foundations supported by knowledge activators and effective knowledge management. Concurrently, intellectual capital and innovation facilitate this process. When tasks are correctly formulated, the teaching staff and the university contribute to increased productivity. The article analyses the impact of three knowledge activators (leadership, culture and organisational incentives) on the knowledge management process.

This section (Keller, 2024) is dedicated to an examination of the role of the concept of "knowledge" in contemporary conceptualisations of the knowledge society. The thesis of altered socio-economic and cultural significance, particularly in regard to scientific, economic and professional knowledge, is considered. In addition to the aggregation of statistical data, the empirical clarifications deal primarily with the utilisation of scientific knowledge in a range of practical fields, eschewing any reference to the concepts and methodological tools of the sociology of knowledge.

In his publication, the author (Park, 2020) posits that the two principal roles of higher education institutions in the context of modern knowledge societies are the facilitation of teaching and the advancement of research. Universities and other higher education institutions have a dual role. They educate and train a qualified workforce capable of coping with the increasingly complex demands of the knowledge economy and the labour market. They also act as central institutions in the creation of new, original ideas and technologies, and continue to play a fundamental role in the production of knowledge. Consequently, higher education institutions occupy a pivotal role in the advancement of innovation and the socio-economic development of society.

The paper (Phillips, Yu, Hameed & El Akhdary, 2017) examines the emergence of the knowledge society, analysing the principal influences that shaped its conceptualisation, commencing with Karl Marx. A synthesis of these ideas allows for the characterisation of the current state and direction of the knowledge society, as well as its relationship with related concepts such as the digital economy, e-government and others. The implications for business and other organisations, as well as for society as a whole, are delineated in comprehensive detail.

In his book, Brian Rosenberg (2023) draws on decades of experience in higher education to identify the entrenched structures, practices, and cultures that impede meaningful postsecondary reform, even as institutions confront significant challenges to their financial and educational models. The book identifies the factors that impede the capacity of U.S. colleges and universities to adopt a creative and entrepreneurial approach in response to calls for improvements in affordability, access, and equity for students.

The authors of the publication (Sekhar, Chaturvedi, & Thakur, 2022) posit that the modernisation of society is concomitant with innovation in technology. They posit that Society 5.0 can be defined as an intelligent society that thrives on human-centric applications of innovative technologies, including the Internet of Things (IoT), blockchain, and artificial intelligence (AI). It is proposed that this will be the future based on Industry 4.0. The potential of Society 5.0 is promising insofar as it promises to deepen the relationship between people and technology, thereby ensuring a positive impact on all aspects of society.

The author of the publication (Stehr, 2018) posits that the advent of novel social realities necessitates the formulation of novel perspectives and responses. Concurrently, over the past couple of decades, the capacity of major social institutions, which significantly influenced the character of the 20th century, to accomplish their objectives has diminished.

In their 2017 work, Stehr and Ruser posit that knowledge has become a vital economic resource, serving as the foundation for societal economic growth.

The Network Society (Van Dijk, 2020) provides an authoritative account of the historical development, implications and future trajectory of digital communications. Furthermore, it comprises a comprehensive introduction to the functioning of new media in contemporary society. The book examines the most significant emerging issues and challenges in the contemporary digital media landscape, as well as the pivotal role of power in comprehending life in a network society. It would be beneficial to direct attention to the following areas of interest: the emergence of the "data economy", the increasing significance of artificial intelligence, big data, and robotics; the analysis of disinformation and fake news; the examination of deep fake videos; and other pertinent subjects.

The contemporary era is characterised by the prevalence of a global information economy. The growth of mass media, the expansion of information professions, and the advent of the Internet demonstrate that life in an information society is a universal phenomenon.

In his 2024 publication, Frank Webster offers a critical examination of the principal post-war approaches to information development.

The book (Wessels, Finn, Wadhwa & Sveinsdottir, 2017) examines the role of the open data movement in facilitating the transformation towards a knowledge society. The concept of a knowledge society has been evolving over the past two decades, yet the transition towards such a society has yet to be actualised in practice. The majority of discussions pertaining to the knowledge society have centred on the knowledge economy and the information society, with comparatively little attention paid to the mobilisation for a knowledge society (Sveinsdottir, Wessels, Finn & Wadhwa, 2017).

It is also noteworthy to mention the third edition of the award-winning The New Palgrave Dictionary of Economics (2018), which contains entries by some of the world's most influential economists, including 36 Nobel laureates. This is an unquestionably remarkable work, comprising both classic and seminal entries of enduring significance, as well as contributions on contemporary issues, including gender and economics, recent economic crises in the European Union and beyond, health economics, and the economics of the Internet. The work comprises over 3,000 individual entries and represents a serious scholarly reference for a new generation of economists.

3. Purpose of the Article

The objective of this study is to examine and elucidate the pivotal role of innovatics in higher education and science in the formation of an innovation-based knowledge society in Ukraine.

Furthermore, the theory and practice of higher education and science innovatics require further development, as well as a determination of the tasks, directions, and features of innovative transformations in the field of higher education and science. This is necessary for the formation of a knowledge-based Ukrainian society.

4. Research Methodology

The authors employed a variety of research methods, including:

– A dialectical approach to the analysis and understanding of the content and features of innovative development of higher education and science under the influence of economic market relations and academic (university) entrepreneurship;

– analysis of innovative transformations as an economic category in the system of socio-economic ties and relations of the integral economic system of the modern knowledge society;

– methods of abstraction, system-structural and information-theoretical approaches are used to study the conditions for the formation of new innovative forms of information, innovation and knowledge-based society;

– a critical study of the impact of innovative transformations and university entrepreneurship on the financial sustainability of higher education institutions;

– methods of analysis and synthesis are used to study various innovative approaches and technologies in higher education and science in order to form a holistic picture of the complex innovation activities of subjects, objects and systems of higher education and science in general.

The research methodology is based on an objective, standardised approach to the analysis of factual data on the development and implementation of innovation policy in higher education systems and leading universities around the world. It also considers the most recent results of experiments and materials from research literature sources on innovation policy in the formation of information, innovative and knowledge-based societies.

The research methodology includes:

– Methods of empirical research of innovations in the field of building a knowledge society and innovations in higher education and science (including observation, experiment, measurement and comparison);

– statistical methods of scientific description and study of various innovative phenomena in the field of information, innovation and knowledge societies, higher education and science systems, which allow quantitative (numerical) expression;

– critical study and understanding of the concept of knowledge society and innovation in higher education and science;

– analysis of literary sources, including electronic and computer tools; comparison and verification of the feasibility or necessity of introducing various types of innovations; analysis of their effectiveness and the possibility of dissemination and implementation in the objects and subjects of the higher education and science system; forecasting ways to form a new innovation policy, innovative approaches, methods and technologies; integration of research results; formation of scientific, theoretical, methodological and practical provisions of information, innovation and knowledge-based societies.

5. Presentation of the Main Research Material

As the knowledge society strives to create the conditions for the development of the potential of each individual, the expansion of educational opportunities, and the growth of social and economic sustainability, it is essential to consider both the accumulation of information and the ability to apply knowledge to solve problems and develop new ideas.

The knowledge society is an integral component of the information society (Figure 1), wherein the utilisation, generation, dissemination, manipulation and integration of information represent the most significant activities. The principal driving forces are information and communication technologies, which have precipitated a rapid increase in the diversity of information formats. These technologies exert a profound influence on the most significant forms of social organisation, including education, the economy, and other domains of human activity and life (Webster, 2014).

It is necessary to consider the direction of the creative activity of the Ukrainian nation in order to achieve the desired results. Among the most significant are:

1. Introduction and strengthening of strong anti-corruption institutions, transparent governance and accountability. This is crucial for improving the business environment and attracting investment.
2. Implementation of market-oriented economic and social reforms. Formation of a new type of economy.
3. Implementation and improvement of social reforms. Further reform of education and science.
4. Reshaping the organisational and legal framework.

In order to achieve these goals, it is essential to instill an entrepreneurial mindset among the population of Ukraine and to cultivate a culture of genuine performance discipline. Further market-type economic and social reforms (Cantamessa & Montagna, 2023) include the following (Figure 2):

– Strengthening strong anti-corruption institutions, introducing transparent governance and ensuring accountability. This is crucial for improving the business environment and attracting investment.
– Increasing fiscal sustainability, improving tax systems and reducing bureaucracy in tax procedures can stimulate economic growth and attract investment.
– Widespread introduction of transparent and efficient privatisation and restructuring processes for state-owned enterprises to increase efficiency, reduce state intervention and promote competition.
– Strengthening the banking sector, improving the regulatory framework and promoting financial inclusion are essential for a stable financial system that supports economic growth.
– Improving trade facilitation, reducing trade barriers and creating a favourable investment climate through legislative and regulatory reforms to attract foreign direct investment (FDI) and increase exports.
– Radically improve the energy efficiency of the energy sector, diversify energy sources and reduce dependence on imports, which will ensure energy security and sustainability.
– Investing in modern infrastructure, including transport, communications and digital infrastructure, to support economic activity and improve connectivity within the country and to international markets.

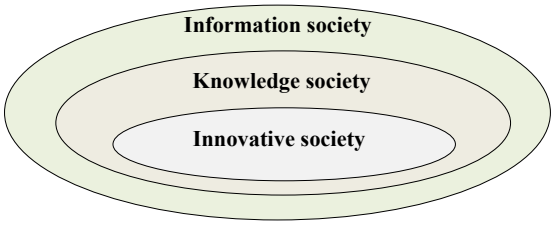

Figure 1. Interconnection and interdependence of the innovative society, the information society and the knowledge society

– Modernisation of the education system with a focus on STEM education (science, technology, engineering and mathematics), vocational training and lifelong learning to meet the needs of the knowledge-based economy.
– Improving the accessibility, quality and efficiency of healthcare by reforming the healthcare system, investing in medical infrastructure and ensuring universal healthcare coverage.
– Establishing effective social protection systems, overcoming poverty and reducing income inequality through targeted social assistance programmes and reforming the pension system.
– Strengthening the rule of law, reforming the judiciary and improving the legal framework to ensure transparency, protect property rights and facilitate fair dispute resolution.
– Empowering local governments and decentralising administrative functions to increase efficiency, accountability and citizen participation in decision-making.
– Introducing policies to address demographic challenges, promote family support programmes, and encourage labour force participation, including initiatives to reverse population decline and the outflow of scientists, professionals, workers, and other highly skilled individuals.

It is imperative to emphasise the pivotal role of innovative universities in bolstering the social and economic advancement of their cities and regions (Charles et al., 2021).

The necessity for Ukraine to construct an alternative economic model has become apparent. This new economic system must be based on the principles of information, innovation and knowledge. These three concepts are interrelated and collectively contribute to the country's economic growth and development, which is based on knowledge. In the information economy, the majority of GDP is generated by the production, processing, storage, and distribution of information and knowledge. Furthermore, over half of the employed population is engaged in this activity. An innovative economy is defined as an economic system based on the utilisation of innovative processes as a means of facilitating creative growth (Sveinsdottir

Figure 2. Market-oriented economic and social reforms needed in Ukraine

et al., 2017). Concurrently, the primary focus is on the creative development, adoption, adaptation, and implementation of novel ideas, processes, technological measures, and products, with the objective of enhancing productivity, competitiveness, quality indicators, and general economic growth. The objective is to establish Ukraine as a knowledge-based economy, whereby the generation, dissemination and application of knowledge are harnessed to stimulate economic growth and development. The production and utilisation of knowledge represent the primary means of generating wealth, enhancing well-being and fostering societal development. The market economy, which is gradually being introduced in Ukraine, has a number of undeniable advantages. It is the basis of the economic power of the leading countries of the world, their prosperity and the well-being of their populations. Furthermore, academic capitalism plays a pivotal role in the advancement of market relations in developed countries, leading to the pervasive commercialisation of research outcomes, the emergence of academic entrepreneurship, and close collaboration between science and industry. It is regrettable that academic capitalism has not yet had a significant impact on the scientific and educational sectors in Ukraine, nor has it facilitated the rapid development of university-based entrepreneurship.

Figure 3 illustrates the role of higher education and science as an engine of innovative socio-economic development in Ukrainian society (Geuna & Rossi, 2017). It is of great importance to facilitate the innovative development of society, socio-economic growth of the nation, and the enhancement of its competitiveness. This will contribute to the advancement and continuous improvement of the Ukrainian knowledge-based society with an innovative-oriented economy. It is also worth adding some key areas where it is necessary to apply innovation in higher education and science (Park, 2020; Sekhar et al., 2022):

– Digital transformation and e-learning.
– Data analytics and learning analytics.
– Artificial intelligence and machine learning in education and research.
– Immersive technologies: virtual reality (VR), augmented reality (AR) and mixed reality (MR).
– Block-chain (for academic certificates obtaining).
– Collaborative research platforms.
– Competency-based education (CBE).
– Sustainability and green science.
– Gamification and interactive learning.
– Personalised and adaptive learning.
– Multidisciplinary and interdisciplinary approaches.
– Commercialisation of academic activities, economic and financial sustainability of innovative universities' activities.
– Resource sharing and collaborative technologies for group learning.
– Ethics and innovation policy.

In publications by Romanovskyi & Romanovska (2020), Romanovskyi et al. (2021; 2022), a new scientific direction was introduced: "innovatics" of higher education and science. This includes a number of innovative changes in the different types of activities inherent in higher education. Consider the areas in which innovative changes in higher education and science are taking place, which influence the formation of a knowledge society in Ukraine (Figure 4).

The result will be an expansion of academic entrepreneurship, innovative entrepreneurial universities, and research institutions. This will increase the role of ICT, R&D, engineering, technology, and intellectual entrepreneurship in higher education and science. This will contribute to economic and intellectual growth, as well as the safe life of human society (Bérubé, 2018). The influence of university innovations on economic development is a crucial aspect of societal advancement. This influence can be observed in the practical implementation of the Triple Helix and other models of H. Etzkowitz's helix theory in various countries across the globe (Amaral & Cai, 2023; Cai & Etzkowitz, 2020; Cai & Amaral, 2021, 2022; Cai, 2022).

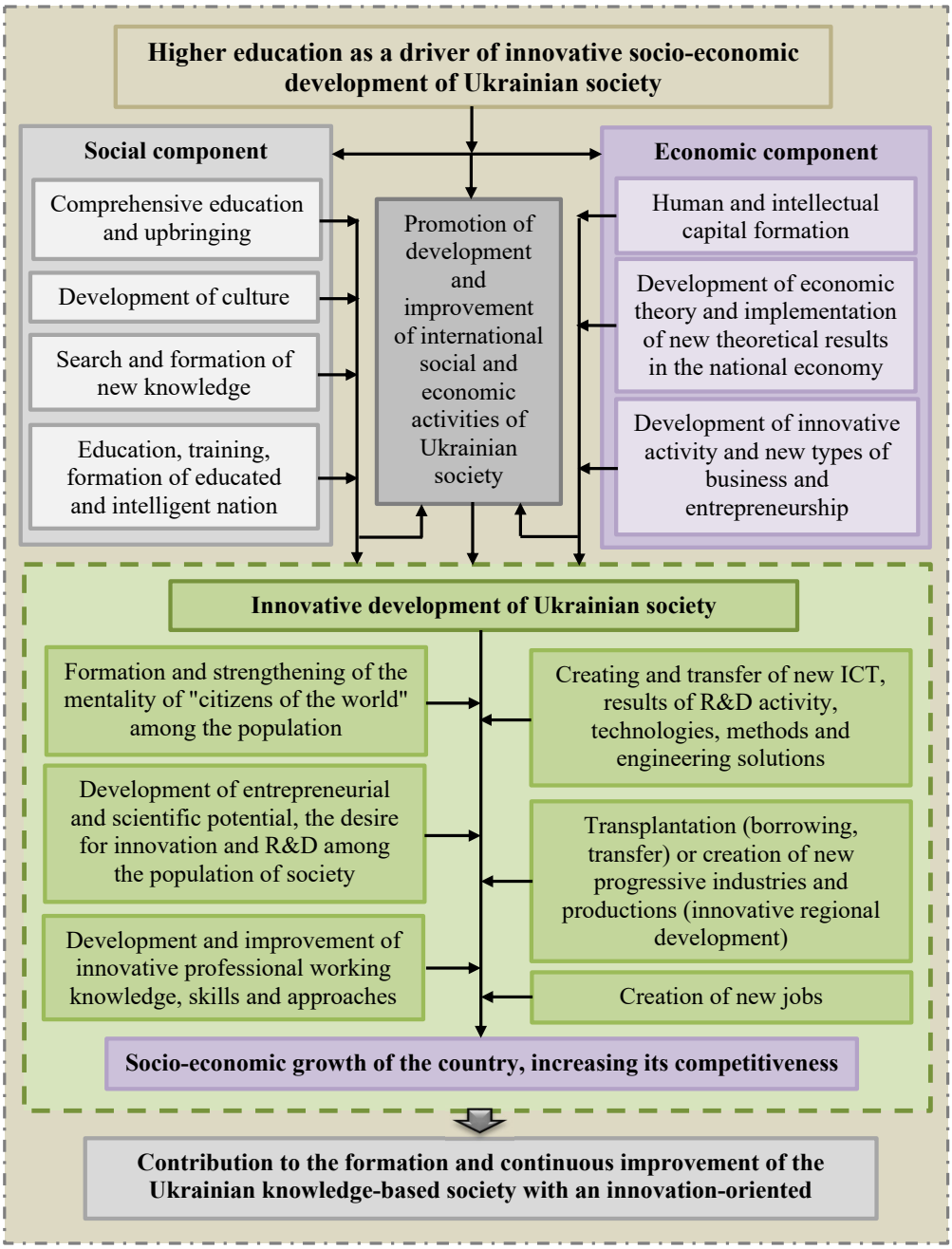

Figure 3. Functions and components of higher education in the innovative socio-economic development of Ukrainian society

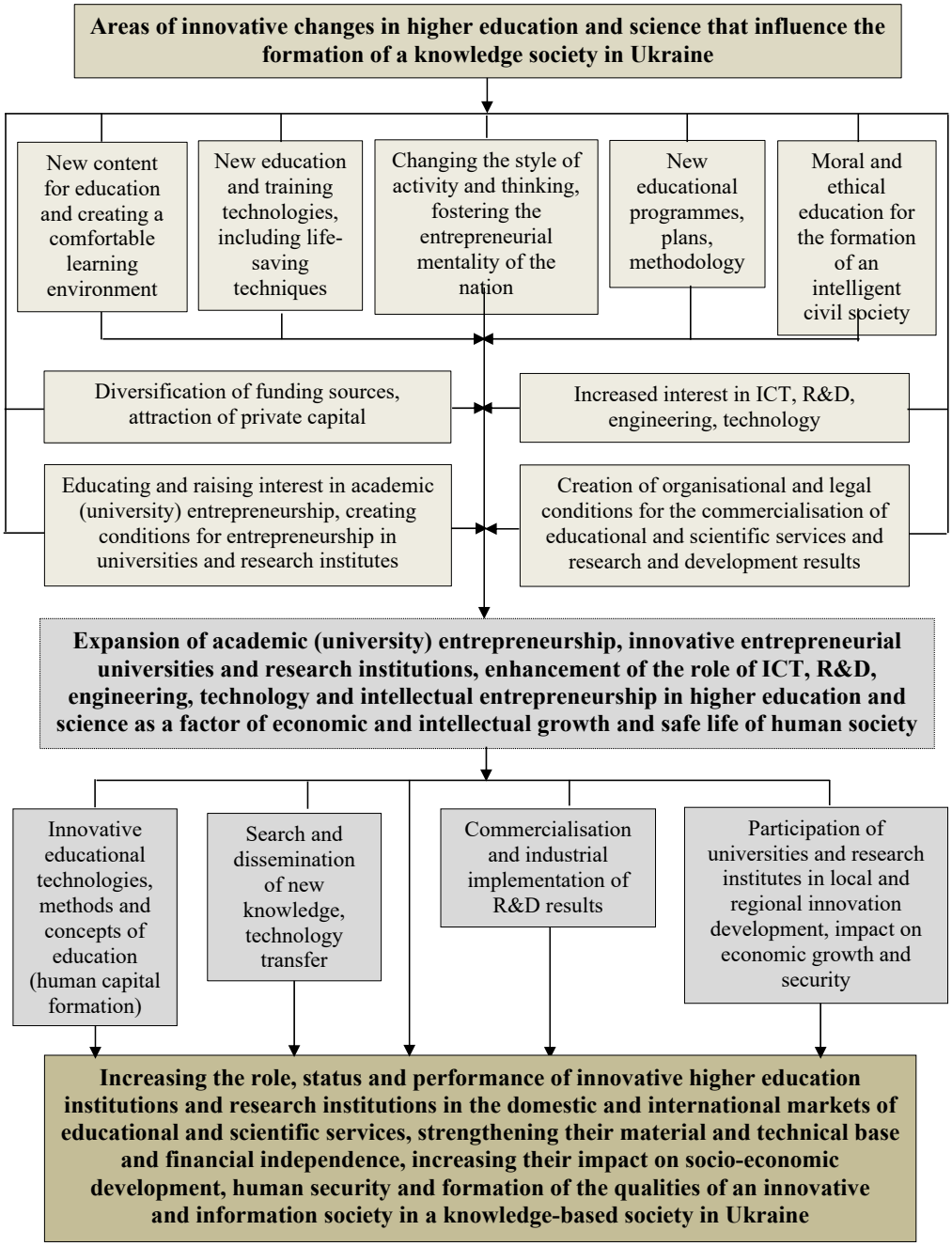

Figure 4. Areas where innovative changes in higher education should take place to positively influence the formation of a knowledge society in Ukraine

Ibarra-Cisneros et al. (2023) observe that universities play a pivotal role in the generation and dissemination of knowledge. In addition to this, they should also establish an environment conducive to the establishment of knowledge activators and the effective management of knowledge.

In conclusion, it is worth noting the two publications (Stehr, 2018) and (Stehr & Ruser, 2017). Further research is warranted on the formation of a knowledge society in developed societies, with a view to taking into account modern realities. The argument is put forth that knowledge has become a vital economic resource, serving as the foundation for economic growth. Nevertheless, knowledge also exerts influence within other social institutions of the modern era, including those pertaining to governance and the world of work. The proliferation of certified scientific and technical knowledge claims has precipitated a multitude of social, political, and personal challenges confronting the global economy, state apparatus, and modern societies. It is important to note that it is science and technology that have led to the emergence of significant global issues of the modern era, including

ozone depletion, climate change, genetic engineering, and the profound transformation of the workforce.

The ultimate objective is to enhance the role, status, and activity results of innovative higher education institutions and research organisations in the domestic and international markets of educational and scientific services. This will be achieved by strengthening their material and technical base and financial independence, thereby raising their influence on socio-economic development, security of human life, and the formation of innovative-information society qualities in the knowledge-oriented society of Ukraine.

6. Conclusions

Based on the fact that there is an interconnection between the knowledge society, the information society and the innovation society, the following follows:

– The information society is primarily a social system in which information plays a crucial role in the development of the economy, culture and social relations. It focuses on the creation, access and exchange of data and information;

– the knowledge society, on the other hand, builds on the information society by focusing on the creation, dissemination and use of knowledge. The knowledge society emphasises the use of information and data to create meaningful knowledge that impacts social development;

– an innovative society is a stage in which a society prioritises the promotion of innovation and creativity through the application of information and knowledge. It emphasises the constant renewal of ideas, technologies and social practices to improve the quality of life and economic growth.

Together, these three societies are interconnected:

– Information is the raw material for knowledge creation;

– knowledge is processed and used for social progress;

– innovation uses information and knowledge to create new solutions to new problems.

In order to address the challenge of developing a knowledge-based society in Ukraine, it is recommended that innovative mechanisms be integrated into the higher education and scientific research sectors. Further attention from scientists, engineers and practitioners is required for the advancement of this research.

The primary objective of the advancement of higher education in any country is to establish the requisite conditions for purposeful business, scientific, educational, engineering and technological activities, with the aim of fostering a knowledge society and an innovation-oriented type of state economy.

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Received on: 18th of September, 2024
Accepted on: 20th of November, 2024
Published on: 17th of December, 2024