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THE ENTREPRENEURIAL UNIVERSITY AS A DRIVER FOR THE COMPETITIVENESS OF THE KNOWLEDGE ECONOMY WITHIN THE CONTEXT OF SUSTAINABLE DEVELOPMENT: THEORETICAL-METHODOLOGICAL FOUNDATIONS AND INSTITUTIONAL MECHANISMS OF DEVELOPMENT

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Abstract

Relevance. The shift towards a knowledge economy – driven by digitalisation, accelerated knowledge circulation, and the increasing significance of human capital – transforms university functions from traditional "educational-scientific" institutions into active agents of the innovation ecosystem. Within the Triple Helix model, the university serves as a primary actor in the "university–industry–government" interaction, facilitating knowledge transfer into production, the commercialisation of research findings, and the development of entrepreneurial competences. Integrating sustainable development principles and orienting innovation towards socio-environmental impacts adds an essential dimension to this transformation.

Aim: This study theoretically substantiates the essence of the entrepreneurial university and systematises the mechanisms of its impact on the competitiveness of the knowledge economy within the framework of innovative transformation and sustainable development.

Methods: The study employs theoretical generalisation and abstraction to develop the conceptual-categorical framework; analysis and synthesis to identify key elements of entrepreneurial transformation; comparison to contrast international and domestic approaches; systemic and structural-functional analysis to examine the university as an institution within the innovation ecosystem; institutional analysis to evaluate regulatory prerequisites and barriers; and modelling alongside logical-analytical methods to formalise impact channels and derive conclusions.

Results. The research substantiates that the entrepreneurial university represents a holistic organisational model that integrates managerial autonomy, funding diversification, innovation infrastructure, and a robust entrepreneurial culture. The study proposes evaluating its contribution to the competitiveness of the knowledge economy through four interconnected channels: the cultivation of human capital and entrepreneurial competences; the commercialisation of R&D and the capitalisation of knowledge; an innovation-active management model and institutional resilience; and ecosystem interaction based on Triple Helix logic, incorporating sustainable innovation criteria. The analysis reveals that while Ukraine possesses basic regulatory prerequisites, practical implementation is hindered by institutional fragmentation, weak cooperation between science and business, and limited financial autonomy.

Conclusions: The entrepreneurial university is best understood as a systemic factor in modernising the knowledge economy and achieving sustainable development goals, provided there is synergy between organisational transformation, commercialisation tools, and ecosystem partnerships; furthermore, performance evaluation must account for socio-environmental effects alongside economic outcomes.

Keywords: entrepreneurial university, knowledge economy, competitiveness, sustainable development, innovation ecosystem, knowledge commercialisation, human capital, innovation-active university.

Introduction. In the 21st century, the global economic system is undergoing a transformation driven by digitalisation, innovative technologies, accelerated knowledge circulation, and the increasing role of human capital. Under these conditions, a new development paradigm emerges – the knowledge economy – wherein intellectual resources, research and development potential, innovation capacity, and the ability to adapt rapidly to technological turbulence constitute key competitiveness factors. Consequently, the role of institutions that produce and transmit knowledge, particularly universities, is shifting. The traditional model of the university as an autonomous centre for education and fundamental research is gradually evolving towards an entrepreneurial model, which entails active interaction with business, the state, and civil society. Within the framework of the "university–industry–government" (Triple Helix) interaction model, developed by H. Etzkowitz (1994) and L. Leydesdorff (2000), the university is viewed as a full-fledged actor in the innovation system, capable of initiating economic processes, creating new organisational forms, and acting as a catalyst for regional development. This transformation is driven not only by the need to diversify funding but also by the necessity of ensuring effective knowledge transfer into production, the commercialisation of research results, and the cultivation of entrepreneurial competences in learners. In such circumstances, universities cease to be merely "educational-scientific" institutions; they become active agents of development that shape innovation ecosystems through partnerships with business and the state and through systemic knowledge transfer into society. The transition to a knowledge economy signifies a shift in the sources of competitive advantage from traditional factors (natural resources, unskilled labour, physical capital) to innovations, human capital, and the capacity to create and scale new technologies, organisational, and social solutions.

In the global knowledge economy, the competitiveness of nations is increasingly determined by their ability to create and scale innovations, as well as to convert scientific results rapidly into products, services, and management solutions. For Ukraine, this implies the necessity of institutional strengthening within the "education–science–innovation–business" chain, as universities concentrate a significant portion of human capital, research infrastructure, and the potential for entrepreneurial thinking.

The integration of sustainable development approaches provides an additional conceptual and regulatory dimension to the studied issues, significantly transforming the understanding of the content and criteria of modern competitiveness. In contemporary conditions, the competitive positions of states and national economies are increasingly assessed not only by labour productivity indicators, economic growth rates, or innovation activity levels, but also by their ability to ensure ecological balance, social inclusiveness, and long-term developmental resilience. A vital criterion also includes the capacity of innovations to minimise systemic risks – such as military, energy, climatic, demographic, and other structural challenges that define society's developmental trajectory in the medium and long term.

The "2030 Agenda for Sustainable Development," adopted by the United Nations in 2015, serves as the regulatory and institutional foundation for this approach at the global level, stipulating the implementation of 17 Sustainable

Development Goals (SDGs) and a corresponding system of targets and monitoring indicators (UN General Assembly Resolution, 2015).

At the national level, the implementation of these guidelines is enshrined in the Decree of the President of Ukraine "On the Sustainable Development Goals of Ukraine for the period until 2030" (2019), which defines strategic goals and state policy priorities adapted to Ukrainian realities. This document establishes the necessity of integrating sustainable development goals into programme and strategic acts, as well as developing a monitoring system for their achievement, which directly links the competitiveness of the national economy with the principles of environmental balance, social responsibility, and innovative transformation.

According to the Decree, achieving a high quality of life and economic growth is impossible without innovation. The entrepreneurial university becomes a platform where SDGs – for instance, Goal 4: ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all; Goal 8: promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all; Goal 9: building resilient infrastructure, promoting inclusive and sustainable industrialisation and fostering innovation – are transformed from political declarations into concrete technological solutions (On the Sustainable Development Goals of Ukraine for the period until 2030: Decree of the President of Ukraine, 2019).

For Ukraine, the formation of entrepreneurial universities acquires particular relevance amidst structural economic modernisation, post-war recovery, integration into the European research and educational area, and the need to improve standings in international innovation rankings. The higher education system can become one of the key institutional mechanisms for recovery and long-term national competitiveness if its activities are directed towards shaping innovation ecosystems, developing high-tech sectors, and supporting socially responsible entrepreneurship (Azhazha, Nestorenko, & Peliova, 2024).

Consequently, the relevance of this study is driven by the transformation of university roles in the knowledge economy; the necessity of integrating the entrepreneurial function with sustainable development principles; the requirement to develop conceptual and methodological frameworks for assessing university impact on competitiveness; and the strategic tasks of modernising the national economy and its innovation system.

Despite a significant body of scientific research regarding the functioning of entrepreneurial universities, the issue of comprehensively measuring their contribution to the competitiveness of the knowledge economy within the context of sustainable development remains debatable. Scientific literature is dominated by either organisational approaches (focusing on internal university transformation) or econometric studies of innovation activity, which do not always account for the socio-environmental dimension of impact. The problem lies in the absence of an integrated conceptual model that would combine: internal mechanisms of entrepreneurial university transformation (management, funding, culture); its functioning within an innovation ecosystem (interaction with business and the state); its impact on macro-level competitiveness of the knowledge economy; and its alignment with the principles and goals of sustainable development. Thus, there is a need for a scientific understanding of the entrepreneurial university not only as an institutional innovation in higher education but as a systemic factor in structural economic modernisation and the achievement of strategic developmental goals.

Resolving the outlined problem is complex and directly linked to both fundamental scientific tasks and current applied needs of state policy and institutional development.

In the scientific dimension, this involves the further development of the theoretical foundations of the knowledge economy and innovation systems, as well as the need to form an interdisciplinary methodology for assessing the impact of universities on socio-economic development, combining approaches from institutional economics, entrepreneurship theory, innovation theory, and the concept of sustainable development. The integration of these scientific directions within a coherent conceptual model, capable of explaining the mechanisms of the transformational impact of universities on the competitiveness of the knowledge economy, is of particular importance.

In the practical dimension, the research is oriented towards improving state policy in the fields of science, education, and innovation by developing tools to support the entrepreneurial transformation of universities and implementing sustainability principles into their activities. This entails formulating university development strategies that integrate the entrepreneurial function with socio-

environmental responsibility; creating and supporting regional innovation ecosystems and cluster models of cooperation; enhancing the efficiency of technology transfer and the commercialisation of research results; and ensuring that educational programmes align with the needs of the modern labour market and long-term strategic priorities of national development.

Furthermore, these issues are directly linked to the implementation of national innovation development strategies, European integration processes, and the harmonisation of educational and scientific policies with European standards, as well as the implementation of the Sustainable Development Goals in Ukraine. In this context, the entrepreneurial university emerges as a key institutional mechanism for ensuring structural economic modernisation and achieving strategic sustainable development benchmarks.

Thus, the problem of researching the entrepreneurial university as a factor in enhancing the competitiveness of the knowledge economy within the context of sustainable development is complex and situated at the intersection of economic theory, innovation theory, educational policy, and strategic management. Its resolution will facilitate the formation of a coherent model of interaction between education, science, and business, ensuring long-term stability and the competitiveness of the national economy amidst global transformations.

Analysis of scientific sources indicates a gradual evolution in approaches to understanding the university's role in the modern economy – from a traditional educational-scientific institution to an active subject of innovative and socio-economic development.

In foreign scientific thought, the concept of the entrepreneurial university formulated by B. Clark (1998) served as the initial theoretical foundation, viewing university transformation as the result of profound organisational changes aimed at increasing autonomy, adaptability, and innovation capacity. H. Etzkowitz (1994) and L. Leydesdorff (2000; 2012), who substantiated the "Triple Helix" model, made significant contributions to the understanding of innovative development mechanisms. Within this concept, the university acts not only as a knowledge generator but also as an equal partner to the state and business in creating innovation ecosystems. Their work initiated the transition from a linear "science → production" model to a network model of innovation co-creation, which defines the modern paradigm of knowledge economy development. Recent studies – such as those by Y. Cai and I. Ahmad (2023); N. Apostolopoulos, S. Moon, and A. Walmsley (2019) – focus on the transformation of the entrepreneurial university towards sustainability. In these works, the university is considered an institution that combines economic efficiency with social responsibility, environmental orientation, and the achievement of the Sustainable Development Goals. Thus, a shift occurs towards the model of the sustainable entrepreneurial university, in which innovations are evaluated by their long-term social impact.

Domestic research develops these approaches while considering the specifics of Ukraine's transitional economy. Y. Bazhal (2015) emphasises the importance of cooperation within the "state–university–industry" triangle as a prerequisite for an innovative breakthrough. I. Gryshchenko and T. Belyalov (2020) investigate the institutional factors behind the establishment of the entrepreneurial university, focusing on the need for funding diversification and innovation infrastructure development. I. Dybach (2020) analyses the corporate-entrepreneurial model of university management as a response to competition in the educational services market. The relationship between education and the knowledge economy is thoroughly explored in the works of I. Kaleniuk and O. Kuklin (2012), where higher education is defined as a strategic investor in human capital. O. Raievnieva, K. Azizova, and V. Ostapenko (2020) developed the concept of the innovation-active university, highlighting the necessity of creating mechanisms for the full innovation cycle – from a scientific idea to its commercial implementation. A separate group consists of studies on modern challenges to the functioning of Ukrainian universities conducted by researchers such as M. Azhazha, T. Nestorenko, and J. Peliova (2023; 2024), alongside N. Isakova and T. Honcharova (2024), which emphasise institutional resilience, adaptation to uncertainty, and the necessity of integration into the global innovation space.

The conducted analysis allows for the following generalisations: global scientific thought regards the entrepreneurial university as a pivotal institution of the knowledge economy and a catalyst for innovation ecosystems; contemporary research shifts the emphasis from knowledge commercialisation to societal value and sustainable development; Ukrainian scholars focus on adapting this model to national conditions while identifying institutional barriers to its implementation; and there

remains a need for further systematisation of the mechanisms through which the entrepreneurial university impacts economic competitiveness, alongside the alignment of organisational, innovative, and ecosystem approaches.

The aim of the study is to theoretically substantiate the essence of the entrepreneurial university and to determine the mechanisms of its influence on the development of knowledge economy competitiveness within the context of innovative transformation and the implementation of sustainable development principles.

To achieve this objective, the article envisages the resolution of the following core tasks: analysing the evolution of scientific approaches to the entrepreneurial university concept and generalising its theoretical-methodological foundations; disclosing the content of organisational transformation in higher education institutions based on the entrepreneurial university model and identifying the key elements of its implementation; investigating the role of the university within the innovation ecosystem through the lens of the "Triple Helix" model of "university–government–industry" interaction; systematising the primary channels of influence of the entrepreneurial university on knowledge economy development and its increased competitiveness; identifying the institutional conditions, instruments, and barriers to the development of entrepreneurial universities in Ukraine; substantiating the significance of integrating sustainable development principles into entrepreneurial university activities as a factor of long-term innovative resilience; and outlining promising directions for the further development of the entrepreneurial university model amidst global technological and socio-economic transformations.

Research Methods. The methodological basis of the study comprises a set of general scientific and specialised methods, the application of which ensured a comprehensive analysis of university transformation into entrepreneurial institutions and determined their impact on knowledge economy development. Specifically, the following research methods are applied: the method of theoretical generalisation and scientific abstraction is used to systematise scientific approaches to defining the concepts of "entrepreneurial university," "knowledge economy," and "innovation ecosystem," as well as to develop the conceptual foundations of the research; the method of analysis and synthesis is applied to isolate the key characteristics of the entrepreneurial university model, generalise its structural elements, and develop a holistic vision of the transformation mechanisms for higher education institutions; the comparative method is used to contrast foreign and domestic scientific approaches to university development, enabling the determination of the specific features of adapting the entrepreneurial university concept to Ukrainian conditions; the systemic approach is applied to view the university as a complex socio-economic institution integrated into interactions with the government, industry, and society within the "Triple Helix" model; structural-functional analysis is used to identify the channels of influence of the entrepreneurial university on knowledge economy competitiveness, as well as to investigate the interconnections between the managerial, innovative, and educational components of its activity; institutional analysis is applied to investigate the regulatory, organisational, and economic conditions for developing entrepreneurial universities in Ukraine, identifying barriers to their growth and evaluating the institutional environment for innovation; the modelling method is used to construct generalised analytical models of the entrepreneurial university's impact on the knowledge economy, particularly by identifying the primary transformation channels and the institutional matrix of its development; and the logical-analytical method is applied to formulate conclusions, substantiate interconnections between the phenomena under study, and determine prospects for the further development of the entrepreneurial university model within the context of sustainable development. The complementary use of these methods ensured the scientific validity of the research results and allowed for a comprehensive disclosure of the entrepreneurial university's role as an institutional factor in developing a competitive knowledge economy.

Results and Discussion. One of the most frequently cited descriptions of university transformation into entrepreneurial organisations is B. Clark's approach, which links successful transformation to five "organisational pathways": a strengthened steering core, an expanded "developmental periphery," a diversified funding base, a stimulated "academic heartland," and the development of an integrated entrepreneurial culture. Within B. Clark's (1998) research, the term "entrepreneurial" is interpreted as a characteristic of social systems – meaning the university as a whole, including its internal structural units, rather than

individual persons. This category carries semantic nuances of the term "enterprise," which implies the conscious development of institutional agency that requires significant effort, specific activity, and the mobilisation of organisational energy. A crucial component of this approach is the willingness to accept risks during the implementation of new practices, the outcomes of which remain uncertain. B. Clark emphasises that the focus is not on "business" in the narrow sense, but on "entrepreneurship" as energy and initiative. Rather than stating "the university must earn money," it is more appropriate to suggest that "the university must exhibit institutional entrepreneurship to ensure its autonomy and development" (Clark, 1998).

The entrepreneurial university independently and proactively strives for innovation in the methods of organising and conducting its activities. This concerns not merely isolated changes, but a purposeful organisational transformation intended to establish a more promising position for the future. Such universities endeavour to become "self-sufficient," "autonomous" institutions capable of acting as full-fledged subjects of market and social relations, rather than merely reacting to external impulses.

The concept of the "innovative university" possesses undeniable appeal: it is semantically softer and encompasses a broader range of phenomena. Furthermore, this term avoids the negative connotations that some members of the academic community associate with the image of an individual entrepreneur as an aggressively business-oriented subject focused on profit maximisation. While the terms "entrepreneurial" and "innovative" have been used interchangeably for a long time, this study shifts the emphasis to the entrepreneurial nature of the institution, as it more explicitly highlights the conscious local efforts aimed at altering the university's organisational position. The very concept of the "entrepreneurial university" most fully reflects the conscious efforts of the academic community to change its organisational stance and transform the institution into an active agent for implementing the Sustainable Development Goals in Ukraine. In the logic of competitiveness, this signifies the university's capacity to adapt rapidly, compete for talent and resources, create interdisciplinary solutions, and consistently support innovative directions.

The Triple Helix model describes innovation as the result of interaction between three sectors, where the university serves not only as a knowledge producer but also as an entrepreneurial actor capable of launching new organisational forms, initiating partnerships, and catalysing regional innovation ecosystems.

H. Etzkowitz (1994) and L. Leydesdorff (2000; 2012) further developed the "Triple Helix" concept of university–industry–government interaction, proposing it as an analytical model for investigating knowledge-based economies. In the interpretation of "university–industry–government," the model ceases to be a merely descriptive scheme of institutional interaction and transforms into a comprehensive theoretical-methodological framework for analysing the production, dissemination, and commercialisation of knowledge in contemporary economic systems (Leydesdorff, 2012). Since 1996, a broad scientific discussion has formed around this concept, facilitating the institutionalisation of the Triple Helix as one of the leading approaches in the study of innovation systems and the mechanisms of the knowledge economy. Within the context of the knowledge economy, this model is significant because it shifts "competitiveness" from the level of individual firms to the level of ecosystems: success is determined by the density of links, institutional quality, and the mechanisms for the commercialisation and social implementation of knowledge.

Since the 2010s, scientific literature has witnessed a substantial reappraisal of the content and functional purpose of the entrepreneurial university. Whereas previously the emphasis was predominantly placed on the commercialisation of research results, the creation of start-ups, and the diversification of funding sources, subsequent research increasingly highlights the necessity for such universities to function within the context of a "new socio-economic landscape" (Guerrero, Urbano, Fayolle, Klofsten, & Mian, 2016). In this environment, the university is regarded not only as an innovative actor but as an institution that must integrate the economic, social, and institutional developmental goals of territories, thereby facilitating the development of balanced regional ecosystems. These approaches are reflected in review papers and conceptual studies dedicated to the evolution of entrepreneurial university models and the expansion of their "third mission."

The integration of sustainable development principles into university operations has emerged as a distinct developmental trajectory for this concept. In contemporary research, the entrepreneurial university is increasingly interpreted as a potential

"engine" of sustainable development, capable of aligning knowledge generation, innovation activity, and social impact with the achievement of strategic sustainability goals (Apostolopoulos, Moon, & Walmsley, 2019). Within this context, particular attention is devoted to harmonising university strategies with sustainability initiatives and the Sustainable Development Goals (SDGs), which establish global benchmarks for socio-economic transformation.

A more systemic conceptual formulation of this evolution is presented within the "Sustainable Entrepreneurial University" (SEU) framework (Cai, & Ahmad, 2023). This model envisages the integration of economic, social, and environmental dimensions directly into the university's strategic mission, its management mechanisms, organisational culture, and performance evaluation system. Consequently, university entrepreneurial activity ceases to be restricted solely to economic efficiency and acquires a comprehensive character oriented towards long-term resilience, social responsibility, and ecological balance.

Ukrainian researchers emphasise that the modern evolution of universities is viewed through models 1.0–4.0, where University 3.0 (entrepreneurial) is based on the Triple Helix concept and focused on the commercialisation of scientific results; simultaneously, universities are increasingly linked with industry and communities, creating a bridge to the "ecological" dimension (sustainability).

In the study by Gryshchenko and Belyalov (2020), the "entrepreneurial university" is interpreted as an institution that fosters an innovation-entrepreneurial culture, diversifies its financial base, and expands its developmental periphery while strengthening the steering core. At the same time, the emphasis on sustainable innovation reinforces the university's significance as a producer of not only "market" solutions but also socially beneficial ones: knowledge commercialisation, energy efficiency, circular practices, security, innovation orientation, digital state/municipal services, entrepreneurial culture, and systemic partnerships with external stakeholders. In their works, the authors emphasize the implementation of the "five elements" of university transformation according to B. Clark (1998), which do not function in isolation – they must form a cohesive system:

1. A strengthened steering core – the transition from purely administrative management to active strategic management; leadership must be capable of making rapid, autonomous decisions under risk, balancing academic values with market requirements.
2. An expanded developmental periphery – the creation of new structures that link the university with the external environment: science parks, technology transfer centres, career centres, incubators, and partnership units.
3. A diversified funding base – a reduction in dependence on a single source of funding (the state budget): attracting grants, research income, endowment funds, and fee-based educational services, which ensures self-sufficiency.
4. Stimulating the academic "heartland" – the involvement of vocational educators and researchers in entrepreneurial activity; scientists must be motivated not only to publish articles but also to commercialise their ideas.
5. An integrated entrepreneurial culture – the formation of shared values regarding innovation and initiative: changing the consciousness of the entire university community, where entrepreneurship is perceived not as "greed" but as a way to be innovative and useful to society (sustainable development).

When all "five elements" operate effectively, the university becomes that "autonomous" and "self-sufficient" entity capable of interacting efficiently within the Triple Helix to achieve the Sustainable Development Goals.

The Ukrainian scientific concept of "government–university–industry" interaction within the Triple Helix model is presented, notably, in the works of Y.M. Bazhal, who substantiates the necessity of forming effective mechanisms for cooperative interaction between these institutional actors and evaluates the state of innovation processes in Ukraine using international competitiveness rankings. Y.M. Bazhal (2011) emphasises that the weakness of institutional links between universities and industry is one of the key hindering factors for the country's innovative development. The absence of a coordinated state policy to support scientific research and its commercialisation, alongside the insufficient integration of universities into production and regional innovation networks, limits the potential of the knowledge economy.

At the macro level, the competitiveness of the knowledge economy requires systemic policy coordination across the spheres of education, science, innovation, and technological development.

As a central "hub" of the innovation ecosystem, the university cannot replace the state or the market, yet it is capable of acting as a platform for accelerating innovation cycles through institutional cooperation tools, strategic partnership development, technology transfer mechanisms, and the formation of a new entrepreneurial culture. In this coordinating role, the entrepreneurial university transforms into a dynamic structural factor for enhancing the competitiveness of the knowledge economy and ensuring the state's sustainable development.

Thus, the transition to an entrepreneurial functional model is not merely a change in the organisational status of a Higher Education Institution (HEI), but a strategic response to the challenges of global digitalisation, allowing for the conversion of intellectual capital into sustainable economic development. Crucially, at the macro level, knowledge economy competitiveness necessitates coordinated policy: the university, acting as a "node" of the innovation ecosystem, does not imply assuming the functions of a state regulator or a commercial enterprise but can become a "platform" for accelerating innovation cycles through partnerships and institutional tools, enabling the filling of institutional voids between academic research and market implementation. The university acts as a resonator that amplifies interaction within the Triple Helix, ensuring a transition from the traditional linear innovation model to systemic knowledge coordination.

In the fundamental dimension, the relationship between higher education and the knowledge economy in Ukrainian literature is disclosed by I. Kaleniuk and O. Kuklin (2012). These scholars substantiate a transition to a new paradigm where education serves not merely as a consumer of resources but as a strategic investor in human capital. The trends of the information society systematised by them confirm that the orientation vectors of higher education must be directed toward bridging the gap between academic outcomes and the dynamic demands of the innovation market, creating the groundwork for building an entrepreneurial university model capable of ensuring knowledge capitalisation at the national level.

The synthesis of domestic and Western approaches allows for the assertion that the strategic orientation vectors of higher education toward the needs of the knowledge economy (according to I. Kaleniuk and O. Kuklin) can only be practically realised provided the corresponding institutional elements of an entrepreneurial university (according to B. Clark) are formed.

Specifically, the adaptive development vector requires a strengthened steering core capable of rapid decision-making, while the innovation vector necessitates the building of a developmental periphery that acts as a link between university science and the real sector of the economy. Thus, B. Clark’s five elements serve as the necessary organisational mechanism for achieving the developmental targets of the educational system amidst global digitalisation and economic intellectualisation.

N. Isakova and T. Goncharova (2024) emphasize that the success of the innovation economy in Ukraine depends directly on the effectiveness of utilising the scientific and educational potential of universities. However, scholars stress the need for a critical reappraisal of future orientations, considering existing internal obstacles – from legal conflicts to weak interaction with the real sector. In this context, the transformation of the university into an entrepreneurial one becomes not just a "desirable vector" but a strategic necessity for overcoming systemic gaps between science and the economy amidst the crisis challenges of recent years (Isakova, & Goncharova, 2024).

In the applied dimension, the concept of the "innovation-active university" is disclosed in the works of O. Raievnieva, K. Azizova, and V. Ostapenko (2020), where the university is considered an innovation-active system. The authors focus on the formation of innovative capabilities that allow HEIs not only to generate knowledge but also to actively influence the dynamics of innovation processes in the country. In contrast to mere "innovativeness," capability constitutes potential + resource + mechanism. A university becomes "innovation-active" not when it simply holds patents, but when it has an established system for transforming a scientific idea into a market product. This is effectively an applied confirmation of B. Clark’s elements (developmental periphery) (Clark, 1998). Such an approach allows for the specification of the university's innovation characteristics, transforming it from a passive recipient of knowledge into an active driver of technological development, which is critical for overcoming the barriers outlined in the works of N. Isakova and T. Goncharova (2024).

Based on a generalisation of scientific approaches, we propose considering the influence of

the entrepreneurial university on knowledge economy competitiveness through four interconnected channels.

Channel A. Human capital and entrepreneurial competences

The university creates the "core" of the knowledge economy through vocational training, but the entrepreneurial model reinforces this by fostering knowledge commercialisation competences: project thinking, innovation management, the ability to create start-ups, and working in interdisciplinary teams (Kaleniuk, & Kuklin, 2012). Consequently, the knowledge economy requires the reorientation of higher education toward new developmental vectors and outcomes relevant to the innovation economy. This ensures not only the training of specialists but also the development of specific knowledge commercialisation competences – from project thinking to the capacity to create high-tech start-ups. In the applied dimension, this directly strengthens national competitiveness, as it increases the innovation activity of enterprises, stimulates the export of intellectual services, and creates a favourable environment for attracting foreign direct investment into the science-intensive sectors of the Ukrainian economy.

Channel B. Commercialisation of R&D and "knowledge capitalisation"

The entrepreneurial university develops mechanisms for technology transfer, patenting, licensing, and the creation of small innovative enterprises/spin-offs and partnership laboratories by building R&D commercialisation mechanisms. The work of L. Hanushchak-Yefimenko and O. Yershova (2022) emphasises that without innovation activity, "knowledge capitalisation" and the transition to sustainable development of the knowledge economy are impossible; effective innovation processes and the commercialisation of innovations must become key characteristics. The creation of spin-off companies and the development of licensing activities transform the university into a powerful subject for the provision of high-tech products. On the scale of the national economy, this leads to the intensification of technological modernisation in production, an increase in the share of science-intensive products in GDP, and the formation of new markets, which constitute the foundation of the state's international competitiveness.

Channel C. Innovation-active organisational model and management

The economic effect of university entrepreneurship requires managerial transformation: innovation strategy, KPIs, support institutions (incubators, accelerators, technology transfer offices), motivation of vocational educators/researchers, and partnerships with stakeholders. Channel C reflects the transformation of the internal organisational model of HEIs in response to the challenges of the knowledge market. Shifting to a corporate-entrepreneurial management logic allows the university to act as a flexible ecosystem subject that diversifies income sources and implements modern tools for innovation support (Dybach, 2020). The entrepreneurial university does not wait for state subsidies but forms a multi-channel model: Endowment funds + Contract research + Royalties + Grants + Educational franchising. In the context of national competitiveness, this ensures the institutional resilience of the higher education system, increases the efficiency of using intellectual resources, and creates mechanisms for rapid scaling of innovative solutions, which is critical for implementing the sustainable development strategy under conditions of high uncertainty (Azhazha, Nestorenko, & Peliova, 2023).

Channel D. Ecosystem interaction of the "Triple Helix" and sustainability as "innovation quality"

An entrepreneurial university is only effective within an ecosystem where cooperation tools operate: state incentives, business demand for R&D, joint programmes, clusters, and innovation projects. Y. Bazhal emphasises the necessity of improving innovation policy by creating and supporting mechanisms of cooperative interaction within the "government–university–industry" triangle (Bazhal, 2015). Channel D closes the transformation cycle, converting the university into an active element of the Triple Helix ecosystem. In this model, sustainability acts as a qualitative characteristic of innovation, integrating financial performance with socio-environmental impact. This not only strengthens the university's role as a leading public institution but also establishes the foundation for the long-term competitiveness of the national economy, grounded in the principles of trust, legitimacy, and responsible innovative development. Within the context of sustainable development, it is significant that innovations are evaluated not only by financial results but also by socio-environmental effects (sustainable innovations), which bolsters the trust and legitimacy

of the university as a "public" innovation institution and, consequently, long-term competitiveness.

Systematising the influence of the entrepreneurial university through four channels allows for viewing it not merely as an educational institution but as a strategic element of the innovation ecosystem. Each channel reflects a distinct level of transformation – from the development of human capital to integration into the Triple Helix ecosystem. Simultaneously, their interaction provides a multiplicative effect for the knowledge economy. The presence of a corresponding regulatory framework in Ukraine creates institutional prerequisites for implementing this model, yet effectiveness depends on policy coordination and the quality of management.

Table 1 presents a generalised comparative analysis of the entrepreneurial university's impact on knowledge economy competitiveness through four interconnected channels. Table 1 systematises the mechanisms of influence, economic results, and the regulatory framework in Ukraine, which forms the institutional basis for implementing the entrepreneurial university model.

Table 1

The Impact of the Entrepreneurial University on Knowledge Economy Competitiveness through Key Transformation Channels

Influence Channel	**Essence of the Mechanism**	**Implementation Instruments**	**Impact on Knowledge Economy Competitiveness**	**Ukrainian Regulatory and Legal Framework**
Channel A. Human capital and entrepreneurial competences	Cultivating innovative and entrepreneurial mindsets alongside the capacity for knowledge commercialisation.	Integrating entrepreneurship into educational programmes; project-based learning (PBL); start-up schools; STEM integration; dual education.	Increased innovation activity among enterprises; high-tech sector development; export of intellectual services; enhanced investment attractiveness.	Law of Ukraine "On Education" (2017); Law of Ukraine "On Higher Education" (2014); Strategy for the Development of Higher Education in Ukraine for 2022–2032 (2022).
Channel B. R&D commercialisation and knowledge capitalisation	Facilitating technology transfer, patenting, spin-off creation, and the licensing of research outcomes.	Technology Transfer Offices (TTOs); incubators; spin-off companies; business contracts; licensing agreements.	Technological modernisation of production; increased share of science-intensive products; creation of new markets; GDP growth driven by R&D.	Law of Ukraine "On Scientific and Scientific-Technical Activity" (2016); Law of Ukraine "On State Regulation of Activities in the Field of Technology Transfer" (2006); Law of Ukraine "On Innovation Activity" (2002).
Channel C. Innovation-active organisational model and management	Transitioning to a corporate-entrepreneurial management logic; diversifying funding; implementing strategic innovation management.	University 3.0 Strategy; Third Mission KPIs; endowment funds; contract research; grants; franchising of educational programmes.	Institutional resilience of HEIs; effective utilisation of intellectual capital; innovation scaling; financial autonomy.	Law of Ukraine "On Higher Education" (Art. 32 – autonomy of HEIs) (2014); Law of Ukraine "On Charitable Activity and Charitable Organisations" (2013); Budget Code of Ukraine (2010) (regarding HEI special funds).
Channel D. Ecosystem interaction (Triple Helix) and	Fostering cooperation between universities, the state, and industry; integrating	Clusters; regional smart specialisation strategies; public-private	Development of long-term competitiveness; enhancement of trust and institutional legitimacy;	Law of Ukraine "On the Principles of State Regional Policy" (2015); Law of Ukraine "On Public-

sustainable innovation	sustainable development principles into innovation processes.	partnerships (PPPs); international programmes (e.g., Horizon Europe); SDG-oriented projects.	advancement of innovation ecosystems.	Private Partnership" (2025); Decree of the President of Ukraine "On the Sustainable Development Goals of Ukraine until 2030" (2019).

Thus, the entrepreneurial university acts as a systemic factor in enhancing the competitiveness of the knowledge economy only through the comprehensive implementation of all four influence channels. Human capital constitutes the foundation of innovation potential; knowledge commercialisation ensures economic returns; managerial transformation guarantees institutional resilience; and ecosystem interaction, alongside a focus on sustainability, creates long-term competitive advantages. The synergy of these mechanisms enables the university to transform into a driver of structural modernisation and the sustainable development of the national economy.

The development of an entrepreneurial university is a complex process necessitating the transformation of not only the HEI organisational model but also the regulatory, financial, and ecosystem environments. The synthesis of international and domestic scientific research facilitates the structuring of key conditions into an institutional matrix that reflects the interconnection between regulatory frameworks, managerial mechanisms, innovation infrastructure, and cultural factors. While appropriate legislative support establishes the formal prerequisites for university transformation into entrepreneurial institutions, the effectiveness of implementation remains dependent on policy coherence, managerial autonomy, and the degree of integration into regional innovation ecosystems.

Table 2 presents a generalised institutional matrix of conditions for developing an entrepreneurial university in Ukraine, formulated based on Ukrainian scientific scholarship concerning University 3.0, the innovation-active university, and the Triple Helix model. Table 2 systematises six groups of conditions, the instruments for their implementation, and the corresponding regulatory and legal framework.

Table 2

Institutional Matrix for the Development of the Entrepreneurial University in Ukraine

No.	Condition Group	Content and Key Elements	Practical Implementation Instruments	Regulatory and Legal Framework	Risks and Barriers in Ukraine
1	Regulatory and Legal Conditions	Rules for the commercialisation of research results; intellectual property (IP) regulation; capacity for creating spin-offs; institutional recognition of the university's "third mission"; legal mechanisms for technology transfer.	IP regulations; internal bylaws for start-up creation; licensing agreements; corporate contracts.	Law of Ukraine "On Higher Education" (2014); Law of Ukraine "On Scientific and Scientific-Technical Activity" (2016); Law of Ukraine "On State Regulation of Activities in the Field of Technology Transfer" (2006); Law of Ukraine "On Innovation Activity" (2002); Civil Code of Ukraine (Book IV	Inadequate implementation of norms; complex commercialisation procedures; weak IP protection; bureaucratic constraints.

				– Intellectual Property Rights) (2003).	
2	Governance Transformation	Transitioning to the University 3.0 model; strategic innovation management; corporate governance elements; financial autonomy.	Innovation development strategies; Third Mission KPIs; establishment of vice-rector positions for innovation; supervisory boards; autonomous structural units.	Law of Ukraine "On Higher Education" (2014); Strategy for the Development of Higher Education in Ukraine for 2022–2032 (2022); Budget Code of Ukraine (2010).	Formal autonomy without genuine financial freedom; weak managerial competences; organizational culture inertia.
3	Diversified Funding and Incentives	Reducing dependence on state budget funding; stimulating innovation activity.	Grants (Horizon Europe, Erasmus+); contract research; endowment funds; royalties; internal motivation programmes (percentage of licensing income).	Law of Ukraine "On Charitable Activity and Charitable Organisations" (2013); Law of Ukraine "On Scientific and Scientific-Technical Activity" (Art. 48 – Financial Support) (2016).	Low levels of private investment in R&D; limited fundraising culture; funding instability.
4	Innovation Infrastructure and Technology Transfer	Developing structures to support innovation and commercialisation; ensuring the capacity to execute the full innovation cycle.	Technology Transfer Offices (TTOs); incubators; accelerators; science parks; prototyping laboratories; service offices for international programmes.	Law of Ukraine "On Science Parks" (2009); Law of Ukraine "On State Regulation of Activities in the Field of Technology Transfer" (2006); Law of Ukraine "On Innovation Activity" (2002).	Insufficient number of effective TTOs; weak integration between science and industry; low commercialisation rates for patents.
5	Entrepreneurial Culture and Human Practices	Integrating entrepreneurial culture; motivating applied research; cultivating practical competences.	Start-up schools; mentoring programmes; dual education; internal incentive systems; mentoring networks; evaluation of teaching staff innovation activity.	Law of Ukraine "On Education" (2017); Law of Ukraine "On Higher Education" (Academic Freedom) (2014); Strategy for the Development of Higher Education in Ukraine for 2022–2032 (2022).	Traditional academic culture; low motivation for entrepreneurship; brain drain.
6	Ecosystem Partnerships (City–	Institutionalising the Triple Helix model;	Clusters; joint R&D projects;	Law of Ukraine "On the Principles	Weak coordination among actors;

	Region–Industry–Community)	integrating the university into regional innovation ecosystems.	public-private partnerships (PPPs); living labs; regional smart specialisation strategies.	of State Regional Policy" (2015); Law of Ukraine "On Public-Private Partnership" (2015); Sustainable Development Goals of Ukraine until 2030 (2019).	fragmentation of regional policy; low levels of trust between industry stakeholders and HEIs.

Consequently, the institutional matrix demonstrates that the entrepreneurial university does not result from an isolated reform or initiative but rather emerges through the systemic interaction of six condition groups. The regulatory framework provides the legal boundaries for knowledge commercialisation; managerial modernisation establishes the organisational prerequisites for innovation; diversified funding ensures financial resilience; innovation infrastructure facilitates the technological cycle; entrepreneurial culture fosters human capital; and ecosystem partnerships integrate the university into the "Triple Helix" model. The synergy of these conditions establishes the foundation for transitioning towards a competitive knowledge economy and implementing Ukraine's sustainable development strategy.

Integrating sustainable development principles substantially transforms the performance evaluation criteria for university innovations. While the dominant indicator in the classical commercialisation model remains financial performance—encompassing licensing revenue, startup profitability, and the growth of contract research—the sustainable innovation paradigm adopts a multidimensional assessment character. Effectiveness is determined not only by economic returns but also by: environmental impact (emission reduction, decarbonisation, resource efficiency, and circular solutions); social impact (improved quality of life, inclusion, security, and service accessibility); and managerial impact (transparency, accountability, collaborative partnership models, and stakeholder trust).

Thus, within the context of sustainable development, the entrepreneurial university transitions from a narrow economic logic of "commercialisation for profit" to a model of "innovation for long-term societal value." University innovative activity serves as a determinant of sustainable knowledge economy development, provided that entrepreneurial activity is coupled with socio-environmental responsibility.

For Ukraine, this holds particular significance given the necessity for structural economic modernisation and integration into the European Research Area. A sustainable profile for university innovations: facilitates access to international funding, notably the Horizon Europe programmes, European Institute of Innovation and Technology (EIT) initiatives (European Institute of Innovation and Technology, 2023), and grants oriented towards the Sustainable Development Goals; mitigates reputational risks while enhancing institutional trust in universities as responsible public actors; and cultivates long-term competitive advantages, as resilient innovation ecosystems with high levels of legitimacy and social support replace short-term "one-off" startups. In a strategic dimension, this implies that sustainability ceases to be a supplementary element of innovation policy and evolves into an integral criterion of innovation quality, determining viability within the global knowledge economy.

A systemic approach to fostering the entrepreneurial university necessitates the convergence of strategic management, innovation infrastructure, and the cultivation of entrepreneurial culture with a robust performance evaluation system. The proposed Table 3 demonstrates the correlation between university transformation instruments and their impact on knowledge economy competitiveness. It allows for the tracing of the transition logic from short-term outputs to long-term impacts, aligning with "Triple Helix" innovation policy principles and strategic sustainable development objectives.

Table 3

Instruments for Fostering the Entrepreneurial University and the System for Assessing Their Impact on Knowledge Economy Competitiveness

Instrument Block	Specific Mechanisms	Expected Results (Output)	Medium-term Effects (Outcome)	Long-term Impact (Impact)
1. Management and Policy	3–5 year university strategy with KPIs (R&D contracts, commercialisation revenue, startups, SDG projects); Intellectual Property and revenue-sharing regulations; Partnership portfolio.	Increased number of contracts; patents; startups; executed partnership agreements.	R&D revenue growth; improved positions in global rankings; intensification of industry collaboration.	Enhanced institutional resilience; strengthening of national innovation capacity.
2. Infrastructure and Services	Technology Transfer Office (TTO) + accelerator; STEM project studios; micro-grant fund (pre-seed); science parks.	Prototypes; patent applications; acceleration teams; pilot projects.	Technology commercialisation; increased share of knowledge-intensive products; creation of spin-offs.	Formation of high-tech sectors; regional innovation clusters.
3. Culture and Human Capital	Entrepreneurship across the curriculum; recognition system for innovation activity; alumni-mentor networks; dual education (work-based learning).	Student-led startup initiatives; competition participation; applied research projects.	Employment in high-tech sectors; growth in entrepreneurial activity among graduates.	Enhanced human capital; strengthening of the country's position in the Global Innovation Index.
5. Indicator System (Output → Outcome → Impact)	**Output:** patents, licences, prototypes, startups; **Outcome:** R&D revenue, employment, partnerships; **Impact:** contribution to GDP, export of knowledge-intensive services, SDG-driven innovations.	Quantitative activity indicators.	Efficiency and financial sustainability indicators.	Strengthening of regional and national competitiveness; sustainable innovation ecosystems.

Compiled by the author

Analysis confirms that the efficacy of the entrepreneurial university is determined not by isolated initiatives, but by the integration of management instruments, infrastructure, and culture into a unified strategic development system. The implementation of a multi-level indicator system ensures the measurability of university contributions to the knowledge economy and facilitates the alignment of their activities with national innovation policy priorities and the Sustainable Development Goals. It is precisely such a model that establishes the prerequisites for the long-term strengthening of Ukraine's competitiveness within the global knowledge economy.

Conclusions. As a result of the conducted research, theoretical and methodological approaches to interpreting the entrepreneurial university phenomenon have been synthesised, and its systemic role in fostering knowledge economy competitiveness has been substantiated. It has been established that the transformation of higher education institutions into entrepreneurial entities is a logical response to global processes of digitalisation, the intellectualisation of production, and the increasing role of human capital as a key development resource.

The study demonstrates that the entrepreneurial university should be viewed not as a collection of separate commercialisation practices, but as a holistic organisational model involving the strategic restructuring of management, diversification of financial sources, development of innovation infrastructure, integration of the academic community into knowledge value-creation processes, and the cultivation of an entrepreneurial culture. Within this process, Burton Clark's concept regarding five interconnected elements of university transformation acquires system-forming significance, as their implementation ensures

institutional autonomy, adaptability, and the capacity for innovative development.

It is substantiated that the effectiveness of the entrepreneurial university is realised within the "Triple Helix" model of "university-state-industry" interaction, which facilitates the transition from a linear to an ecosystemic innovation model. In this paradigm, the university acts as an integrator of knowledge, technology, and societal needs, fulfilling the function of a catalyst for regional innovation ecosystems.

The systematisation of scientific approaches allowed for the identification of four key channels through which the entrepreneurial university influences knowledge economy competitiveness: the development of human capital and entrepreneurial competencies; the commercialisation of research results and the capitalisation of knowledge; the formation of an innovation-active organisational management model; and ecosystem interaction based on sustainable development principles. Their synergistic action ensures a multiplicative socio-economic effect, manifested in the technological renewal of production, the growth of knowledge-intensive economic sectors, and the enhancement of the state's innovation capacity.

The study establishes that while the basic regulatory and legal prerequisites for the development of entrepreneurial universities have been formed in Ukraine, their practical implementation is hindered by institutional fragmentation, insufficient cooperation between science and business, limited financial autonomy of higher education institutions, and the inertia of traditional academic culture.

The integration of sustainable development principles defines a new quality of the university's entrepreneurial model, where innovative activity is evaluated not only by economic outcomes but also by social and environmental impacts. This necessitates a transition to the concept of the sustainable entrepreneurial university as an institution that combines knowledge generation, innovative entrepreneurship, and social responsibility.

Further research should be directed towards developing methodological approaches for the quantitative assessment of university contributions to national and regional innovation systems; investigating mechanisms for the effective commercialisation of R&D results within a transformational economy; analysing university management models in the context of ensuring institutional resilience and post-crisis recovery; and formulating indicators to measure the socio-environmental impact of university innovations within the sustainable development paradigm.

Conflict of Interest

The author certifies that no conflict of interest (financial, professional, or personal) exists that could have influenced the objectivity of the research results or conclusions. The integrity of the double-blind peer review process was ensured through a mandatory declaration of the absence of conflict of interest submitted via the journal's editorial system. This protocol guaranteed complete author anonymity and the independence of the expert evaluation throughout the entire editorial cycle.

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ПІДПРИЄМНИЦЬКИЙ УНІВЕРСИТЕТ ЯК ДРАЙВЕР ФОРМУВАННЯ КОНКУРЕНТОСПРОМОЖНОСТІ ЕКОНОМІКИ ЗНАНЬ У КОНТЕКСТІ СТАЛОГО РОЗВИТКУ: ТЕОРЕТИКО-МЕТОДОЛОГІЧНІ ЗАСАДИ ТА ІНСТИТУЦІЙНІ МЕХАНІЗМИ РОЗВИТКУ

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Реферат:

Актуальність. Перехід до економіки знань, зумовлений цифровізацією, прискореною циркуляцією знань і зростанням ролі людського капіталу, змінює функції університетів: від «освітньо-наукових» установ до активних агентів інноваційної екосистеми. У межах моделі Triple Helix університет виступає актором взаємодії «університет–індустрія–уряд», що забезпечує трансфер знань у виробництво, комерціалізацію результатів досліджень і розвиток підприємницьких компетентностей. Додаткового виміру проблемі надає інтеграція принципів сталого розвитку та орієнтація інновацій на соціально-екологічний ефект.

Мета: теоретично обґрунтувати сутність підприємницького університету та систематизувати механізми його впливу на конкурентоспроможність економіки знань у контексті інноваційної трансформації та сталого розвитку.

Методи: теоретичне узагальнення та абстрагування – для формування понятєво-категоріального апарату; аналіз і синтез – для виокремлення ключових елементів підприємницької трансформації; порівняння –

для зіставлення зарубіжних і вітчизняних підходів; системний і структурно-функціональний аналіз – для дослідження університету як інституції інноваційної екосистеми; інституційний аналіз – для оцінювання нормативно-правових передумов та бар'єрів; моделювання та логіко-аналітичний методи – для формалізації каналів упливу та формування висновків.

Результати. Обґрунтовано, що підприємницький університет є цілісною організаційною моделлю, що поєднує управлінську автономію, диверсифікацію фінансування, інноваційну інфраструктуру та підприємницьку культуру. Запропоновано розглядати його внесок у конкурентоспроможність економіки знань через чотири взаємопов'язані канали: формування людського капіталу та підприємницьких компетентностей; комерціалізація НДДКР і капіталізація знань; інноваційно-активна модель управління та інституційна стійкість; екосистемна взаємодія в логіці Triple Helix із включенням критеріїв сталих інновацій. Показано, що в Україні наявні базові нормативні передумови, однак практичну імплементацію стримують інституційна фрагментарність, слабка кооперація науки, бізнесу та обмежена фінансова автономія.

Висновки: підприємницький університет доцільно трактувати як системний чинник модернізації економіки знань і реалізації цілей сталого розвитку за умови синергії організаційної трансформації, інструментів комерціалізації та екосистемних партнерств; оцінювання результативності має враховувати не лише економічні, а й соціально-екологічні ефекти.

Ключові слова: *підприємницький університет, економіка знань, конкурентоспроможність, сталий розвиток, інноваційна екосистема, комерціалізація знань, людський капітал, інноваційно-активний університет*

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