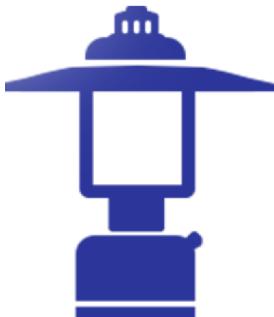


ADVANCES IN HIGHER EDUCATION THROUGH STRATEGIC UNIVERSITY-INDUSTRY ALLIANCES TO STRENGTHEN COMPETITIVENESS IN THE ECONOMY



AVANCES DE LA EDUCACIÓN SUPERIOR MEDIANTE ALIANZAS ESTRÁTÉGICAS UNIVERSIDAD-INDUSTRIA PARA FORTALECER LA COMPETITIVIDAD EN LA ECONOMÍA

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ABSTRACT

The article examines the specifics of training specialists in the context of a knowledge-based economy. The research highlights models of workforce training typical of industrial and resource-based economies. The study is based on document analysis and content analysis of scientific literature. The results indicate that successful adaptation to the requirements of the knowledge economy is impossible without a shift to an interdisciplinary research model and close cooperation between universities and businesses. In the Russian context, these conclusions are especially relevant due to systemic problems in higher education: limited labor mobility, declining student motivation, and insufficient alignment of educational programs with labor market needs. The proposed recommendations can be applied in implementing educational reforms, regional re-training programs, and the creation of sustainable labor ecosystems. The article emphasizes that modernization of the education system should be viewed not as a forced measure but as a long-term strategy in response to global economic changes.

Keywords:

Economy, higher education, knowledge exchange, innovation.

RESUMEN

Este artículo examina las particularidades de la formación de especialistas en el contexto de una economía del conocimiento. La investigación destaca modelos de formación laboral típicos de las economías industriales y basadas en recursos. El estudio se fundamenta en el análisis documental y de contenido de la literatura científica. Los resultados indican que una adaptación exitosa a las exigencias de la economía del conocimiento es imposible sin un cambio hacia un modelo de investigación interdisciplinario y una estrecha colaboración entre universidades y empresas. En el contexto ruso, estas conclusiones son especialmente relevantes debido a problemas sistémicos en la educación superior: movilidad laboral limitada, disminución de la motivación estudiantil e insuficiente adecuación de los programas educativos a las necesidades del mercado laboral. Las recomendaciones propuestas pueden aplicarse en la implementación de reformas



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educativas, programas regionales de reciclaje profesional y la creación de ecosistemas laborales sostenibles. El artículo enfatiza que la modernización del sistema educativo debe concebirse no como una medida impuesta, sino como una estrategia a largo plazo en respuesta a los cambios económicos globales.

Palabras clave:

Economía, Educación Superior, intercambio de conocimiento, innovación.

INTRODUCTION

The intensification of competition among the world's leading economies, prevalent in current times, dictates a constant search for the most effective and sustainable growth factors. One of these factors is knowledge (in the static approach) and its dissemination and commercialization (in the dynamic approach). A country's ability to create and absorb knowledge largely determines its competitive position on the international stage. Traditional factors that were previously considered key, such as labor costs, exchange rates, interest rates, and economies of scale, are giving way to the features of a knowledge-based economy (KBE). In this new paradigm, the strategic capacity to generate, codify, update, and apply knowledge becomes not simply an economic advantage but the primary foundation of national and global competitiveness.

In 2001, the OECD and the World Bank defined the KBE as *“an economy in which knowledge is created, accumulated, transferred, and effectively used by enterprises, organizations, individuals, and communities”*. It is not limited to high-tech industries or information technologies but rather serves as a framework for analyzing policy options in education, information infrastructure, and innovation systems that can support countries in entering the knowledge economy (Davis & Dingel, 2019). This definition highlights the systemic and multidimensional character of a KBE: it requires institutional coordination, coherent public policy, and collaborative ecosystems in which scientific, technological, and human resources are mobilized and linked with broader economic goals.

The meaning of the concept of a KBE is largely determined by its name. A KBE is formed and develops under the dominant influence of science or scientific knowledge (Semenova et al., 2023). Another interpretation limits the KBE to the segment of the economy shaped directly by technological knowledge and innovation, those that are used or can be used to produce new goods and services (Samushkin, 2024). This perspective emphasizes the commercial and applied dimension of knowledge and underscores the importance of converting scientific research into innovation that generates measurable economic value. At the same time, information and telecommunication

innovations play a central role in supporting and accelerating the development of the KBE (Skrodzka, 2016), enabling rapid knowledge flows and increasing the efficiency of innovation systems.

SoriaLeón (2025) emphasizes that educational management in higher education should be approached not merely as a set of administrative procedures but as a strategic, human-centered, and context-sensitive practice that recognizes universities as complex, dynamic, and learning-oriented systems. She highlights that effective educational management is crucial for promoting continuous improvement, institutional quality, and the development of human capital, which directly influences competitiveness in a knowledge-based economy.

Key dimensions include academic leadership, collaborative organizational culture, student well-being, ethical training, and professional development of personnel, all of which align with the need for universities to generate socially responsible, innovative, and skilled graduates. Moreover, she stresses the importance of inclusive, sustainable, and student-centered approaches, alongside reliable evaluation processes, evidence-based decision-making, and transparent governance. These principles suggest that university–industry alliances should extend beyond technological transfer or economic objectives to integrate values, equity, human development, and sustainability. Overall, SoriaLeón's framework supports the argument that modernizing higher education requires strategic educational management that fosters knowledge creation, talent development, and societal impact, thereby enhancing universities' contribution to economic competitiveness and the knowledge-based economy.

In a broader sense, the KBE is shaped not only by technological innovation (Abdullayev et al., 2024) but also by continuous processes of learning and training among economic actors, processes that unfold both before and during economic activity. Organizational and institutional conditions significantly influence the assimilation of knowledge and innovation (Zhukova et al., 2024), thus affecting overall economic competitiveness. From this perspective, the KBE transforms into an “economy of learning individuals,” where economic progress relies heavily on public policies related to competition, trade (Khalipov, 2024), investment, telecommunications (Belikova, 2024), support for innovative enterprises, and the development of robust and inclusive education systems.

This conceptualization reflects the four core pillars of the KBE: an institutional and legal environment (Naumenko, 2024; Vassilchenko, 2024), innovation systems, information infrastructure, and education and training. Among these, education holds a foundational and strategic place because it ensures the formation and renewal of human capital. In contemporary conditions, there is an urgent

need to enhance lifelong learning opportunities and improve educational quality (Serebrennikova, 2024). The concept of human capital positions individuals as both sources and carriers of knowledge, capable of transferring it into innovation processes that benefit the economy. Studies show that knowledge and skills relevant to economic activity increase productivity, reduce the risk of social exclusion, and raise income levels, while influencing social behavior in ways that enhance the overall effectiveness of investments in human capital.

However, the rapid digitalization of social life and work continuously introduces new challenges to education (Shichkin et al., 2024). The need for digital literacy, adaptability, and interdisciplinary competencies reshapes the requirements placed upon educational institutions, particularly universities. These institutions face mounting pressure from governments, industries, and society to remain competitive, forward-looking, and responsive. Universities must now generate knowledge on a larger scale than before and transfer it outward for use in the economy. The traditional model, in which universities produce knowledge and external actors, such as enterprises or research institutes, convert it into market or societal solutions, no longer aligns with the dynamic, innovation-oriented demands of the KBE.

These transformations are theorized in the Triple Helix model, which conceptualizes the interaction between universities, businesses, and governments as the fundamental mechanism of innovative development. According to this model, universities are no longer isolated generators of knowledge but active, interconnected partners that collaborate with economic and governmental actors to stimulate innovation ecosystems. This triadic relationship becomes even more relevant as competition intensifies not only among enterprises but also among regions, nations, and economic blocs, driven by strategic investments in research and emerging technologies.

In response to these pressures, scholars propose more integrated and advanced cooperation tools that align with the evolving challenges of the KBE. Significant financial resources devoted by governments to technology development reveal the need for structured, collaborative innovation platforms. One such proposal is the creation of knowledge integration communities (KIC), which bring together academic institutions, industry actors, and governmental agencies to pursue joint agendas. These communities aim to generate improved outcomes such as new products, processes, and organizational or social innovations, fostering dynamic innovation ecosystems capable of supporting sustainable economic growth.

In this context, the role of higher education institutions becomes increasingly strategic. Universities must adapt by rethinking their mission, restructuring their programs,

and enhancing their capacity to engage in meaningful collaboration with the business sector. Strategic university-industry partnerships are essential for ensuring that educational processes align with labor market needs, accelerating knowledge transfer, and strengthening national and regional competitiveness. Consequently, the focus of contemporary research is shifting toward developing new models of higher education institutions that operate within networked, innovation-driven environments.

The present study aims to contribute to this evolving discussion by presenting a model of a modern higher education institution grounded in robust, mutually beneficial relationships between universities and the business environment. This model seeks to illuminate the institutional mechanisms and strategic opportunities through which higher education can support innovation, address the demands of the KBE, and strengthen overall economic competitiveness.

MATERIALS AND METHODS

The study was based on a combination of qualitative and analytical methods to examine the issue of modernizing higher education in the context of the knowledge economy.

1. Search and selection of sources. The literature search was conducted in international and national databases (Scopus, Web of Science, Google Scholar, eLibrary) for the period 2000-2023. The main selection criteria were as follows: relevance to the topic of university-business interaction, publications in English and Russian, and indexation in recognized scientific databases.

2. Methods of analysis. Content analysis of scientific literature was applied, identifying key themes such as forms of cooperation between universities and business, models of knowledge integration, and tools for the commercialization of innovations. In addition, a comparative analysis of publications was used to identify regional features.

3. Data validation. To increase the reliability of the conclusions drawn, methodological triangulation was applied: comparing data from scientific publications with official documents of the OECD, the World Bank, and national strategies in education and innovation.

The main objectives of the presented exploratory study were to identify the main reasons for the need to change the current model of higher education in the KBE and to determine the modern forms of cooperation between universities and businesses. Therefore, the following research questions were formulated:

1. What are the main reasons for the need to change the current model of higher education in the KBE?

2. What are the modern forms of cooperation between universities and businesses?

As shown by document analysis and content analysis of scientific literature, there are three main prerequisites for seeking a new model of higher education based on cooperation between the university and the business environment: high costs of basic research, the unprofitability of fundamental studies within enterprises, and the growing importance of interdisciplinary research.

Our analysis of scientific literature also helps identify the main contemporary forms of cooperation between universities and the business environment. These include technology parks, business incubators, technology transfer centers, venture capital mechanisms, business angel participation, spin-off companies, and Knowledge and Innovation Communities (KICs). Together, these structures create an ecosystem in which universities can more effectively commercialize research results and integrate students into real economic processes. They also enable businesses to access academic expertise, reduce innovation risks, and accelerate the development of new technological solutions.

Within the framework of our study, we showed that a KIC consists of six main elements. Four of them (research (research groups), education (universities), the business environment (industry), and government) take part in various processes of planning and organizing the work of a KIC. The remaining two components are knowledge exchange (KE) and knowledge-generated innovations (KGI).

According to the analysis of scientific literature, the foundation of university activity in the KBE is basic research. In traditionally managed universities with a departmental structure, it is difficult to participate in interdisciplinary research. Each department is a separate organizational and budgetary unit. Interdisciplinary teams create misunderstandings between departments; therefore, radical organizational changes are needed, i.e., abandoning departments in favor of sections. In this case, university management would take on a process-oriented rather than a functional character (Danilova, 2024). It can be said that the growing importance of interdisciplinary research requires a different university structure (Severin, 2023). Faculties, as the main organizational units of universities, are considered an obstacle to the creation of interdisciplinary teams.

Spending on basic research began to grow. Given the fact that the state could not afford to increase subsidies, alternative sources of funding were needed, which universities began to seek in the business environment, ready for cooperation and seeing benefits in such relationships (Golubtsova et al., 2025).

Industrial organizations engaged in R&D also began to face problems due to low financial profitability. Their research initially consisted of two parts: one part was altruistic ("free") and aimed at strengthening the organization's scientific position, while the other part allowed it to survive and develop. The market came to determine the type of research activity. Research organizations ceased to be cost centers and turned into profit centers. As profit centers, they had to be included in value chains created for the market. Out of necessity, they were forced to abandon altruistic activity in the field of basic research. Seeking to survive, these organizations began looking for alternative, cheaper sources of technological support and found them in academic institutions conducting basic research.

The growing number of students led to the massification of education and the dilution of science within the educational process. This gave rise to problems with maintaining high quality in education (Shichkin et al., 2024; Zhuzelev et al., 2024). It is becoming increasingly difficult to make effective use of the resources available to universities that lack traditions of cooperation with industry (Cury, 2010).

The variety of tools for the commercialization of innovations is a response to the need for different forms of cooperation between industry and higher education. The experience of many countries that are among the leaders in economic innovation shows that their success was influenced by the introduction of new tools for introducing innovations into the economy. These include technology parks, business incubators, technology transfer centers, venture capital, business angels, and spin-off companies (startups).

According to the International Association of Science Parks, the mission of a technology, science, or research park is "to enhance the welfare of the community in which it operates by promoting a culture of innovation and competitiveness among entrepreneurs and knowledge-based institutions". The improvement of community living standards is achieved through cooperation of universities, research and development units, enterprises, and markets. Technology parks help develop knowledge-intensive enterprises (for example, spin-offs or spin-outs) through incubation and spin-off processes.

Business incubators (including technology incubators) are organizations that provide business, financial, and technical consulting at the early stage of enterprise development, known as the company incubation stage. The main goal of this stage is to bring a newly established enterprise to a condition in which it can function independently in the market for a period of time. Companies created in this way generate jobs, bring new technologies to the market, and contribute to prosperity and successful economic development at both the local and national levels.

A special type of business incubator is the pre-incubator or academic business incubator, defined as an extension of the educational process, through which accumulated knowledge of innovations and market processes serves to better prepare future specialists for entering the market. An academic incubator is created to support the economic activity of the academic community or university staff and students engaged in entrepreneurship. It is based within higher education institutions. Such units carry out a wide range of activities aimed at the commercialization of products and technological innovations.

The Technology Transfer Center (TTC) brings together an organizationally diverse group of consulting, training, and information teams that implement programs to support technology transfer and commercialization, as well as all tasks associated with this process. Such teams are established to facilitate the transfer of knowledge from universities to business. The objectives of the TTC include conducting internal university audits, creating databases and developing networks between science and the economy, identifying the needs of innovative business structures, supporting new technologies developed at universities, and promoting and fostering technological entrepreneurship.

Business angels are responsible for financing newly established innovative enterprises. The main goal of business angels is to increase their own capital invested in innovative projects. Business angels may act individually, but often, to protect personal assets, share risks, optimize taxation, or consolidate capital from different donors, they unite into a business angel network. This form of cooperation between science and business is difficult to implement in Russia. One of the reasons for this situation is the lack of free financial resources among angels for innovation.

One of the instruments of cooperation between higher education and business that is currently being promoted is the creation of spin-off enterprises. In the relevant literature, a spin-off is identified as a "spun-off" company defined as a new enterprise established through the initiative of an employee (or group of employees) of a parent organization (e.g., a university) who makes use of the intellectual resources of that parent organization. The establishment of a spin-off enterprise by researchers from scientific institutions or staff of large industrial enterprises is often linked to the commercial use of technologies, technical knowledge, and skills acquired within the parent organization. This process makes a significant contribution to the dissemination (diffusion) of new technologies in the economy.

The selection of the optimal form of cooperation between universities and businesses depends on many factors. The most important among them are the willingness to participate in joint innovation projects (both on the part

of the university and the business sector), the knowledge and skills possessed by all participants, the volume of financial resources at their disposal, as well as the recognition of the feasibility of implementing innovations.

In this context, a promising form of cooperation between universities and business may be the so-called KIC, whose origins can be traced to the collaboration between the Massachusetts Institute of Technology (USA) and the University of Cambridge (UK) (Petrova, 2024). To adopt the best practices of cooperation between the American industry and MIT, the UK government established the Cambridge-MIT Institute (CMI). The third partner in this initiative was the British government, together with private investors.

The need for such an approach is rooted in the multidirectional flow of knowledge and experience of industry, science, education, and the governance sector (i.e., government and regional authorities). Groups of people from different sectors of society, who had not previously worked together, began to collaborate within the framework of the KIC. Most often, this cooperation concerned technological, economic, and social issues. At the same time, the training of students, the commercialization of research results, and the resolution of regional problems were carried out. The experience of the CMI allows us to generalize and propose the KIC model as an effective tool for the commercialization of knowledge and innovation, including in Russia.

It is assumed that the KIC will attract companies of all sizes, from startups and small and medium-sized enterprises to large corporations. For students, the opportunity to engage in solving real problems represents a unique chance to apply and expand the knowledge acquired during their studies. One of the most important skills gained through interaction with the KIC is an understanding of how to implement developed solutions. Cooperation with the KIC also makes it possible to launch new types of interdisciplinary research that foster innovation through participation in KIC working groups. However, the most crucial element of the KIC model is the continuous application of the experience gained in educational activities.

The fundamental component of the theoretical KIC model is KE, which integrates all human resources into a single whole. It also embodies the main mission of the KIC and distinguishes it from other concepts pursuing similar objectives. KE is carried out in different ways: from regular seminars for all stakeholder groups (not only academic), staff exchanges, and dedicated websites to regularly issued electronic newsletters, video conferences, and PR activities.

The KIC should be headed by individuals of equal status: one manager from each university participating in the consortium (for example, in the case of the CMI, both

MIT and Cambridge University have their representatives managing projects, while a third person acts as the KIC Director). The Director of the KIC should not bear substantial responsibility for research activities. Their primary role is to coordinate and organize the work of the KIC. The Director is responsible for ensuring that the main goals of the KIC (i.e., knowledge exchange) are achieved and that the KIC does not become exclusively engaged in academic tasks.

Lower-level management does not influence the overall activity of the KIC but supervises assigned research programs and the staff conducting the research. Outside the formal structure are representatives of the other three groups (business, education, and government). As a rule, they occupy different levels of management within their home organizations. Managing interaction with these stakeholders and addressing their diverse expectations is one of the Director's key responsibilities.

In summary, the research allows us to draw the following theoretical and practical conclusions:

1. At the present stage of social development, the modern economy is often referred to as a KBE (or the knowledge economy) to emphasize the new role of knowledge. This new role of knowledge (whether in terms of access to it or possession of it) is reflected in the recognition of knowledge as a key factor in the competitive struggle of economic actors in the global market.
2. Universities are faced with the need to collaborate with the business environment. Therefore, they must adopt an entrepreneurial and creative approach. The necessity for change is driven by the high cost of fundamental research, the unprofitability of conducting such research within technology companies, the growing international competitiveness in academic education, and the increasing importance of interdisciplinary studies.
3. Currently, universities are regarded as drivers for improving the quality of life in society worldwide and are often referred to as socially responsible universities. However, this requires revolutionary changes in their structures and culture. At the same time, Russian higher education is lagging behind organizational and technological progress, suffers from underinvestment, and operates with weak management systems. This creates the need for a model of higher education that emphasizes collaboration between science and business in the transfer and use of resources. Similar challenges are also typical of Latin American countries, where universities are viewed as key drivers of the KBE.

CONCLUSIONS

The article presents a new model of a higher education institution and identifies the main features of the relationship between the modern university and the business

environment within the concept of KIC. A KIC is an effective tool for supporting cooperation between universities and businesses in a KBE. The practical use of KIC opens opportunities for integrating research and education, as well as for the commercialization of innovations. A necessary condition for the KIC's success in Russia is the integration of the scientific community and closer cooperation than before with leading enterprises and innovation centers.

The use of this tool requires qualitatively new and multi-level interaction between universities and the business environment. Presenting these issues will enable the academic community to gain insight into effective forms of cooperation between universities and business, while also highlighting the need for closer collaboration or even integration at levels ranging from individual cities and regions to the international arena.

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