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RESEARCH ON TREND CHANGES IN THE GLOBAL MARKET OF CONSTRUCTION AND ENGINEERING SERVICES IN THE CONTEXT OF ENSURING THEIR COMPETITIVENESS

ДОСЛІДЖЕННЯ ТЕНДЕНЦІЙНИХ ЗМІН НА СВІТОВОМУ РИНКУ БУДІВЕЛЬНИХ ТА ІНЖИНІРИНГОВИХ ПОСЛУГ В КОНТЕКСТІ ЗАБЕЗПЕЧЕННЯ ЇХ КОНКУРЕНТОСПРОМОЖНОСТІ

The paper explores trend changes in the global market of construction and engineering services in the context of ensuring their competitiveness. It demonstrates that the growing demand for design-technological and consulting services has facilitated the active formation of specialized companies. It is established that the global market is characterized by spatial unevenness of development. Special attention is paid to the issue of technological rent as a factor of long-term competitiveness. The interdependence between the development of construction and engineering projects and the modernization of related industrial sectors is analyzed. International and national mechanisms for regulating the engineering services market are systematized. A scientific and practical approach to optimizing marketing management of the competitiveness of engineering services is proposed.

Key words: *construction services, engineering services, competitiveness, marketing management, digitalization, "green" innovations, market regulation.*

У статті досліджено тенденційні зміни на світовому ринку будівельних та інжинірингових послуг у контексті забезпечення їх конкурентоспроможності. Показано, що зростаючий попит на проектно-технологічні та консультаційні послуги сприяв активному формуванню спеціалізованих компаній, які завдяки вузькій спеціалізації, орієнтації на клієнта, кваліфікованому персоналу та впровадженню інновацій здатні ефективніше й економічніше задовольняти потреби ринку. На основі аналізу сучасних досліджень і міжнародних звітів з'ясовано, що конкурентоспроможність інжинірингових компаній залежить від інтеграції у глобальні інноваційні мережі, доступу до високих технологій, цифровізації процесів і поширення BIM-систем, а також від упровадження «зелених» рішень та підвищення енергоефективності. Встановлено, що світовий ринок характеризується

просторовою нерівномірністю розвитку. Найбільша концентрація інноваційних кластерів спостерігається у Північно-Східній Азії, США та Західній Європі, тоді як ринки Латинської Америки, Африки та Австралазії демонструють стриманіші темпи зростання. Особливу увагу приділено питанню технологічної ренти як чинника довгострокової конкурентоспроможності, що визначає ринкову вартість інжинірингових послуг і масштаби їх комерційної віддачі. Проаналізовано взаємозалежність між розвитком будівельних та інжинірингових проєктів і модернізацією суміжних секторів промисловості, зокрема у сфері виробництва промислового обладнання, енергетики та охолоджувальних систем. Систематизовано міжнародні та національні механізми регулювання ринку інжинірингових послуг. Запропоновано науково-практичний підхід до оптимізації маркетингового управління конкурентоспроможністю інжинірингових послуг, що поєднує стратегічні, організаційні та інноваційні складові. Підсумовано, що розвиток будівельного та інжинірингового секторів безпосередньо корелює з якістю наукових досліджень, рівнем цифровізації й інноваційності економіки, а перспективи подальших досліджень пов'язані з розробкою моделей гармонізації міжнародних і національних стандартів регулювання та із визначенням маркетингових стратегій зміцнення конкурентних позицій компаній у глобальній економіці.

Ключові слова: *будівельні послуги, інжинірингові послуги, конкурентоспроможність, маркетингове управління, цифровізація, «зелені» інновації, регулювання ринку.*

Statement of the problem. In recent decades, many countries around the world have witnessed intensive growth in the service sector, which is reflected in the emergence of new types of services and the establishment of powerful service companies. The growing demand for engineering and design-consulting services has stimulated the active development of specialized companies that are gradually displacing auxiliary service departments within manufacturing firms and forming separate sectors of the economies of developed countries. Their competitive advantage lies in narrow specialization, client orientation, and the ability to provide high-quality and diverse services for related sectors of the economy. By attracting qualified personnel and applying modern technologies and equipment, such companies are able to fulfill orders faster, more efficiently, and more economically, thus contributing to the overall development of the state. Unlike manufacturing structures, for which service activities are secondary, specialized engineering companies concentrate all resources on improving service quality, which directly affects their competitiveness in the global market of construction and engineering services and enhances the positions of the countries that foster their growth in innovation rankings.

Analysis of recent research and publications. The results of modern scientific research confirm that the engineering and construction sectors are closely interconnected with related fields that shape their competitiveness and increase the demand for the services of engineering companies. Thus, O.A. Shvydanenko, T.V. Chernytska and O.S. Ponomarenko emphasize the importance of integration into global innovation networks through the synergy of scientific potential, business, and the state, which is particularly relevant for Ukraine under wartime challenges [6]. In this context, I.M. Miahkykh highlights the significance of effective project activity organization as a mechanism of strategic enterprise development, enabling rapid adaptation to market changes [10]. The research of V.I. Chobitok and S.D. Hodunov draws attention to innovative technologies in the field of outdoor advertising (LED neon, digital billboards, 3D technologies), which ensure a new level of business competitiveness [5]. At the same time, O.V. Arefieva, L.T. Horal, S.O. Arefieva, and O.V. Popovych substantiate the feasibility of integrating engineering technologies into the system of enterprise energy security, which strengthens resilience to risks and contributes to the economic efficiency of operations [1].

At the same time, a number of researchers draw attention to the issues of regulatory and legal frameworks for engineering activities in construction. In particular, O.V. Nevzorov notes that the absence of specific legislative regulation of engineering contracts in Ukraine creates legal uncertainty that hinders the development of the services market [3]. I.O. Kyrychenko supports the above statement and emphasizes that the regulatory and legal framework for engineering in Ukraine is fragmented, therefore, it is necessary to establish a comprehensive legislative basis using a three-tier regulation model [2]. Along with the above, O.M. Nepomniashchyi, analyzing the experience of EU countries and the United States, proves the effectiveness of a model based on the combination of state control with transparent mechanisms of public-private partnership, which enhance the efficiency of investment projects [4].

Analytical reports of international organizations and research centers provide a broader picture of the development of the construction industry on a global scale. In particular, the Global Innovation Index 2025 (WIPO) highlights the decisive role of innovation clusters, where the combination of scientific publications, patent activity, and venture capital creates the foundation for technological growth [12]. The report "Construction Market Insights. Europe" (Richard Joyce et al.) indicates the gradual recovery of the European construction industry [9], which is supported by the views of the GlobalData analytical group. In its report Global Construction Outlook to 2024, GlobalData emphasizes the recovery of the construction sector after the pandemic due to infrastructure investments and government support [8]. Finally, the Global Status Report for Buildings and Construction 2024/2025 (UNEP and GlobalABC) underlines the necessity of radical decarbonization and the introduction of energy-efficient solutions in the field of engineering and construction as a key prerequisite for achieving the goals of the Paris Agreement [11].

Highlighting previously unresolved parts of the overall problem. Thus, despite significant scientific achievements and analytical studies in the field of the global construction and engineering services market, the issues of systematizing international and national regu-

latory mechanisms for these markets, assessing the impact of technological factors on the competitiveness of engineering companies, as well as the comprehensive integration of innovative and "green" technologies into marketing strategies for their promotion under conditions of global digitalization, remain insufficiently explored.

Objectives of the article. The purpose of this study is to provide a comprehensive justification of trend changes in the global market of construction and engineering services in the context of shaping their competitiveness through the analysis of current challenges and opportunities of digitalization, innovation, and the intensification of "green" approaches to production and consumption.

Summary of the main results of the study. Scientific sources and reports of international organizations emphasize that technology acquires the status of an economic good only if a business entity holds exclusive rights to its use and commercialization. If, however, the knowledge underlying an innovative solution becomes publicly available, the potential for obtaining additional benefits from its application decreases significantly. According to UN methodological approaches, technologies are classified into high, medium, and low levels, with high-tech developments having the greatest market value, circulating mainly within the economies of developed countries. In contrast, medium- and low-level technologies almost do not create competitive advantages, since their dissemination is widespread and implementation is generally not accompanied by increased profitability.

Thus, in modern international rankings, the leading position in terms of the concentration of innovation and industrial-production capacities belongs to the Shenzhen-Hong Kong-Guangzhou agglomeration (China and Hong Kong), which significantly outpaces other global centers. The second place is occupied by the Tokyo–Yokohama metropolis (Japan), while the top three is completed by San Jose–San Francisco in the United States. Next are Beijing (China) and Seoul (Republic of Korea), ranked fourth and fifth, respectively. The top ten strongest innovation centers also include New York (7th place) and Los Angeles (10th place) in the United States, as well as London (United Kingdom), which holds the eighth position (Fig. 1). This structure of spatial distribution demonstrates the growing role of megacities as nodal points in the development of global construction and engineering services markets, since it is precisely these cities that are becoming platforms for the implementation of advanced technologies and the strengthening of their competitiveness.

Thus, the process of technology transfer acquires a hierarchical nature: advanced solutions are transmitted from economically stronger to less developed countries, where they gradually lose their novelty and turn into a tool of catch-up development. Under the current trends of the global construction and engineering services market, defined by digitalization, the implementation of BIM systems, automation, and "green" technologies, the issue of access to advanced technologies becomes a key factor in shaping the competitiveness of companies and sectors.

Accordingly, the highest concentration of construction activity is observed in Northeast Asia and Western Europe, where market volumes during 2015–2024

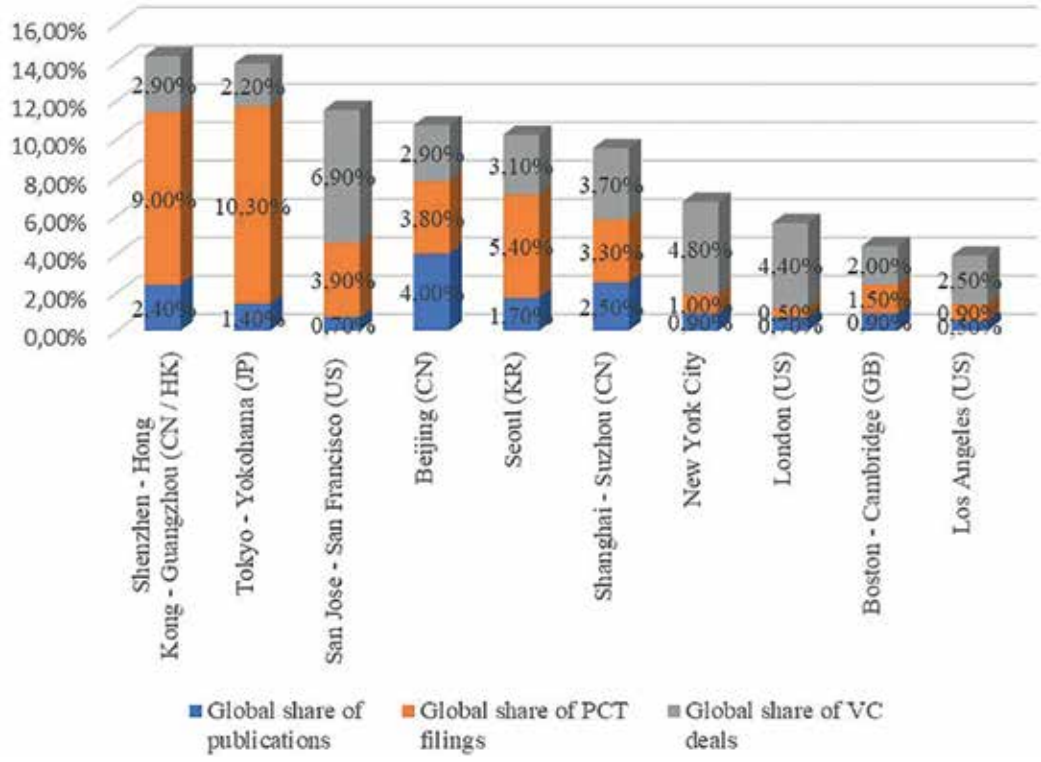

Figure 1. Top 10 leading innovation clusters in the world and their key indicators in 2025, %

Source: compiled based on data [12]

demonstrate steady growth despite certain declines in crisis years. The markets of South and Southeast Asia, as well as Eastern Europe and Central Asia, are characterized by dynamic growth rates, which indicates processes of structural modernization and increased investment in the construction sector (Fig. 2).

In contrast, Latin America, Africa, and partly Australasia demonstrate more moderate dynamics, driven by uneven economic development and the lower integration of these regions into the global market of construction and engineering services.

The determination of technology value when signing transfer agreements is one of the key aspects of regulating innovation relations in the global market of construction and engineering services. Traditionally, the basis for calculation includes the costs of conducting research and development (R&D) as well as related expenses associated with the creation of an innovative service. However, the final price of technology as an economic good is determined not only by the incurred costs but also by the scale of expected commercial returns, that is, the amount of additional profit that can be generated through its implementation. In this context, a specific technological rent is referred to, which becomes the foundation for shaping the competitiveness of engineering services. Considering current trends, the role of technological rent is increasing, as it is directly connected with improving project efficiency and creating long-term competitive advantages.

Thus, during 2015–2019, the dynamics of producer prices and costs in the construction sector of the EU-27 grew at a relatively moderate pace, demonstrating the stability of this market's development (Fig. 3).

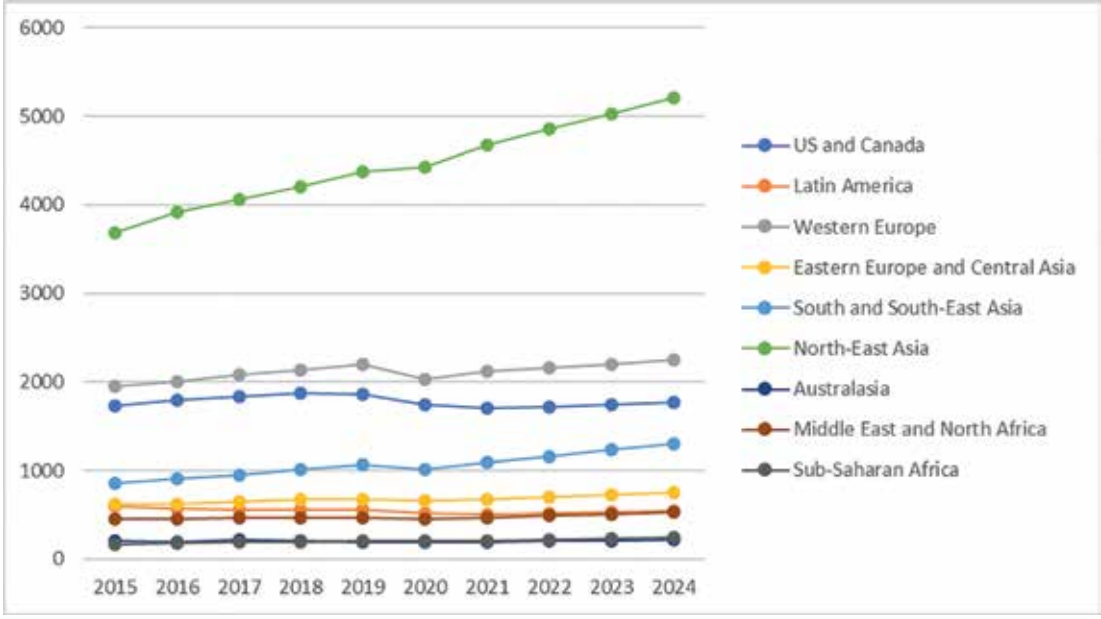

Figure 2. Total value of construction works by world regions (real, USD billion, 2017), 2015–2024

Source: compiled based on data [8]

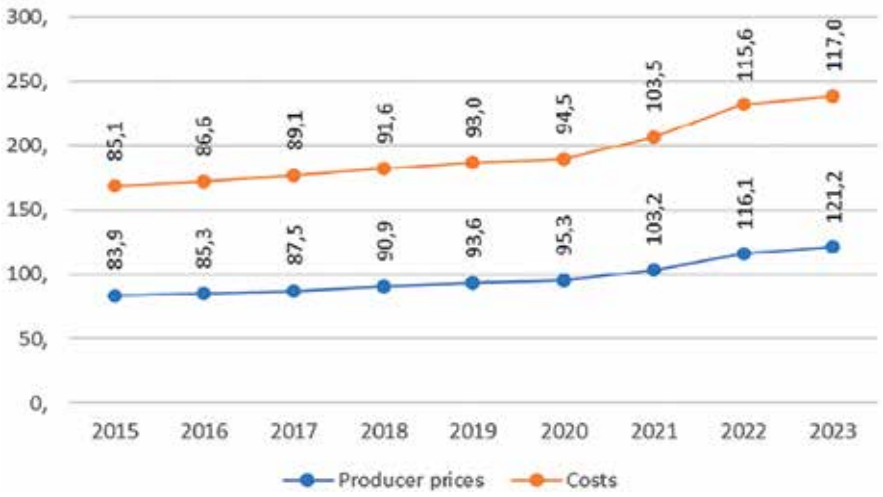

Figure 3. Changes in the Producer Price Index and Construction Costs in the EU-27 Countries, 2015–2023, %

Source: compiled based on data [7]

Starting from 2020, a significant acceleration in the growth of both prices and costs can be observed, which is associated with macroeconomic shocks, the COVID-19 pandemic, and rising resource prices on a global scale. In 2021–2022, the highest growth rates were recorded, indicating increasing pressure from inflationary factors and shortages of construction materials, as a result of which, already in 2023, producer prices remained at a higher level than costs, which may suggest a certain recovery of profitability among companies in the construction sector. Thus, the overall trend of changes in producer prices and costs in construction across EU countries during the study period demonstrates the growing dependence of the competitiveness of the EU construction sector on effective cost management and the ability to adapt to price fluctuations in global resource markets.

In our view, the engineering sector organically combines its dependence on the research potential of the state while simultaneously acting as a catalyst for industrial development. The level of fundamental and applied research directly determines the quality of construction technologies, particularly in the field of digital design and the implementation of BIM systems, which today serve as a core tool of innovative construction. At the same time, engineering companies are able to provide industrial enterprises with new equipment and technologies, promote the advancement of their scientific and technical capacity, and support adaptation to the challenges of automation and robotization of production processes. Through the development of modular construction and the integration of "green" solutions, these companies not only meet current production needs but also shape long-term prerequisites for sustainable development. As a result, their activities directly correlate with strengthening the competitiveness of products and services created on the basis of advanced technologies and digital project management platforms, thereby consolidating the leading positions of the construction and engineering sectors in the global economy.

For example, energy consumption trends in the construction sector differ significantly between developed countries and emerging markets, with the highest growth rates since 2020 recorded in Africa and the Asia-Pacific region (Fig. 4). In advanced economies, energy demand is projected to stabilize by 2030, after which it is expected to gradually decline by about 0.3% annually until 2050, as a result of the implementation of energy efficiency measures and decarbonization policies. In contrast, in developing countries, annual energy consumption is projected to grow at a rate of 1.5% until 2030 and about 1.3% in the subsequent period. The main determinants of this trend are rising household incomes, rapid urbanization, and demographic expansion. Special attention should be paid to the increasing demand for cooling in hot and humid climates, which creates significant pressure on energy systems and requires innovative solutions in the field of sustainable architectural practices and passive ventilation technologies. It is worth noting that cooling is the fastest-growing area of energy use in buildings, and this process is particularly pronounced in the Asia-Pacific region, where average annual growth rates have been around 4% since the early 2000s.

Analytical data indicate that the growing demand for data center infrastructure in Europe is causing a shortage of critical industrial equipment, particularly transformers, generators, and uninterruptible power supply systems. This situation demonstrates that the development of construction and engineering projects goes beyond the industry itself and creates a multiplier effect for related industrial sectors. The introduction of innovations in energy and cooling solutions stimulates the modernization of production chains, strengthening their technological component. As a result, construction companies not only respond to the current needs of the digital economy but also act as drivers of structural changes in equipment

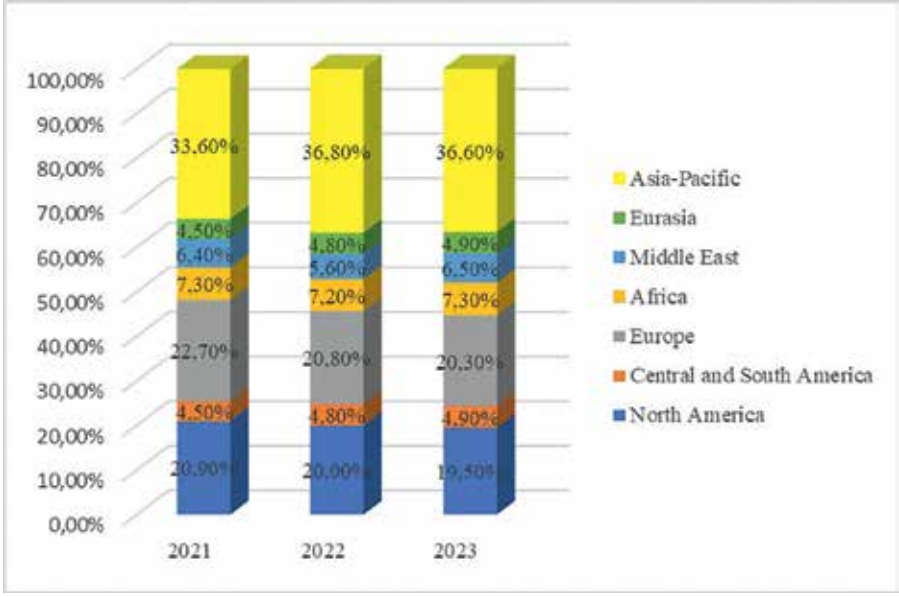

Figure 4. Energy consumption in buildings by region, 2021–2023, %

Source: compiled based on data [11]

manufacturing. This confirms the interdependence between the development of innovative infrastructure projects and the enhancement of competitiveness in related industrial sectors [9].

Along with the above, the systematization of international and national regulatory acts makes it possible to comprehensively reflect the mechanisms of state regulation of the engineering services market in both global and Ukrainian contexts (Table 1).

The analysis of the presented sources shows that state regulation of engineering services is multi-level in nature, combining international standards with national norms. In global practice, the emphasis is placed on the unification of contractual relations and ensuring transparency of investment processes, whereas in Ukraine the legal framework remains fragmented, focusing mainly on urban planning and architectural legislation. This highlights the need to create a systemic regulatory foundation capable of supporting the development of a competitive engineering services market at both the national and international levels.

The scheme presented in Fig. 5 illustrates a scientific and practical approach to optimizing the processes of marketing management of the competitiveness of engineering services through the integration of strategic, organizational, and innovative components, which is particularly important in the context of dynamic changes in the global market of construction and engineering services.

It should be noted that the competitiveness of engineering services is determined primarily by the useful properties of technologies and the effect that the client receives in the process of their implementation. Demand for innovative technologies is derivative in nature and is formed depending on the effectiveness of the products expected to be manufactured with their use, which necessitates careful segmentation of potential consumers of engineering services. An important factor in the successful implementation of such services is the close interconnection between sales policy and financial support, since most agreements require substantial investments.

Table 1

Features of regulation of the engineering services market

№	Organization, document	Brief description
International regulation		
1	UNCTAD, “International Code of Conduct on the Transfer of Technology”	Defines the principles of exchanging technologies, know-how, and engineering services. Aimed at establishing transparent rules for technology transfer. Ensures a balance between the interests of states and private companies.
2	UNECE, “Guide on the Preparation of International Contracts for Consulting Engineering Services”	Regulates the structure of international contracts between the client and the consultant. Establishes conditions of cooperation, distribution of responsibilities, and the list of consulting services. Promotes the unification of contract practices in construction.
3	International Federation of Consulting Engineers (FIDIC). Standard Contracts	Develops model contracts for construction engineering. Provides standard conditions regarding the parties’ responsibilities, deadlines, and force majeure circumstances. Used as a basis for international agreements.
4	European Union (European Parliament, UNECE)	Engineering is considered a component of investment processes. State regulation emphasizes transparency of financing and control over project documentation. Highlights the integration of science and innovation into construction.
5	USA (ASME, American Council for Professional Development of Engineers)	Focuses on drafting contracts for architectural and construction projects. Great importance is given to the quality training of consulting engineers. Financial engineering and cooperation with banking institutions are widespread.
National legislation of Ukraine		
1	Civil Code of Ukraine (Chapters 61–63)	Regulates contracts for works, research, and service provision. Engineering contracts combine elements of all these structures. The Civil Code does not provide a definition of an engineering contract.
2	Tax Code of Ukraine (Art. 14.1.85)	Provides a legal definition of engineering as a set of works and services. Includes design, documentation development, author supervision, and consulting. No tax benefits are provided for engineering companies.
3	Law of Ukraine “On Architectural Activity” (Art. 1)	Establishes the definition of engineering activities in construction. Covers feasibility studies, examinations, preparation of tenders, and coordination of construction participants. Sets requirements for licensing and certification of contractors.
4	Law of Ukraine “On Regulation of Urban Development Activity” and related acts	Defines the rules for planning and implementing construction projects. Provides liability for violations in the field of urban development. Aimed at integrating engineering into the general system of construction law.
5	State Building Codes and Standards (DBN, DSTU)	Establish requirements for the quality of design, construction, and installation works. Regulate the technical parameters of engineering solutions. Aimed at ensuring the safety and reliability of facilities.

Source: compiled based on data [2, 3, 4]

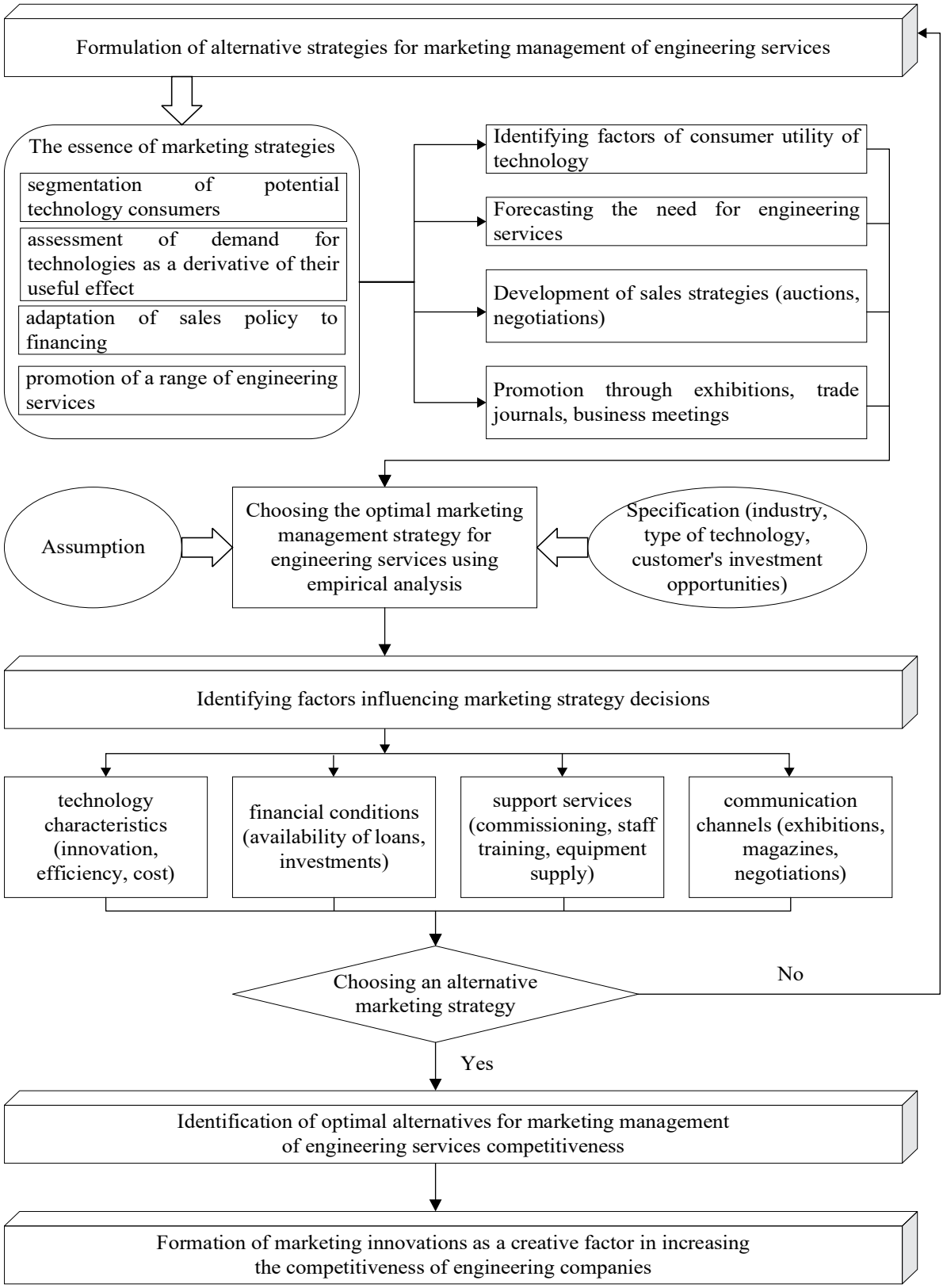

Figure 5. A scientific and practical approach to optimizing the processes of marketing management of the competitiveness of engineering services

Source: developed by the authors

Marketing of engineering technologies and services should include the organization of their adaptation processes, which are intended to cover feasibility studies, equipment procurement, logistics and material supply, personnel training, and commissioning works. Effective promotion of engineering services involves

a focus on specialized exhibitions, industry-specific online and offline publications, and direct negotiations with clients, which ensures the targeted nature and effectiveness of marketing communications.

Conclusions. The conducted study confirmed that the global market of construction and engineering services is undergoing profound transformations under the influence of digitalization, automation, and the spread of "green" technologies. At the same time, it should be noted that today the competitiveness of engineering companies is determined not only by the quality of technologies but also by the effectiveness of marketing management, their capacity for innovation, and adaptability to global challenges. National and international regulatory mechanisms play a significant role in shaping competitive advantages, as they ensure transparency of investment processes and the unification of contractual relations. Equally important is the integration of engineering technologies into related industries and their multiplier effect, which strengthens the technological modernization of industry. Prospects for further research lie in the development of models for harmonizing international and national regulatory standards, as well as in exploring strategies for enhancing the competitiveness of engineering companies under the dynamic changes of the global economy.

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