



e-ISSN 3083-6018

SOCIAL DEVELOPMENT: Economic and Legal Issues

<https://www.eu-scientists.com/index.php/sdel>


Development of the Institutional Framework for the Technological Competitiveness of Ukraine's Economy: Expected Outcomes

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ARTICLE INFO

ABSTRACT

Research Article

DOI:

[10.70651/3083-6018/2026.6.15](https://doi.org/10.70651/3083-6018/2026.6.15)

Received:

20 April 2026

Accepted:

21 May 2026

Published online:

23 May 2026

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The article substantiates the theoretical and methodological foundations for the development of institutional support for the technological competitiveness of Ukraine's economy and identifies the expected results of implementing the strategic priorities of state policy in this area. It is argued that under the conditions of war, deep structural transformations of the national economy, and intensifying global technological competition, the formation of an effective institutional system to support technological development becomes a key prerequisite for economic modernization and strengthening the country's innovation potential. It is proved that particular importance is attached to the formation of a comprehensive system of strategic management of technological development, which ensures the coherence of public policy in the fields of science, innovation, industry, investment, and education. The necessity of improving the institutional architecture of the state technological policy is substantiated, including the development of mechanisms of intersectoral interaction between the state, research institutions, business, and civil society, as well as the formation of an effective governance framework for technological development. The importance of strategic planning and the use of technological foresight tools for identifying promising directions of scientific and technological development and concentrating resources on building long-term competitive advantages of the national economy is emphasized. The key directions for the development of institutional support for technological competitiveness are revealed, including the activation of investments in research and development, the development of technology transfer institutions and innovation support mechanisms, improvement of public-private partnership instruments, attraction of international financial assistance and private investment, and the development of human capital and the national scientific and technological potential. Particular attention is paid to the need to preserve intellectual capital, modernize the education system, stimulate technological entrepreneurship, and create conditions for engaging highly qualified specialists in the implementation of innovative and technological projects. It is proved that the implementation of the defined strategic priorities will contribute to the intensification of commercialization processes of scientific research results, expansion of technological modernization of production, increased automation and digitalization of economic processes, and growth of the share of high-tech products in industrial output and exports. The importance of the development of dual-use technologies and defense technological innovations is also highlighted as a factor in strengthening the defense-industrial potential of the state and stimulating the diffusion of technological innovations into the civilian sector of the economy. It is established that an important result of implementing the strategic priorities will be the deepening of Ukraine's integration into the European and global innovation and technological space, which will expand access to advanced technologies, international sources of financing, and global markets for innovative products. It is concluded that the development of institutional support for technological competitiveness creates the preconditions for the formation of a modern model of economic development in Ukraine based on innovation, knowledge, and advanced technologies, while also strengthening the international competitiveness of the national economy and its integration into global value chains.

KEYWORDS

national economy, development, competitiveness, innovative and technological activity, state policy, state regulation, innovations, innovative activity, advanced technologies, technological competitiveness.





e-ISSN 3083-6018

СОЦІАЛЬНИЙ РОЗВИТОК: економіко-правові проблеми

<https://www.eu-scientists.com/index.php/sdel>


Розвиток інституційного забезпечення технологічної конкурентоспроможності економіки України: очікувані результати

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СТАТТЯ

АНОТАЦІЯ

Дослідницька

DOI:

[10.70651/3083-6018/2026.6.15](https://doi.org/10.70651/3083-6018/2026.6.15)

Отримана:

20.04.2026 р.

Прийнята:

21.05.2026 р.

Опублікована:

23.05.2026 р.

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У статті обґрунтовано теоретико-методологічні засади розвитку інституційного забезпечення технологічної конкурентоспроможності економіки України та визначено ключові очікувані результати реалізації стратегічних пріоритетів державної політики у цій сфері. Доведено, що в умовах воєнних викликів, структурних трансформацій національної економіки та посилення глобальної технологічної конкуренції формування ефективної інституційної системи підтримки технологічного розвитку є важливою передумовою модернізації економіки та підвищення її інноваційного потенціалу. Аргументовано, що пріоритетного значення набуває формування цілісної системи стратегічного управління технологічним розвитком, яка забезпечує узгодженість державної політики у сферах науки, інновацій, промисловості, інвестицій та освіти. Обґрунтовано необхідність удосконалення інституційної архітектури державної технологічної політики, розвитку механізмів міжсекторальної взаємодії між державою, науковими установами, бізнесом і громадянським суспільством, а також формування ефективної вертикалі управління технологічним розвитком. Визначено важливу роль стратегічного планування та застосування інструментів технологічного форсайту для ідентифікації перспективних напрямів науково-технологічного розвитку і концентрації ресурсів на формуванні довгострокових конкурентних переваг національної економіки. Розкрито ключові напрями розвитку інституційного забезпечення технологічної конкурентоспроможності, серед яких: активізація інвестицій у дослідження і розробки, розвиток інституцій трансферу технологій та підтримки інноваційного підприємництва, удосконалення механізмів державно-приватного партнерства, залучення міжнародної фінансової допомоги та інвестицій, розвиток людського капіталу і підтримка науково-технологічного потенціалу держави. Особливу увагу приділено необхідності збереження інтелектуального капіталу, модернізації системи освіти, стимулювання технологічного підприємництва та створення умов для залучення висококваліфікованих фахівців до реалізації інноваційних проєктів. Доведено, що реалізація визначених стратегічних пріоритетів сприятиме активізації процесів комерціалізації результатів наукових досліджень, розширенню масштабів технологічної модернізації виробництва, підвищенню рівня автоматизації та цифровізації господарських процесів, зростанню частки високотехнологічної продукції у структурі промислового виробництва та експорту. Окреслено значення розвитку технологій подвійного призначення та оборонно-технологічних інновацій як чинника посилення оборонно-промислового потенціалу держави та стимулювання дифузії технологічних інновацій у цивільному секторі економіки. Встановлено, що важливим результатом реалізації стратегічних пріоритетів стане поглиблення інтеграції України у європейський та глобальний інноваційно-технологічний простір, що сприятиме розширенню доступу до передових технологій, міжнародних джерел фінансування та глобальних ринків інноваційної продукції. Зроблено висновок, що розвиток інституційного забезпечення технологічної конкурентоспроможності формує передумови для створення в Україні сучасної моделі економічного розвитку, заснованої на інноваціях, знаннях і високих технологіях, а також забезпечує підвищення міжнародної конкурентоспроможності національної економіки та її ефективну інтеграцію у глобальні ланцюги створення доданої вартості.

КЛЮЧОВІ СЛОВА

національна економіка, розвиток, конкурентоспроможність, інноваційно-технологічна діяльність, державна політика, державне регулювання, інновації, інноваційна активність, прогресивні технології, технологічна конкурентоспроможність.



1. Introduction

Current trends in the development of the world economy indicate an increased role of the state in the formation of a favorable institutional environment for the development of technologies. Many countries are actively implementing a policy of technological sovereignty, supporting the development of strategic industries, stimulating investments in scientific research and development, forming innovation clusters and technological ecosystems. In this context, an important task for Ukraine is to form proper institutional support for technological development, including ensuring coordination of actions of state bodies, scientific institutions, business and international partners. The war also significantly updated the issues of the development of defense technologies, dual-purpose innovations, digital solutions in the field of security and the restoration of critical infrastructure. Many technological solutions that are developed for the purposes of war have significant potential for further use in civilian sectors of the economy. And this is the path to the formation of new innovative directions of development, in particular in the areas of security technologies, unmanned systems, cybersecurity, the defense-industrial complex, digital services, and engineering solutions for infrastructure reconstruction. We additionally argue that the effective commercialization of breakthrough technologies in the defense industry requires appropriate institutional mechanisms for support, development of innovative infrastructure and stimulation of entrepreneurial activity.

Modern scientific research confirms that technological development and innovative transformation of the economy largely depend on the effectiveness of institutional support capable of forming favorable conditions for the generation, dissemination and commercialization of new technological solutions. In this context, research on the impact of digitalization, financial technologies, artificial intelligence and innovative ecosystems on the formation of technological competitiveness of economies is of great importance.

2. Literature Review

One of the key areas of modern research is the analysis of the digital transformation of economic systems and its role in the formation of new technological opportunities for business and the state. Scientific works emphasize that digitalization is an important driver of innovative development, as it contributes to increasing the efficiency of economic processes, the development of new business models and the formation of technologically oriented markets [1–3]. Researchers emphasize that digital transformation is accompanied by structural changes in the financial sector, the emergence of new technology companies and the expansion of the use of innovative digital services [14].

Considerable attention in modern scientific literature is paid to the development of financial technologies (FinTech) as one of the key factors in the technological modernization of the economy. Scientists note that FinTech contributes to increasing the efficiency of financial markets, expanding access to financial services and the formation of new instruments for financing innovative activities [1]. At the same time, the digitalization of financial services creates new challenges for traditional financial institutions, which requires the adaptation of their business models and institutional mechanisms of operation [6; 11].

The works of researchers also emphasize the strategic importance of digital transformation for ensuring long-term economic growth and the formation of innovative competitive advantages. In particular, it is emphasized that effective management of digital transformation processes involves the integration of modern technologies into the strategic management system of enterprises and the economy as a whole [4]. In this context, the development of institutional mechanisms that facilitate the implementation of innovative technologies and support technological entrepreneurship is important.

A separate area of research is related to the application of artificial intelligence, machine learning and big data analysis methods in financial and economic processes. Scientists note that the use of such technologies creates new opportunities for forecasting economic processes, managing risks, and improving the efficiency of managerial decision-making [5; 9]. In particular, the use of artificial intelligence methods and neural networks allows significantly increasing the accuracy of financial time series analysis and forecasting economic dynamics [8].

Scientific research also actively addresses the issues of financial and operational risk management in the context of digital transformation. Researchers emphasize that the effective integration of information and communication technologies into the activities of enterprises and financial institutions contributes to increasing their level of adaptability to changes in the economic environment and reducing the risks of economic activity [10].

An important aspect of technological modernization of the economy is the development of modern analytical tools that allow for a comprehensive analysis of financial markets and economic processes. In this context, researchers focus on the use of statistical and mathematical methods for modeling economic processes, in particular Bayesian approaches to assessing credit risks and analyzing financial systems [7]. The use of modern information technologies also contributes to the improvement of analytical tools for market research and the development of information systems to support business decision-making [12; 13].

In addition, modern scientific literature emphasizes the importance of creating institutional conditions to support innovative development and digital transformation of the economy. Researchers note that effective state policy in the field of technological development should include the creation of a favorable institutional environment for the development of innovations, stimulating investment in research and development, as well as supporting interaction between scientific institutions, business and state institutions [15]. Thus, the analysis of scientific works indicates the growing role of digital technologies, financial innovations and institutional support in shaping the technological competitiveness of economies. At the same time, modern research confirms the need for a comprehensive approach to the formation of an effective system of institutional support for technological development, which combines innovation policy, human capital development, digital transformation and stimulation of investment activity. It is in this context that the need for further research on the formation of an effective system of institutional support for the technological competitiveness of the Ukrainian economy and the determination of the expected results of the implementation of relevant strategic priorities of state policy becomes urgent.

3. Problem Statement

The purpose of the article is to substantiate the state policy tools for the development of institutional support for the technological competitiveness of the economy of Ukraine. To achieve this goal, the following tasks are envisaged: to form conceptual principles for building institutional support for the technological competitiveness of the national economy, to generalize the instruments and means of state policy for strengthening the technological competitiveness of the national economy of Ukraine in war conditions, to identify the expected results of state policy in this area, and to substantiate their complementary relationship based on an approach to defining practical guidelines for state innovation and industrial policy.

4. Methods and Materials

The methodological basis of the study is formed by a combination of general scientific and special research methods. The methods of theoretical generalization and systematization were used to identify the conceptual foundations of institutional support for technological competitiveness. The system-structural approach made it possible to determine the interrelationships between the key elements of the institutional framework for technological development. Comparative analysis was applied to examine international approaches to innovation and technological policy and to identify opportunities for their adaptation to the Ukrainian context. Methods of logical analysis and scientific abstraction were employed to formulate strategic priorities and expected outcomes of state policy aimed at strengthening the technological competitiveness of Ukraine's economy. The information base of the research includes scientific publications, analytical reports, international policy documents, and normative legal acts related to innovation, technological development, and state regulation.

5. Results and Discussion

To achieve the goal of studying the expected results of the development of institutional support for the technological competitiveness of the Ukrainian economy, a set of complementary scientific approaches was used, which allowed forming a theoretical, methodological and applied basis for the analysis of transformations of the institutional environment of technological development, innovative activity of business entities and mechanisms of state regulation in this area. The conceptual principles of the relationship between the institutional conditions of the functioning of the national economy, the level of development of scientific and technological potential, innovative activity of enterprises and parameters of the technological competitiveness of the state were substantiated. The key barriers to the formation of an effective institutional system of support for technological development were determined; the risks of insufficient coordination between the scientific sector, business and the state, limited financial resources for innovative activity, as well as structural imbalances in the development of scientific and technological potential were identified. Methodological approaches have been developed to assess the level of institutional support for technological competitiveness of the economy, taking into account indicators of innovation infrastructure development, investment in research and development, human capital quality and the effectiveness of state innovation and technological policy.

In the process of research, cause-and-effect and factor analysis were used to identify determinants of technological development and institutional prerequisites for increasing the competitiveness of the national economy; bibliometric and content analysis using the Elsevier, Scopus, Web of Science and Google Scholar platforms to systematize modern scientific discourse on institutional mechanisms for supporting innovation and technological development. Semantic, systemic and structural-functional analysis were used to form logical connections between the institutional conditions of the economy, innovative activity of business entities, human capital development and technological competitiveness. This allowed us to form a holistic view of the mechanisms for increasing the efficiency of institutional support for technological development and to determine the expected results of its improvement in the context of strengthening the competitive positions of the Ukrainian economy.

Today, the formation of institutional mechanisms focused on activating investments in technological development is gaining importance. In conditions of limited domestic financial resources and increased risks of conducting economic activities, the priority task of state policy should be to ensure the effective attraction and use of international financial assistance, resources of donor programs, investments of international financial organizations and private capital. The implementation of such an approach requires the creation of transparent and effective institutional mechanisms for managing investment processes, improving public-private partnership instruments, as well as the formation of a support system for innovative startups and enterprises in the technology sector.

At the same time, an important component of the institutional support for technological competitiveness is the development of human capital. It is the level of scientific and technical potential, the quality of education and professional qualifications of personnel that determine the ability of the national economy to generate, disseminate and commercialize innovations. For Ukraine, given the significant external migration activity of the population in wartime conditions, the problem of preserving and reproducing scientific and engineering potential is becoming particularly urgent. Forced migration of a significant part of highly qualified specialists or their change of professional activity increases the risks of losing the intellectual capital of the state. In this regard, strategic guidelines for the development of institutional support should include the introduction of mechanisms for supporting scientific research, modernization of the education system, stimulation of technological entrepreneurship, and creation of conditions for attracting Ukrainian specialists to the implementation of innovative and technological projects.

Determining strategic priorities for the formation of an effective system of institutional support for the technological competitiveness of the national economy is one of the key tasks of the economic policy of Ukraine. The development of an effective institutional system of support for technological development is an important prerequisite for the modernization of the economy, increasing its innovative potential, strengthening the state's positions in the international economic environment and ensuring long-term sustainable development.

The implementation of such a state policy requires a clear strategic direction and systematic management decisions based on the awareness of its basic strategic priorities. It is they who form the

conceptual guidelines of the state technological policy, determine the long-term goals of economic development and serve as the basis for the introduction of appropriate institutional support mechanisms, instruments for stimulating innovation, investment activity and modernization of production processes.

In conditions of war and deep structural transformations of the national economy, ensuring strategic control over the processes of technological renewal becomes of particular importance. This makes it possible to concentrate limited resources on the most promising areas of development, increase the effectiveness of state policy and create the prerequisites for long-term growth of the innovation potential of the economy. On the other hand, the lack of a holistic system of strategic management, insufficient coordination of program and strategic documents, as well as the fragmentation of institutional mechanisms for supporting innovations lead to inefficient use of resources, a decrease in the effectiveness of state policy and a slowdown in the processes of technological modernization.

The formation of an effective system of state strategic management of technological development involves, first of all, improving the institutional architecture of state policy in this area. This involves increasing the coordination of strategic and program documents that determine the priorities of scientific and technological, innovative and industrial development, as well as the formation of a clear system for managing the implementation of the relevant policy. An important element of this process is the creation of an effective vertical for managing technological policy, which ensures coordination of the activities of central executive bodies, regional government bodies, scientific institutions, higher education institutions, the business sector and development institutions. It is under such conditions that it is possible to form a comprehensive system of technological development management, within which the coherence of decisions in the spheres of innovation, industrial, investment, educational and scientific and technological policy is ensured.

An integral part of the implementation of this strategic direction is the implementation of systematic strategic planning of technological development. This approach involves determining long-term technological priorities of the national economy, supporting strategically important industries and creating favorable conditions for the development of innovation ecosystems. In this context, the use of modern strategic forecasting tools, in particular technological foresight, is of particular importance, which allows identifying promising areas of scientific and technological development and ensuring the formation of appropriate state support programs. This creates the prerequisites for concentrating resources on areas of technological development with the highest potential for the formation of competitive advantages of the national economy.

It is also important to emphasize that achieving the outlined strategic priority requires strengthening intersectoral interaction between the state, scientific institutions, business and civil society institutions. Effective cooperation between these entities forms the basis for the functioning of modern innovation ecosystems, within which the generation, dissemination and commercialization of new technological solutions are ensured. In this context, important tasks are the development of partnership mechanisms between the public and private sectors, stimulating the participation of business in the formation and implementation of technological policy, as well as the creation of institutional conditions for active interaction between science and production.

The practical implementation of the specified strategic priority will contribute to increasing the effectiveness of state policy in the field of technological development, ensuring the coherence of institutional mechanisms for supporting innovation activities, optimizing the use of public and private resources and forming a long-term orientation of the economy towards technological modernization. As a result, this will create the prerequisites for the formation of a modern system of technological development management in Ukraine, the effective use of the country's scientific and technological potential, the acceleration of innovation processes and the strengthening of the technological competitiveness of the national economy.

Institutional integration into the European and global innovation and technological space opens up new opportunities for Ukraine to access advanced technologies, modern knowledge, international sources of financing and global markets for innovative products. At the same time, such integration contributes to raising the level of technological culture, the spread of modern management and technological practices, the formation of effective mechanisms for interaction between the scientific sphere and business. The result will be the strengthening of the international competitiveness of the

national economy, the activation of innovative activities of domestic business entities and more effective use of the scientific and technological potential of Ukraine in the context of the globalization of economic processes.

The implementation in practice of the above-mentioned strategic priorities for the development of institutional support for technological competitiveness will allow forming a holistic system of support for technological development, ensure effective interaction of key economic actors, activate innovative activity and create prerequisites for the formation of a modern high-tech economy in Ukraine. Moreover, Fig. 1 shows the leading expected results of the implementation/achievement of the identified strategic priorities of state regulation in the studied area. According to the author's position, the implementation of the identified strategic priorities for the development of institutional support for technological competitiveness of the national economy is designed to ensure the achievement of comprehensive results aimed at forming a modern model of technological development of the Ukrainian economy, strengthening its innovative potential and improving its positions in the global economic space. The cumulative effect of the implementation of these priorities is manifested in the improvement of the system of strategic management of technological development, the activation of innovative activity of business entities, and the growth of the scale of investments in research and development.

One of the key expected results is to increase the level of coherence and effectiveness of state policy in the field of science, technology and innovation. The formation of an effective system of strategic management of technological development lays the foundation for establishing systemic coordination between all stakeholders. Thus, the coherence of strategizing, institutional support and the functioning of the risk management system of duplication of functions and inefficient use of resources is ensured. Only in this way can a holistic system of strategic planning of technological modernization of priority industries and the national economy of Ukraine as a whole be created. An important result of the implementation of strategic policy priorities in the analyzed area should be considered the intensification of the processes of commercialization of scientific research results and increasing the efficiency of the use of scientific and technological potential.

The development of institutions supporting innovation and technology transfer ensures the best possible interaction between the scientific community and business.

Due to this, the level of implementation of scientific developments in production increases, and favorable conditions are formed for the development of high-tech business and innovative startups. These processes ensure the transformation of scientific knowledge into economically significant technological solutions that ensure increased production productivity and the creation of new high-tech products.

A significant expected result of the implementation of strategic priorities of state policy, according to the author's vision, will also be an increase in the scale of investments in research and development and technological modernization of the production sector of regional economic systems and the national economy of Ukraine in general. Expanding funding for research and development activities, in particular from state, private and international sources, creates conditions for the development of innovative activity of enterprises and the formation of a modern scientific and technological base for economic progress. Transformations in this area activate the processes of technological renewal of production, increasing the level of automation and digitalization of production processes, and increasing energy and resource efficiency of economic activity. At the same time, technological modernization increases the share of high-tech products in the structure of industrial production and exports.

We point out that in the current realities, the development of dual-use technologies and defense-technological innovations is of particular importance. Their scaling strengthens the defense-technological potential of the national economy and modernizes the defense industry sector. At the same time, the spread of dual-use technologies creates additional opportunities for the diffusion of innovations and the growth of the technological level of production in other types of economic activity. These processes synergize the defense and civilian spheres, stimulating the development of new technological directions and the formation of more competitive industries.

We will identify no less important expected results of the implementation of strategic priorities as strengthening human capital and supporting the scientific and technological potential of the state. Improving the training of personnel for an innovative economy, improving the quality of education in the field of science, technology and engineering form highly qualified personnel potential to ensure the development of modern technological sectors of the economy. Of particular importance is the

strengthening of institutional mechanisms for attracting young researchers to scientific and technological activities and the return of highly qualified specialists from abroad.

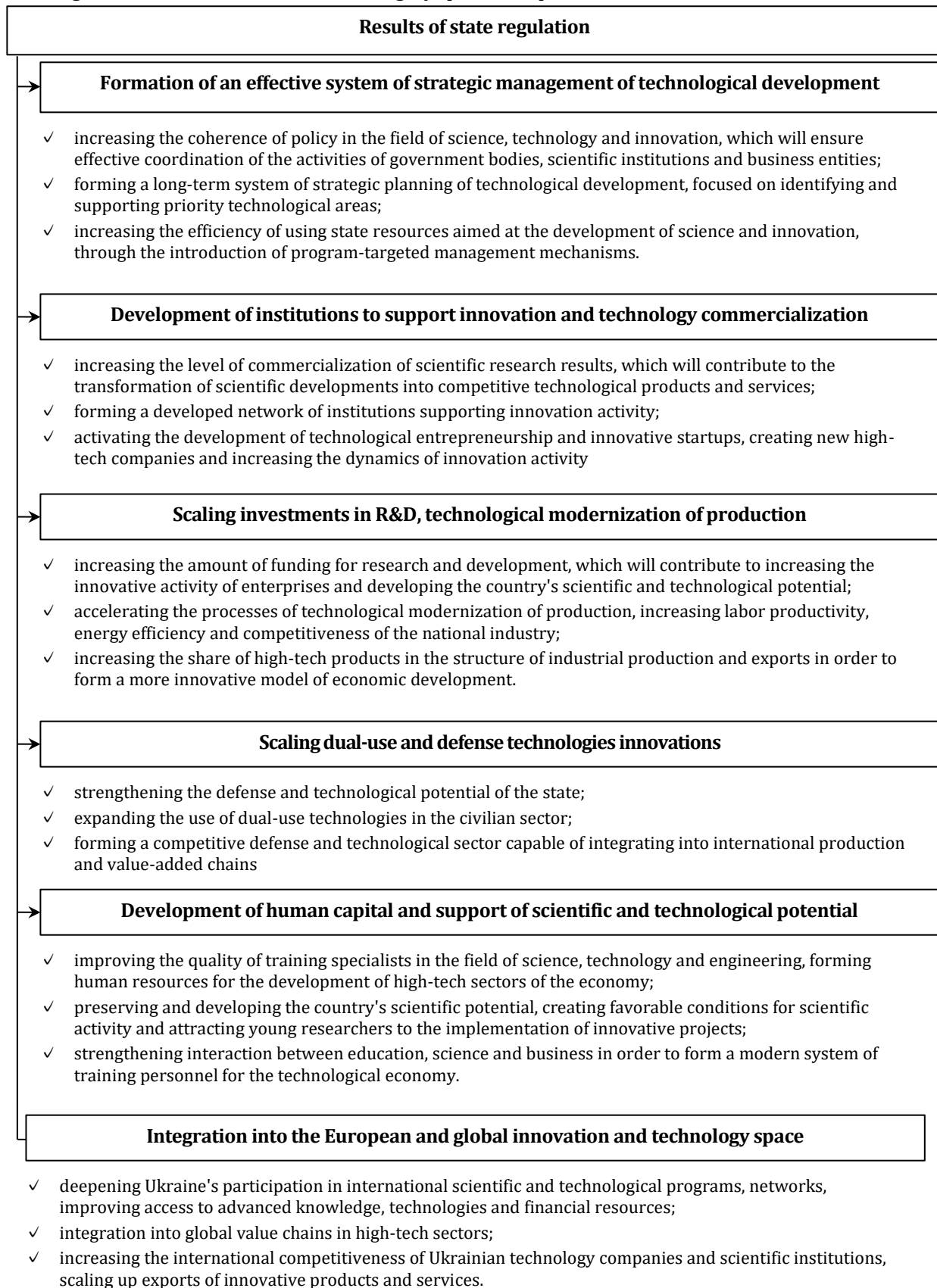


Figure 1. Development of institutional support for the technological competitiveness of the Ukrainian economy: expected results

Source: Built by the author.

Another, no less important result of the implementation of the identified strategic priorities should be considered the deepening of Ukraine's integration into the European and global innovation and technological space. The activation of international scientific and technological cooperation, participation in international research programs and projects, and the development of partnerships with foreign scientific centers and technological companies will expand the access of domestic entities of the real sector of the economy to advanced knowledge, innovative resources and modern technologies. In addition to the main task, the policy in this direction increases the degree of integration of the national economy into global value chains, strengthens the international competitiveness of business and scientific institutions, and expands channels for the export of high-tech products and innovative services. In general, in the author's opinion, the implementation of the outlined strategic priorities for the development of institutional support for the technological competitiveness of the national economy creates the prerequisites for the formation of an effective system of technological development of the economy, modernization of the production structure, increasing the innovative activity of enterprises and the integration of Ukraine into the global technological space. The set of expected results indicates the systemic nature of the impact of the state policy of technological modernization on the development of the national economy and the construction of a new model of economic progress based on innovation, knowledge, and modern technologies.

6. Conclusions

As a result of the generalization of methodological and applied provisions on managing the technological competitiveness of the national economy, it was established that the formation of an effective state policy in this area requires a clear definition of its strategic priorities, which serve as key guidelines for the development and implementation of relevant institutional, organizational and economic mechanisms of influence. The identification of priorities allows ensuring the consistency and purposefulness of state policy, coordinating the activities of various institutions of state power, the scientific sector and business, and increasing the efficiency of the use of available financial, intellectual and institutional resources. These aspects acquire particular importance in wartime, when limited resources, large-scale structural transformations of the economy and the need for rapid technological modernization necessitate a clear strategic focus of state policy. The definition of strategic priorities in this area makes it possible to form a holistic system of regulatory instruments aimed at stimulating innovative activity, developing high-tech sectors of the economy, increasing the efficiency of technology transfer and strengthening the institutional capacity of the state in the field of technological development.

Taking into account modern challenges and transformation processes in the national economy, the feasibility of identifying such strategic priorities for the development of institutional support for the technological competitiveness of the Ukrainian economy is substantiated, such as the formation of an effective system of state strategic management of technological development (in order to ensure the coherence and effectiveness of state policy); the development of institutions to support innovation and commercialization of technologies (which enhances the interaction of science, business and the state); stimulating investments in research, development and technological modernization of production; institutional support for the development of dual-purpose technologies and defense-technological innovations; the development of human capital and the country's scientific and technological potential; deepening the integration of Ukraine into the European and global innovation and technological space. The implementation of the outlined priorities will contribute to the formation of an effective institutional system to support technological development, the activation of innovation activity, the acceleration of technological modernization of the economy and the strengthening of Ukraine's competitive positions in the global economic environment.

It is appropriate to link the prospects for further research with the development of a roadmap for the state policy of technological modernization of the national economy of Ukraine.

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