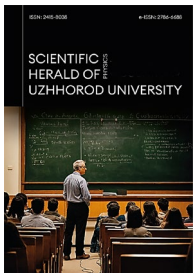
Scientific Herald of Uzhhorod University
Series "Physics"
Journal homepage: https://physics.uz.ua/en
Issue 55, 244–256
Received: 05.11.2023. Revised: 11.01.2024. Accepted: 13.02.2024



DOI: 10.54919/physics/55.2024.24fj4

Development of the innovation system infrastructure of Kazakhstan in the context of the knowledge-intensive economy

Rysty Sabirova*
PhD in Economics, Associate Professor
Kh. Dosmukhamedov Atyrau University
060011, 1 Studenchesky Ave., Atyrau, Republic of Kazakhstan
https://orcid.org/0000-0001-6637-2614

Bibinur Korgan
PhD in Pedagogy, Dean of the Faculty of Multilingual Education
Kh. Dosmukhamedov Atyrau University
060011, 1 Studenchesky Ave., Atyrau, Republic of Kazakhstan
https://orcid.org/0000-0001-6862-4272

Elmira Adiyetova
PhD in Economics, Associate Professor
Kh. Dosmukhamedov Atyrau University
060011, 1 Studenchesky Ave., Atyrau, Republic of Kazakhstan
https://orcid.org/0000-0002-6895-2169

Karlygash Auyezova
PhD in Technical Sciences, Associate Professor
L.N. Gumilyov Eurasian National University
010008, 2 Satpayev Str., Astana, Republic of Kazakhstan
https://orcid.org/0000-0002-7190-0271

Zhanat Yerniyazova
PhD in Economics, Associate Professor
Korkyt Ata Kyzylorda University
120001, 29A Aitike bi Str., Kyzylorda, Republic of Kazakhstan
https://orcid.org/0000-0003-2198-3985

Ainur Kanatova
Master of Science, Senior Lecturer
Kh. Dosmukhamedov Atyrau University
060011, 1 Studenchesky Ave., Atyrau, Republic of Kazakhstan
https://orcid.org/0000-0002-0844-5093

Suggested Citation:
Sabirova R, Korgan B, Adiyetova E, Auyezova K, Yerniyazova Zh, Kanatova A. Development of the innovation system infrastructure of Kazakhstan in the context of the knowledge-intensive economy. *Sci Herald Uzhhorod Univ Ser Phys.* 2024;(55):244–256. DOI: 10.54919/physics/55.2024.24fj4

*Corresponding author

Abstract

Relevance. The modern conditions of post-industrialism in the sphere of economic relations are influenced by some factors, in particular, institutional changes and the challenges of globalization. In turn, this is characterized by a new format that has an organizational and institutional focus.

Purpose. This research aims to elucidate the distinctions between the terms "institute" and "institution" within the context of the innovation economy.

Methodology. The study draws on theoretical and methodological foundations rooted in the national innovation system, synthesizing insights from foreign and domestic scholarship. Employing a system-structural and functional approach

Results. The research unveils a sequential hierarchy of institutional definitions, revealing inherent differences between "institute" and "institution". It proposes a classification of institutions based on eight criteria, offering a nuanced understanding of institutional dynamics within the innovation economy. Notably, it introduces the concept of temporary and permanent institutions, elucidating their roles in periods of systemic modernization and legislative evolution.

Conclusions. The study underscores the necessity for clarity in conceptualizing institutional terms, particularly within the realm of institutionalism.

Keywords: features of the economic system; innovations in the Republic of Kazakhstan; institutionalism; globalization; post-industrial information society.

Introduction

With the development of the economic system in modern conditions, attention should be paid to the experience of advanced countries, for example, the USA, Germany, France, Switzerland, Singapore, Finland and others. Based on this, the experience of these states allows concluding that the development of an innovative economy is due to the discovery of a new method that ensures the orderliness of communications and interactions, the harmonization of needs on the basis of strict rules and regulations, which is inherent in the Republic of Kazakhstan only fragmentarily, sporadically and selectively [1]. To improve the situation, it is important to understand practical information about the insufficient effectiveness of existing development institutions, the prospects for new ones, the behavior of subjects in the implementation of the mechanism [2], the strategic problems of reforms that have a negative impact on the state of the economic system. Modern reality reveals the importance of awareness of the institutional dimension of the object of study [3], overcoming existing problematic aspects and their elimination [4]. The need to identify institutional contours in this area and the palette of the national path of self-development and self-identification in the modern world-system determined the importance of research in this area [5].

Despite the active study and in-depth cognition of the institutional and structural transformations of the innovation sphere by foreign and Kazakh researchers [6], it is still worth noting that many issues remain unresolved and debatable, namely: on the one hand, the theoretical and methodological approaches to the innovative economy development are understudied, on the other hand, the results of such research for the institutional support of innovative development [7]; there is a terminological ambiguity in the subject area, which sparks the conflict of interest at all levels of aggregation and hinders the identification of issues and strategies for innovative development; there are no systematic and targeted measures and regulators regarding the reasonable and consistent innovative economy development [8]. The institutional determinants, driving forces of the innovative economy development, and the innovative economy globalization of the Republic of Kazakhstan are quite controversial issues [9, 10]. Numerous theoretical and practical provisions concerning the unique institutional design of the innovative portrait of the national infrastructure remain undeveloped and scientifically debatable [11, 12]. Consequently, the insufficient theoretical examination of the innovation economy institutionalization in a globalizing world, its relevance and practical significance led to the choice of the subject of the monograph, determined its purpose, structure, and corresponding scientific tasks [13].

The scientific and innovative path of developing the economic systems is objectively the initial stage of the post-industrial, information society [14]. The world economy globalization, the efforts of Kazakhstan to join various world organizations and its desire to become a developed country with a competitive economy, necessitate a transition from a commodity-oriented economy to an innovative one [15, 16]. The development of knowledge-intensive production, the increasing role of intangible forms of capital and the intellectual factor, as well as the transition to an intensive mode of production have proved to be superior and perspective [17]. In the world economy, a new paradigm of economic growth is being formed based on the use of innovation and knowledge as the main economic resources, and technological advance changes the scale and structure of production, influencing the state of the economy [18, 19]. The

increasing importance of technological advance in socio-economic progress is successfully reflected in modern economic theory [20, 21]. Thus, institutional economic theory, relying on scientific cognition, structuring its development in the form of technological order and methods of production, implanted them in economic theory [22, 23]. This new level of economic theory and methodology reflects the current level of information and is fully connected with development of a new, post-industrial paradigm of economic theory, namely its innovative type [24-26]. The key objective of this study is to explore the theoretical and methodological development foundations and functioning of the innovation infrastructure as an important link in the innovation system of Kazakhstan, to substantiate research-to-practice recommendations for the system development in a knowledge economy.

Materials and Methods

Theoretical and methodological foundations of the study. The basis of the study, which revealed the theoretical and practical aspects included the main provisions of the national innovation system. The study was based on the papers of foreign and Kazakh researchers and scientists. The study used the regulations of the Republic of Kazakhstan on the establishment and development of innovation infrastructure, as well as program documents and methodological developments of international organizations.

The study was based on a system-structural and functional approach using a broad definition of the national innovation system. The following quantitative and qualitative methods were used: generalization – a method of thinking, which allows establishing the general properties and features of objects. The generalization was performed as a transition from a particular or less general concept and judgment to a more general concept or judgment. This method was used to gather the necessary information from previously studied sources. Systematization helped to identify the optimal criteria for evaluating innovative projects, and through comparison, these criteria were unified for various industries containing innovative projects. The historical and logical method helped the authors investigate the evolution and the New Industrial Countries (NIC) concept, clarify the economic essence of "innovation infrastructure", analyze foreign experience in the innovation infrastructure development, analyze the legislative framework of Kazakhstan on the establishment and development of innovation infrastructure; analyze the state of innovation infrastructure and its elements in Kazakhstan based on statistical analysis; methods of abstraction, formalization, concretization, modelling, and thematic cartography helped develop an index of innovation infrastructure development, innovation infrastructure map, a model of the national innovation system, multi-level innovation infrastructure in Kazakhstan and its description, methods for monitoring and analyzing the effectiveness of elements of innovation infrastructure; SWOT analysis and the method of expert assessments helped identify the priority areas for the development of innovative infrastructure in Kazakhstan. The study used Microsoft Excel for statistical data processing.

The information basis of the study included the statistical data from the Ministry of National Economy of the Republic of Kazakhstan Statistics Committee, analytical reports of JSC "National Agency for Technological Development", the Ministry of Investment and Development of the Republic of Kazakhstan, the World Bank, the Organization for Economic Cooperation and Development, the United Nations, data from the websites on elements of the innovation infrastructure of Kazakhstan, expert assessments of the dissertation, as well as research-to-practice materials from conferences, periodicals and Internet resources.

Forecasting of innovative development: theories and concepts

Focusing on the technological advance of the economy and society, modern institutionalism revealed that the development of technology is the cause of change and development of institutions, shifting emphasis to the technological organization of production. Modern institutionalism also established those technological methods of production are one of the defining forms of innovative economy development at a certain stage, and created a theory of the human civilization progress and its post-industrial stage. The post-industrial information society theory was brought up in the generalization of technical improvement of tools to three technological methods of production, which became the foundation for the establishment and development of the pre-industrial, industrial, and post-industrial information society. The development of the life of modern society, in particular, the economic system, took place through the introduction of something new. The fact that confirms this is the efficient functioning of economic systems in the advanced countries of the world. It is innovation that combines economic needs and the possibilities of technological progress. Technological progress is a process that contains a large number of aspects and is complex. It is based on such aspects as socio-economic, scientific and technological. It is worth noting that it very well combines the development of two main components, which are technical and scientific in nature. It should be mentioned that each further step in development is based on the previous one [27, 28]. Proceeding from this, technological progress is the materialization of scientific progress. In turn, it is an important factor in innovative development. Thus, it unites all the main spheres of public life. Its boundaries, from the birth of an idea to its commercialization, constitute a set of relations: production → exchange → consumption.

Innovation, improvements, and entrepreneurship are among the most significant forces in determining further growth in the economy. The expansion of improvements and innovations, that is, the areas of

entrepreneurship, provide an opportunity to track the dynamics in the segment of the economy. The core of economic development is the figure of a business entity as a creator of new features, including technologies, products and factors. These factors disrupt the economic system and stimulate economic growth. The predictions of innovative development processes are based on the interaction of laws of statics, cyclical dynamics, and socio-genetics. There are three types of waves: long Kondratiev waves; medium Zhuglyar waves; short Kitchin waves. Innovative cycles of different durations are superimposed, providing an enhanced or softening effect on the oscillation amplitude. Thus, each Kondratiev cycle contains several Zhuglar cycles, and each Zhuglar cycle contains several Kitchin cycles. Based on the current trends in science, engineering, technology, most scientists are convinced that long cycles are reduced in time to 35-40 years.

Having justified the theory of great cycles of conjuncture, the researcher associated the transition to a new cycle with introduction of inventions and innovations. He also distinguished the emergence of large and important inventions and their application in production. The rise of each great-cycle wave sees changes in the economic life of society, which manifest themselves in modifications of technology preceded by technical discoveries. The researcher traced powerful changes in the technology and production based on the emergence of fundamentally new inventions and innovations prior to each great cycle. The waves are described by changing generations of basic technologies in production. Economic cycles were associated with waves of consumer and technological innovations. The researcher stated that innovation is the main factor that causes dynamic changes of a wave-like economy nature. He defined innovation as changes in technology and management. In his studies, based on the production economic crises, the researcher set a trend for the medium-term economic cycles development and proved that the phases of industrial cycles are determined by the investment laws.

The technological gap marks the transition from one technology to another. According to P. Renna & M. Ambrico [29], technological innovations are one of the main reasons for the worries and concerns of those who manage production, with both the absence and the presence of innovations being troublesome. Innovation is an individual process that cannot be managed or planned. Innovation involves risk, more risk than protecting the positions that the company holds. That is, any company is dependent on technological revolutions [30]. The researchers defined this type of ongoing revolution is a powerful cluster of most aspects that affect the growth of the economic sphere and are a development trend for a long time. It is a set of interconnected technical innovations, including an important low-cost resource of wide application – often a source of energy, new products, processes and infrastructure. The innovative development concept of integrated structures is associated with the reform of the mechanism of economic management organization. Such a mechanism has an impact on productivity, the improvement of financial condition of the organization, its employees, and the industry in general [31]. During innovative development, the basis of the production is formed at all levels. This is caused by the development of high technologies, the structural orientation of innovation activities in the country and a coordinated integrated policy. Innovation and integration are two interrelated economic processes that contribute to the development of high-tech and extremely adapted organizations for stable economic growth at all levels of the national economy.

Proceeding from the subject of the monograph, it is appropriate to cover the scientific opinions of institutionalists on institutions, engineering, technology, innovation, and innovative development. The name “institutional economic theory” and the term “institutionalism” were first used by an Irish mathematician. The researcher understood the institution as a bundle of social customs and pointed out that institutions are the driving force of social development, which plays the role of fixing established traditions and shows general coherence in society. The methodology of institutional analysis was first developed in the late 19th century by an American philosopher and economist. The researcher considered institutions as the result of processes that occurred in the past and were inconsistent with the requirements of the present. Thus, the study "The Theory of the Leisure Class" indicated that the term “institutionalism” is associated with two concepts: “institution” – an attitude, custom, order accepted in society, and “institute” – the consolidation of customs and orders in the form of a law or institution. The division of these concepts is rather arbitrary since they have an extremely broad meaning in the institutionalists’ concepts.

Engineering and technology act as the main determinant, which affects the study of institutions because it is the increasing role of engineering intelligentsia and rapid, continuous technological advance that is the basis for the development of society and innovation. The study covered the interrelation of the industrial system and technological factors with the institutional structure of society. In economic theory, the term “technology” is considered as a means and form of knowledge, as a factor of production, based on the study of technological changes and their impact on the restructuring of the firm. Many researchers use the evolutionary approach to describe technological change. It is believed that technical inventions and innovations are the result of incentives that come not from the economy as such, but from various social subsystems. P. Renna & M. Ambrico [29] also identified the totality of mental properties and functions that accompany management. The economic body develops the external forms where economic life functions: economic and technical forms, diverse organizations, in the environment of which and with the help of which economic management is carried out. The researcher considered the mentality and it’s spread from the marginals to the general population. The researcher

stated that people of different countries and cultures are not equally gifted with the qualities that the new system of relations requires. The talent of specialization, the multitasking abilities – the assistance for expense and discipline, these qualities create consummate people, exemplified by methodical scientists and technicians, engineers and workers, who take their place in the system of labor distribution and function like a small cog in a big mechanism.

The concept of national innovation systems is the major theory in innovative economy development in its modern interpretation and originates from the 1970s in studies of technological systems. In the mid-1980s, the foundations of the national innovation systems were developed simultaneously by a large number of economic scientists from different countries. The scientists developed theoretical foundation for state incentives for innovation processes in an effective institutional environment and a network model of interaction. The American economists were the first to identify the opposite processes in economic evolution – selection and variability (Table 1). According to the economists, this process is carried out on the scale of the entire economy, which promotes the development and change of the technological paradigm, extends to the low hierarchical levels of turning points in the development of the technological system.

Table 1. Criteria for evaluating innovative projects

Criteria	The importance of criterion	Quality criteria levels Assessment of levels in points (1-5)
The compliance degree of the project with the market and innovation strategy of the enterprise	0.5	1. Compatibility with current and future market strategy (3-5). 2. Compatibility with the innovation strategy (2-3). 3. Compliance with the adopted policy in the field of uncertainty and risk (1-2).
Research level	0.1	1. Improvement of secondary characteristics (1-2). 2. Improvement of the main technical characteristics (2-4). 3. Obtaining higher technical characteristics among similar types of products (4-5).
Level of experiment and design	0.1	Compliance of the level of the scientific and technical project with the main indicators: 1. Below the main commodity indicators (1-2). 2. Corresponds to the main commodity indicators (2-3). 3. Exceeds the main indicators of the product (4-5).
Production level	0.1	1. Compliance with the available capacities of the enterprise (2-5). 2. The production safety level during the project implementation (1-2).
The level of need for innovation	0.5	1. Meeting the needs of the market (1-3). 2. The future development possibility and further application of the product (3-5).
Investment level	0.2	1. Compliance of the funding and its sources with the project cost projections (1-5).
Commercial success rate	0.5	1. Low success rate (1-2). 2. Average success rate (2-4). 3. High success rate (4-5).
Risk level	0.2	1. The probability of scientific and technical success (1-3). 2. Probability of commercial success (3-5).

Source: compiled by the authors

Both technologies and industries evolve in different ways. The micro level differences in technological changes are probably related to the intersectoral differences in the rates of technological progress and production growth. To establish a connection with the microeconomic research of the technological advance, a subtle and complex version is required, and the existing differences between the sectors of the economy should be considered through the general model of the selective environment. The selective environment influences the nature of changes upon applying various technologies. Evidently, the selective environment also generates feedback, strongly influencing the research and development, design and experimental papers that will be profitable to apply for firms in the industry. Attention should be drawn to the ambiguity of results of technological advance for firms, since it is difficult to predict who will benefit from innovation. The transformation of routines is often associated with high costs of firm innovators. Firms that copy these transformations are deprived of these costs, and it is not uncommon for imitators to be in advantage. Furthermore, not all innovations are successful, and if they fail, conservative firms become the winners in the competition. It is the technological paradigm that considers the technological process in dynamics, analyses the causes, economic consequences of innovations and forms of technology implementation.

Table 2 presents a list of opportunities and threats to the innovation infrastructure of Kazakhstan. It is evident that economic factors are paramount, and it is possible for the external environment note the significant influence of factors that provide opportunities for its effective functioning (Table 2). The following can be considered as such:

- political will to change;
- development of STEM education;
- integration of the economic plan;
- transfer of advanced foreign technologies;
- expansion of sources of financing.

The most significant threats to the innovation infrastructure of Kazakhstan include:

- high level of corruption;
- the raw material orientation of the economy;
- low culture of entrepreneurship and lack of innovation culture;
- the backwardness of the economy in the technological aspect.

Table 2. Matrix for assessing external factors of Kazakhstan's innovation infrastructure

	External factors	Importance	Rating	Balanced assessment
Opportunities	*Political factors*			
	1. Political will to innovate	0.09	4	0.36
	Economic factors			
	2. Economic integration (creation of the Eurasian Economic Union (EAEU), accession to the World Trade Organisation (WTO), creation of the Silk Road Economic Belt (SREB)	0.08	4	0.32
	3. Development of new industries (high-tech industries, creative industries, "green" technologies, etc.)	0.09	4	0.36
	4. Expanding sources of innovation financing	0.08	4	0.32
	Social factors			
	5. Development of STEM education	0.09	4	0.36
	Technological factors			
	6. Transfer of advanced foreign technologies	0.08	4	0.32
	Total	0.51	-	2.04
Threats	*Political factors*			
	1. High corruption level	0.1	1	0.1
	Economic factors			
	2. Raw materials orientation of the economy	0.1	1	0.1
	3. High interest rate	0.07	1	0.07
	4. A new wave of the global economic crisis	0.06	1	0.06
	Social factors			
	5. Low entrepreneurship culture and lack of innovation culture	0.08	1	0.08
	Technological factors			
	6. Technological lag of the economy	0.08	1	0.08
	Total	0.49	-	0.49
Total		1	-	2.53

Notes: 1. The value of each factor varies from 0 to 1. The importance that applies to a given factor indicates its relativity. 0 means that the factor has no effect, 1 indicates that the factor is very influential. The total sum of importance must be equal to 1; 2. A rating is given on a scale of 1 to 4 for each factor indicating whether the factor is a major (1), minor threat (2), minor (3), or major opportunity (4); the balanced score is the product of the importance and the rating of the relevant factor

Source: compiled by the authors

The strategic management tool used to assess strengths and weaknesses –the Internal Factors Assessment Matrix. The tool also provides a strategy formulation that can be used to evaluate goal performance relating to identified internal strengths and weaknesses. The suggested stages of Kazakhstan's innovation infrastructure development are presented below (Table 3).

Table 3. Stages of innovative infrastructure development in Kazakhstan

Feature	Stage 1 (until 2030)	Stage 2 (2030-2050)	Stage 3 (after 2050)
	Emerging model of Kazakhstan's innovation infrastructure	**Transition model of innovation infrastructure in Kazakhstan**	**Prospective model of Kazakhstan's innovation infrastructure**
1	**2**	**3**	**4**
Nature of development	Developing country	Developing country	Stable

Stability	Less stable	More stable	Stable
Integrity	Fragmentary	Segmented	Integrated
Openness	Closed	Combined	Open
Management structure	Centralised	Strengthening the independence of infrastructure	Decentralised
Hierarchy	Prevail vertical links	Strengthening of horizontal lines	Network
Complexity	Small number of NIC infrastructure links	Increasing the number of NIS infrastructure links	A large number of NIC infrastructure links
Integrativity	Weak	Average	High
Virtualisation degree	Low	Moderate	High
The prevailing innovation model	Linear	Triple helix	Non-linear (open innovation)
Methods of state regulation	Straight lines prevail	Strengthening indirect links	Indirect factors prevail
	Legal and administrative issues prevail	Strengthening economic links	Economic factors prevail
The role of the state and private business in the financing of AI facilities	The high role of the state	Gradual increase in business share	The predominance of private business
Incentives for the creation of innovative infrastructure elements by the private sector	Absent	Development of tax and customs incentives and other preferences (accelerated depreciation, preferential provision of premises (land), etc.). Wide application of PPP	The presence of strong incentives
The existence of a legislative framework for the functioning, development and establishment of AI	Disjointed	Development of national and regional programmes for the development of innovative infrastructure, subordination to unified development strategy	Unified Innovation Development Plan

Source: compiled by the authors

Thus, the implementation of the recommendations in the development and functioning of the innovation infrastructure will contribute to the transformation of the domestic innovation system into an effective mechanism of socio-economic policy aimed at technological modernization and innovative development of the domestic economy, as well as increasing its knowledge intensity.

W.J. Gordon & K.D. Mandl [20] identified the firm and the market as the components of the institutional structure of any economic system. The firm is the institution, the organization that turns the basic resource into the final innovative product. In the research, the scientist indicated that it is the absence of market institutions that are designed to ensure the minimization of transaction costs that can lead to economic collapse. The institutional solution to any problem is always multivariate, and therefore it is absurd to urge the state to intervene in the economy, while measures to encourage competition, changes in legal provisions, and the abolition of previous administrative regulations can be more effective.

According to the R. Eito-Brun [15], the digital revolution will show its potential. The achievement of global superhighways and telecommunications will happen in the 21st century. It is worth noting that a person will be able to perform a large number of actions with living matter for the first time. But at the same time, it should be mentioned that new technologies that relate to the field of genetics and their effects cannot be completely controlled, and such an institutional nature over them is decentralized. It is worth noting that the path we have chosen is entirely dependent on society and the values of humanity. The proportion of wealth that individuals receive will depend on their access to education, whereas the share of society – on its innovation system [29]. In the 1960s, a new concept of futurology emerged, which nowadays partially underlies the development of an innovative economy. Scientists noted that with technical development there will be a change in communication, which concerns the replacement of an unreliable type of information with a reliable one [18]. This revolution provides the opportunity to get big changes, but the era of large hierarchical organizations is not yet over. Even in the telecommunications industry, fiber optic technologies can work best if they are managed by one huge and geographically dispersed company. The third wave introduces a new life order, which is based on various renewable energy sources [32]. Economists encounter a system of wealth that has lost its dependence on resources over several decades, having gone all the way to the main factor of economic growth – knowledge, the resources are excising [33].

Notably, today it is not the differentiation of knowledge that is more important, but its integration, since it determines the significance, the importance of individual knowledge in the general system of

knowledge, making this differentiation more adequate to system representations. Pure knowledge has an exclusively virtual form. The virtual form turns knowledge into a subject of commodity-money relations and includes it in economic turnover [34, 35]. Reflecting on the knowledge economy, L. Marti & R. Puertas [36] recognized it as an internal driving force of the technological advance. The understanding of the innovation economy, according to the scientist, reflects the content of the main material resource that is attracted to public production. Therewith, the technical basis of the new economy is information technology. In one of their fundamental studies, scientists consider the technological structure of the economy a necessary condition for the economic policy development as it determines the priorities and is a reliable basis for identifying the area of investment, ensuring the development of the economy through progressive shifts, consistent growth of the scientific and technical level of the economy. Therewith, scientists consider technological structures as technical and technological complexes that reflect the historical level of industrial development and the transition to a post-industrial technological method of production.

Theory of long-term technical and technological development

In this study, the theory of long-term technical and technological development, based on the study of structural changes in the economy in the work E. Dovgal *et al.* [37], is worthwhile. The scientist successfully described the transition of the economic system from one technological basis to another, showing the leading importance of new technological systems for the dynamics of economic growth. Evidently, the technological development of the economy and the development of a new way of life can take place based on production potential. This potential is created during the previous stage of technical and technological development. The structures of the 6th and 7th technological structures that determine the future economic development. The techno-economic paradigm as a model of best business practice consists of comprehensive general technological and organizational principles that reflect the most effective way to implement a particular technological revolution and the proper way to revitalize and modernize the economy [38, 39]. If these principles become universal, they determine the basis and vector of innovative development, which form the activities of any development institution.

The gaps between the phases of technology evolution, the ability to overcome which depends on the state of the institutions that provide technological advance, also have a considerable impact. It is the institutional environment that plays a key role in the innovative development of economic systems and subjects. It creates opportunities and provides resources for transformational, institutional change. For the temporary performance of functions as part of additional development strategies of innovation in institutional environment, it is possible to create working "quasi-institutions". The mechanisms that support the developed rules should be supported by appropriate enforcement mechanisms, which should correspond to their enforcement mechanisms, etc., which forms an endless chain of rules. According to the scientist, the institutionalization of provisions can be provided not only by enforcement mechanisms, and therefore the sustainability requirements are sufficient for their implementation. Institutions that are the behavior or interests of various individuals and their groups that are very resistant to change, as well as diverse provisions or their systems that regulate decision-making, activities and interaction of socio-economic entities and their groups [37].

Based on the given issue, there is an attention-worthy thesis that the evolution of the structure of society is natural selection, and the progress that is realized in institutions and character can be thinking and the required adaptation to the external environment. The scientist believed that in the development of society, it is the institutions that always adapt to the new conditions of life and the new economic order. Institutions that do not adapt to changes hinder innovative development, because the normal society development takes place when its institutional structure corresponds to the external environment. Regarding the conceptual apparatus, it is notable that the institution, as the basic category of institutionalism, was designed to reflect an objective and subjective reality, as a result, there is no comprehensive and universal interpretation of it today, and scientific discussions and disputes regarding the content and accuracy of the category keep on happening. Therefore, it is timely and appropriate to try to overcome the identification of the terms "institute" and "institution", which arose due to the inaccuracy of the translation from English into Russian. Thus, the economic category "institute" appeared due to the inaccurate translation of the scientific studies of the American economist. Notably, in the original studies, the author used the category "institution", which was replaced by "institute" when translated. At present, this creates so-called institutional traps and increases the aggravation of existing methodological disputes [37].

Currently, there is an urgent need for high-class innovators who are ready for intensive and productive work in the field of high technologies, and are able to follow the demands of the market. Employees in the field of innovation should be ready to retrain to meet current requirements. The employees should be self-disciplined, have the desire to improve their skills in order implementation of competitiveness in the labor market and the desire to improve the efficiency of an innovative organization. The methodologically significant thesis of a foreign scientist demonstrates that institutions should be considered as a framework that structures the interaction between people in various spheres of their activity; they are a set of formal, informal, and spontaneously chosen frameworks that structure the interaction of individuals in the economic, political, and social

spheres. Therefore, it is important to be aware of the individual during the study of the innovation economy institutionalization.

There is a quite convincing point of the American economist, who noted that at times an institution seems like a building, a certain structure of laws and regulations, whereby individuals act as its members. Sometimes it seems to be the "behavior" of the prisoners. Behavioral habits and institutional structure are closely intertwined and are actively influenced by each other. To get a complete picture, it is always necessary to consider both aspects. The authors of the study agree with this idea. After all, it is the individual who is the creator of innovation, as seen through its prism. The individual "nurtures" ideas under the influence and with the help of institutions, and puts them into practice within the institutions, organizations, laws, regulations. The authors' opinion is confirmed by the scientific views that institutions should be seen as complex factors of production, which are specific complexes of interaction between institutions and organizations, which consolidate effective institutions within the innovation system. Institutions are typical complexes, acting as functional genotypes of organizations and models of their functional structure, developed evolutionarily.

When studying the nature of including factors in the institutional system that affect the institutional elements, their interaction, and the choice of the analysis level of institutional complementarity, it is proposed to distinguish endogenous and exogenous complementarity of economic systems. In the institutionalization of the innovation economy, endogenous complementarity will reflect the interaction of institutions within the innovation system, subsystem, and institution. Exogenous complementarity is the quality of interaction between an innovation system and the external environment, the elements of which can be both other institutional systems and economic phenomena that affect the functioning of the system. The main importance belongs to the material and technological conditions of the innovation system environment. An in-depth scientific analysis of institutions in the context of market infrastructure research was conducted, and these institutions were divided into two groups: institutions – agencies; institutions act as behavior that corresponds to provisions and rules. Institutions – general-purpose establishments focused on interacting with commodity or cash flows. Through the lens of an innovative economy, such establishments include cargo transport for the transportation of an innovative product, warehouses for its storage, communication enterprises, enterprises for the production of innovative communication equipment and equipment for warehouses and ports. Private and public structures can be considered as institutes of a special nature in the innovation economy [40, 41].

To understand the institutionalization of the object of research, it is essential to use periodization of the institutional human evolution. There are three stages: pre-institutional, institutional, and post-institutional. Notably, periodization is not an end in itself, therefore the researcher does not absolutize it. According to the scientific team led by J.P. Pardo-Guerra [7], the role of general periodization is that it allows identifying the level and state of institutional and innovative development in certain areas of human life. This means that in some areas one can observe the pre-institutional stage, in others – the institutional stage, and in yet others – the post-institutional stage. As for the innovative economy of the Republic of Kazakhstan, it is at the pre-institutional stage, since the institute of innovation not only failed to become a key component of the economy functioning, but its development is vacuumized by the current system of legal regulation in every way possible. It is a so-called "institutional vacuum" in the innovation sphere. The essence of institutes is implemented using the function. Therewith, the scientist identified only four most relevant functions: coordination, restriction, distribution, and information. The study considered the operation of these functions through the lens of innovation economy. However, proceeding from the issue under study, there is a need to identify the fifth function – the function of motivation, which is one of the key functions for the innovation economy.

These five functions have different effects on the costs and benefits of both the recipients of the institution and its guarantors, as well as third parties who are accidental consumers of the external effects of the first two individuals. Therewith, the total ratio of benefits and costs for each institution of the innovation economy may differ. This means that the institutions of the innovation economy can be both effective, that is, providing an increase in public welfare, and inefficient, that is, leading to direct losses of public benefit. During the implementation of the work, the meaning of such phrases as "innovative institute" and "innovative institution" are considered as follows: when referring to an innovative institute, it relates to an innovative enterprise or a law regulating innovative activity, when referring to an innovative institution, it relates to the mechanism of this institution. The vagueness of institutionalism, primarily in the scientific literature, the simplification or, conversely, the excessive expansion of its key categories, lead to a distorted perception and delay the practical institutionalization and modernization of the national economy in the innovation area. The word "mechanism" is a synonym of the term "institution", and it is incorrect to use word "institute" with it. Within the monograph subject, this will mean: "innovative institutions – innovative mechanisms" and "innovative institutions".

Conclusions

The results of scientific research on understanding the differences between the "institute" and "institution", which established a sequence of institutional definitions in a logical order, where first definition implies the second, the second – the third, etc., in order: institute – organization – institution – body in the innovation economy. This sequence proves the existence of differences between the terms under

study. The vagueness of institutionalism, primarily in the scientific literature, the simplification or, conversely, the excessive expansion of its key categories, lead to a distorted perception and delay the practical institutionalization and modernization of the national economy in the innovation area. The word "mechanism" is a synonym of the term "institution", and it is incorrect to use the word "institute" alongside it. Within the monograph subject, this will mean: "innovative institutions – innovative mechanisms" and "innovative institutions".

The classification of institutions according to eight criteria are also attention-worthy, as it should be used as a means of understanding the institutional dynamics in the innovation economy in the conditions of market transformation. Other approaches to classifying institutions are also possible. The use of a particular criterion depends on the purpose of the study. Within the framework of the monograph subject, this study offered a classification that considers the opinions and approaches of many researchers regarding the grouping and understanding of institutions. Therewith, it revealed three individual classification features proposed for a more complete understanding of innovation economy phenomenon. The classification attribute, depending on the existence duration of innovative economy institutions, divides them into temporary and permanent ones. The temporary institution can refer to transitional provisions to various legislations and regulations in the innovation field, which are relevant in the period of systemic and complex modernization or reform. In turn, institutional changes in the country may lead to the termination of one of the laws regulating national innovation. From the example above, it is evident that such a law loses its force.

Acknowledgements

This study was funded by the Kh. Dosmukhamedov Atyrau University.

Conflict of Interest

None.

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Розвиток інфраструктури інноваційної системи Казахстану в контексті наукомісткої економіки

Ристи Сабірова*
Кандидат економічних наук, доцент
Атирауський університет ім. Х. Досмухамедова
060011, просп. Студентський, 1, м. Атирау, Республіка Казахстан
https://orcid.org/0000-0001-6637-2614

Бібінур Корган
Кандидат педагогічних наук, декан факультету багатомовної освіти
Атирауський університет ім. Х. Досмухамедова
060011, просп. Студентський, 1, м. Атирау, Республіка Казахстан
https://orcid.org/0000-0001-6862-4272

Ельміра Адієтова
Кандидат економічних наук, доцент
Атирауський університет ім. Х. Досмухамедова
060011, просп. Студентський, 1, м. Атирау, Республіка Казахстан
https://orcid.org/0000-0002-6895-2169

Карлигаш Ауєзова
Кандидат технічних наук, доцент
Євразійський національний університет імені Л.Н. Гумільова
010008, вул. Сатпаєва, 2, м. Астана, Республіка Казахстан
https://orcid.org/0000-0002-7190-0271

Жанат Єрніязова
Кандидат економічних наук, доцент
Кизилординський університет ім. Коркит Ата
120001, вул. Айтеке бі, 29А, м. Кизилорда, Республіка Казахстан
https://orcid.org/0000-0003-2198-3985

Айнур Канатова
Магістр наук, старший викладач
Атирауський університет ім. Х. Досмухамедова
060011, просп. Студентський, 1, м. Атирау, Республіка Казахстан
https://orcid.org/0000-0002-0844-5093

Анотація

Актуальність. Сучасні умови постіндустріалізму у сфері економічних відносин формуються під впливом низки чинників, зокрема, інституційних змін та викликів глобалізації. У свою чергу, це характеризується новим форматом, який має організаційно-інституційну спрямованість.

Мета. Метою дослідження є з'ясування відмінностей між поняттями «інститут» та «інституція» в контексті інноваційної економіки.

Методологія. Дослідження ґрунтується на теоретико-методологічних засадах національної інноваційної системи, синтезуючи напрацювання зарубіжних і вітчизняних науковців. Застосовано системно-структурний та функціональний підходи.

Результати. Дослідження розкриває послідовну ієрархію інституційних визначень, виявляючи сутнісні відмінності між поняттями «інститут» та «інституція». Запропоновано класифікацію інститутів на основі восьми критеріїв, що дає змогу глибше зрозуміти інституційну динаміку в інноваційній економіці. Зокрема, вона вводить поняття тимчасових і постійних інститутів, з'ясовуючи їхню роль у періоди системної модернізації та законодавчої еволюції.

Висновки. Дослідження підкреслює необхідність ясності в концептуалізації інституційних термінів, особливо в рамках інституціоналізму.

Ключові слова: особливості економічної системи, інновації в Республіці Казахстан, інституціоналізм, глобалізація, постіндустріальне інформаційне суспільство.