

Synergic mechanisms of university transformation in the global economy

The subject of the study is the process of forming synergistic mechanisms for the transformation of universities in the global economy, which includes the interaction of educational, scientific, entrepreneurial, digital and institutional components, as well as the mechanisms for the emergence of added value as a result of their integrated functioning.

The purpose of the study is to substantiate the essence of synergistic mechanisms for the transformation of universities and determine the features of their implementation in the conditions of globalization with the subsequent formation of approaches to increasing the efficiency of the functioning of universities in the global economic space.

The research methods are analysis and synthesis, a systematic approach, comparative analysis, induction and deduction, as well as elements of synergistic and structural–functional analysis of complex socio–economic systems.

Results of the work: the essence of synergistic mechanisms for the transformation of universities is revealed; key elements and the nature of their interaction in the global environment are identified; the role of the integration of education, science, business and digital technologies in the formation of a new university model is substantiated; types of synergistic effects and mechanisms of their occurrence are systematized; the influence of network interactions on the development of innovative potential is established; directions for increasing the competitiveness of universities in the global economy are outlined.

Field of application of the results. The results obtained can be used: by state administration bodies to form a policy for the development of higher education in the context of globalization; in higher education institutions to transform management models and integrate into global educational and scientific networks; in research institutions to activate innovative activity; in management practice to increase the efficiency of the functioning of universities as elements of the global economy.

Conclusions. As a result of the study, it was established that synergistic mechanisms are a determining factor in the transformation of universities in the global economy and form their ability to integrate, adapt and generate innovations. The effectiveness of the functioning of universities depends on the level of coherence of interaction between their structural elements and the degree of inclusion in global knowledge networks. Taking into account synergistic effects allows to increase the effectiveness of management decisions and ensure the sustainable development of universities in a dynamic environment.

Keywords: synergy, university transformation, global economy, university systems, innovative development, academic entrepreneurship, network interactions, digitalization, intellectual capital.

ВЕРГУН М. О.

Синергетичні механізми трансформації університетів у глобальній економіці

Предметом дослідження є процес формування синергетичних механізмів трансформації університетів у глобальній економіці, що охоплює взаємодію освітніх, наукових, підприємницьких, цифрових та інституційних складових, а також механізми виникнення доданої вартості внаслідок їх інтегрованого функціонування.

Метою дослідження є обґрунтування сутності синергетичних механізмів трансформації університетів та визначення особливостей їх реалізації в умовах глобалізації з подальшим формуванням підходів до підвищення ефективності функціонування університетів у світовому економічному просторі.

Методи дослідження становлять аналіз і синтез, системний підхід, порівняльний аналіз, індукція та дедукція, а також елементи синергетичного та структурно–функціонального аналізу складних соціально–економічних систем.

Результати роботи: розкрито сутність синергетичних механізмів трансформації університетів; визначено ключові елементи та характер їх взаємодії у глобальному середовищі; обґрунтовано роль інтеграції освіти, науки, бізнесу та цифрових технологій у формуванні нової моделі університету; систематизовано типи синергетичних ефектів та механізми їх виникнення; встановлено вплив мережових взаємодій на розвиток інноваційного потенціалу; окреслено напрями підвищення конкурентоспроможності університетів у глобальній економіці.

Галузь застосування результатів. Отримані результати можуть бути використані: органами державного управління для формування політики розвитку вищої освіти в умовах глобалізації; у закладах вищої освіти для трансформації управлінських моделей та інтеграції у світові освітньо-наукові мережі; у науково-дослідних установах для активізації інноваційної діяльності; у практиці управління для підвищення ефективності функціонування університетів як елементів глобальної економіки.

Висновки. У результаті дослідження встановлено, що синергетичні механізми є визначальним чинником трансформації університетів у глобальній економіці та формують їх здатність до інтеграції, адаптації та генерації інновацій. Ефективність функціонування університетів залежить від рівня узгодженості взаємодії між їх структурними елементами та ступеня включення у глобальні мережі знань. Урахування синергетичних ефектів дозволяє підвищити результативність управлінських рішень та забезпечити стійкий розвиток університетів у динамічному середовищі.

Ключові слова: синергетика, трансформація університетів, глобальна економіка, університетські системи, інноваційний розвиток, академічне підприємництво, мережові взаємодії, цифровізація, інтелектуальний капітал.

Problem statement. The transformation of universities is taking place in the context of increasing global competition, digitalization of the economy and the growing role of knowledge as a key resource for development. Universities increasingly operate not as isolated educational institutions, but as open systems integrated into global networks of knowledge creation and dissemination, innovation and technology. In these conditions, their functional purpose is changing, which requires a transition from traditional management models to more complex, integrated and adaptive forms of organizing activities. Modern challenges are associated not only with the need to improve the quality of education and scientific research, but also with ensuring effective interaction of universities with business, the state and international institutions. Such interaction forms new effects that are not reduced to the results of the activities of individual structural elements, but arise as a result of their coordinated interaction. It is these effects that determine the ability of universities to innovative development, integration into the global economy and the formation of competitive advantages. At the same time, in the practice of managing the development of universities, synergistic mechanisms remain insufficiently taken into account. Most of the existing approaches are focused on the analysis of individual components of activity, without taking into account their systemic interaction and the nonlinear

nature of development. This limits the possibilities of a comprehensive assessment of the potential of universities and hinders the formation of effective strategies for their transformation. The relevance of the study is due to the need to deepen the theoretical foundations of the synergistic approach to the transformation of universities in the global economy and to substantiate the mechanisms that ensure the increase in the efficiency of their functioning based on the integration of educational, scientific and business processes.

Analysis of recent research and publications. In modern scientific research, the transformation of universities is considered through the prism of the development of the knowledge economy, the globalization of the educational space and the formation of entrepreneurial and innovative models of higher education. Considerable attention is paid to the integration of educational, scientific and business activities, the development of university ecosystems, as well as the strengthening of the role of digital technologies in the functioning of universities. At the same time, the synergistic aspects of their development are studied mainly in the context of the theory of complex systems and are only partially adapted to the sphere of higher education. Existing approaches focus mainly on individual elements of transformation, not providing a holistic view of the mechanisms of the emergence of synergistic effects in the process of integrating

universities into the global economy [1–5]. The issues of the interaction of structural components of universities, their role in the formation of innovative potential and the influence of network connections on the effectiveness of functioning remain insufficiently revealed. This necessitates further research aimed at substantiating the synergistic mechanisms of university transformation and their practical use in management.

Presentation of the main material. The transformation of universities in the global economy occurs as a process of transition from locally oriented educational structures to multi-level systems integrated into international scientific, educational and innovation networks. In this context, the determining factor is synergistic mechanisms that ensure the formation of new qualitative characteristics of the functioning of universities through the interaction of their key elements. Such interaction is not limited to the sum of individual results, but generates additional value in the form of acceleration of innovation processes, increased management efficiency and expansion of opportunities for integration into the global environment. Synergistic mechanisms are based on the coordinated interaction of educational, scientific, entrepreneurial, digital and institutional components, each of which performs specific functions, but their combination forms a new model of the university as a center for the generation and commercialization of knowledge. In this process, the quality of connections between the elements of the system becomes key, which determines the level of emergence of synergistic effects and their impact on the development of the university.

To systematize the main components of the synergistic transformation of universities, it is advisable to present them in the form of a generalized structure (Table 1).

The synergistic effect within such a system arises as a result of the combination of functions of individual components, which ensures the formation of

new development opportunities. For example, the integration of scientific research with entrepreneurial activity contributes to the rapid commercialization of innovations, while the combination of the educational process with real business practices increases the quality of specialist training. As a result, a multiplicative effect is formed, which exceeds the total result of the activities of individual elements. For a deeper understanding of the nature of synergistic effects, it is advisable to consider their main types and mechanisms of occurrence (Table 2).

A condition for the effective functioning of synergistic mechanisms is the presence of developed network connections that ensure the exchange of resources, knowledge and innovations. The university in such a system plays the role of a coordinating center that integrates various information flows and ensures their transformation into specific results. This changes the traditional management model, focusing it on supporting horizontal connections, flexibility of organizational structures and rapid response to changes in the external environment. The further development of universities in the global economy is associated with the deepening of synergistic interactions, the formation of new partnership formats and the transition to integrated models of value creation. In such conditions, the key is not the volume of resources, but the ability to effectively combine them, which ensures the emergence of new qualitative effects and determines the competitiveness of universities at the international level.

Further deployment of synergistic mechanisms for university transformation is associated with the transition to more complex configurations of interaction, in which not only the structure of the system, but also the dynamics of the connections between its elements play a decisive role. In these conditions, the university acts as an open center for the circulation of knowledge, innovations and resources, which ensures their effective combination and transformation into practical results. Such a role involves a change

Table 1. Components of synergistic mechanisms of university transformation

Component	Content	Functional purpose	Result
Educational	educational programs, training	competency formation	human capital development
Scientific	research, innovation projects	knowledge generation	innovative results
Entrepreneurship	startups, incubators, technology transfer	commercialization	added value creation
Digital	information systems, platforms	process integration	increased efficiency
Institutional	regulation, partnerships	interaction coordination	sustainable development

Source: formed by the author

Table 2. Types of synergistic effects of university transformation

Effect Type	Characteristics	Formation mechanism	Manifestation
Systemic	exceeding the overall result	integration of components	increasing efficiency
Innovative	accelerating the creation of new solutions	interaction of science and business	new products
Cognitive	accumulation of knowledge	information exchange	increasing the quality of education
Institutional	coordination of actions	regulatory support	system stability
Network	expanding interaction	formation of connections	global integration

Source: formed by the author

in management approaches focused on supporting the interdependence of processes and creating conditions for the self-development of the system. The increase in the intensity of interaction between educational, scientific and business components contributes to the formation of accumulation effects, when the results of previous actions become the basis for further development. This is manifested in an increase in the number of innovative projects, the expansion of partner networks and an increase in the level of integration of universities into international structures. As a result, a self-reinforcing effect occurs, which ensures the acceleration of transformation processes. At the same time, the strengthening of relationships is accompanied by a complication of the structure of the system, which requires new approaches to management. Traditional administrative methods are insufficient, as they do not take into account the nonlinear nature of development and multi-vector interactions. In these conditions, it is advisable to use adaptive management models that provide a balance between the autonomy of individual elements and the coherence of their functioning.

An important aspect is the ability of university systems to restore and maintain stability in the face of external influences. The stability of such systems is formed due to the diversification of resources, the development of alternative channels of interaction and the flexibility of organizational structures. This allows maintaining the effectiveness of functioning even in the event of changes in the external environment or disruption of individual connections.

Thus, synergistic mechanisms for the transformation of universities determine a new quality of their development, which is based on integration, interaction and the ability to self-development. In these conditions, the key factor for success is not only the availability of resources, but also the effectiveness of their combination, which ensures the formation of new competitive advantages in the global economy.

Conclusions

As a result of the study, it was established that synergistic mechanisms are the determining basis for the transformation of universities in the global economy, since it is through the interaction of key components that a new quality of their functioning is formed. It is proven that the effectiveness of university development depends on the nature of the connections between educational, scientific, entrepreneurial and institutional components, which ensure the emergence of additional effects that exceed the total results of their separate functioning. It is determined that synergistic effects are manifested in the acceleration of innovation processes, improving the quality of educational and scientific results, developing entrepreneurial activity and expanding the international integration of universities. Their formation is associated with the development of network interactions, the concentration of innovative potential and the activation of knowledge exchange processes. It is substantiated that increasing the effectiveness of university functioning requires the implementation of adaptive management models that take into account the nonlinear nature of development and ensure the consistency of actions of all elements of the system. Of particular importance is the formation of mechanisms to support flexibility, resilience and the ability to self-development, which allows universities to function effectively in a dynamic global environment.

The generalization of the research results gives grounds to argue that the use of a synergistic approach opens up new opportunities for improving the management of university development, increasing their competitiveness and ensuring sustainable integration into the global economy.

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