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## MODERN PROBLEMS AND PROSPECTS FOR THE DEVELOPMENT OF THE ESTIMATE BUSINESS IN THE CONSTRUCTION OF THE REPUBLIC OF KAZAKHSTAN

### ANNOTATION

Estimating is one of the main parts of construction production, which is a combination of methods and means that are used to determine the cost of all construction and installation work, as well as the costs of operation and repair of buildings and structures.

The paper shows a literature review of foreign research articles on cost estimates in construction. The problems of pricing, as well as modern problems and prospects for the development of cost estimates in construction are considered and investigated. The basic requirements and conditions for pricing in construction in Kazakhstan are presented, including some features of the formation of the construction price of an object. An analysis was made of the main directions of reforming estimate regulation and pricing, as well as the prospects for introducing new technologies into estimate activities. Options for the use of computer technologies (computer products) in calculating the estimated cost of construction are considered, options for the development of estimating in construction are proposed, which includes automation of the costing process (estimate programs ABC-4, SANA), development of information and BIM technologies, improvement of the personnel training system and regulatory framework, creating an improved effective price control system.

*Key words:* regulatory framework, calculation, automation, pricing, problems.

**Introduction.** Cost estimation is one of the main sections of construction production. It is a set of methods and tools used to determine the cost of construction work, the cost of operation and repair of buildings and structures.

Foreign scientists are also studying problems in the field of estimates.

Thus, the author has studied the pricing process in the construction industry. A study was conducted that allowed us to consider the main features of this process, to identify the key factors that have a direct impact on the final cost of products. The methods of calculating the estimated cost of construction are analyzed and the positive and negative aspects of using each method are determined [1].

The estimate business consists of the following: the formation of prices for construction products, estimated norms, prices, etc.

The pricing policy in construction is an integral part of the general pricing policy and proceeds from the pricing principles common to all industries. At the same time, the pricing mechanism in construction has specific features. The specifics of pricing in construction are determined by the specifics of construction products: their individuality, complexity, dependence on natural and climatic conditions,

and large costs. Pricing in construction has an individual character: the price of each type of construction product is determined on the basis of an estimate (calculation).

Pricing in construction is carried out by the designer, the customer and the contractor, each of whom pursues their own commercial goals. Therefore, the final price for construction products is, in fact, a compromise price between all subjects of construction production.

Estimated norms and prices for repair and construction works are intended to determine direct costs as part of the estimated cost of repair and construction work on disassembly, dismantling, repair, reinforcement and replacement of building structures, engineering equipment and restoration of finishing coatings in the conditions of workplace organization and intra-building movement of building materials, parts and structures at the facilities of major repairs and reconstruction of buildings and structures.

Building codes and regulations are the initial standards for the development of individual and consolidated standards (rates) and other regulatory documents used to determine direct costs in the estimated cost of repair and construction work. Data on the composition and quantity of resources obtained on the basis of Building codes and regulations can be used to determine the duration of work, compile various technological documentation and write off materials.

Estimated norms and prices for repair and construction works are an integral part of the pricing and estimated rationing system in construction operating in the territory of the Republic of Kazakhstan. The content, construction, presentation and design of the collections of Building codes and regulations comply with the requirements of the «State standards in the field of architecture, urban planning and construction. Basic provisions», taking into account these General Provisions.

**Materials and research methods.** Currently, the estimated pricing system is facing a number of problems that hinder its effective functioning.

In this regard, the study of modern problems and prospects for the development of estimates in construction is relevant [2, 11-15].

Thus, the author Dedyukhina E.S. investigated the problems of using innovative methods for determining the estimated cost of construction work. The current state of the pricing system in the construction industry of a certain area was analyzed. As a result of the study, problems were identified and their possible consequences were described. A comparative analysis of the estimated cost of repairs and dismantling of buildings was carried out. Based on the results obtained, shortcomings in determining the estimated cost of construction are shown, and proposals are made to improve innovative methods for calculating the estimated cost [2].

The problems of cost estimation in construction in the Republic of Kazakhstan are shown in Figure 1.

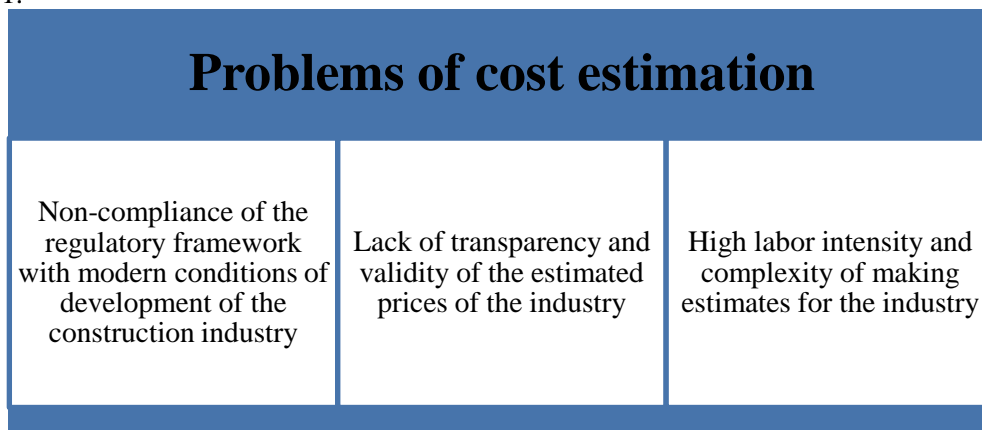


Fig. 1 – Problems of cost estimation in construction in the Republic of Kazakhstan

Non-compliance of the regulatory framework with modern conditions of development of the construction industry. The modern system of estimated pricing is based on standards developed during the Soviet period. These standards do not take into account modern changes in the construction industry, such as the introduction of new technologies, materials and equipment. As a result, estimated prices often turn out to be overstated or underestimated, which leads to inefficient use of budget funds.

Lack of transparency and validity of the estimated prices of the industry. Estimated prices are based on cost standards, which are not always transparent and reasonable. As a result, customers and contractors often cannot understand what the cost of construction consists of.

High labor intensity and complexity of making estimates for the industry. Making estimates is a time-consuming and complex process that requires a highly qualified and experienced estimator. As a result, errors and inaccuracies often arise, which can lead to overestimation or underestimation of the cost of construction.

**Research results.** Promising directions in calculating the estimated cost in construction are the use of computer technologies (software products) [3, 4].

Analyzing various options at the design stage of facilities has always been a difficult task. One of the main parameters that help engineers make more informed decisions when designing buildings is cost accounting for various design options. The authors propose to implement a semi-automatic BIM-based cost estimation approach that allows practitioners to estimate the cost of projects based on various design options using an accurate and flexible system. The study proposes an integrated structure through which the cost estimation standard is associated with the calculation of the amount of materials from BIM models [5].

BIM has evolved into a powerful solution that can improve many aspects of the construction industry. Most studies regarding the impact of orientation on the energy needs of a building rarely use the potential of BIM. The paper explores the impact of orientation on energy consumption in small-scale construction and evaluates how BIM can be used to facilitate this process. A real building is modeled using Revit, one of the leading BIM tools. Then, using the extensible green building markup language, the model is exported to Green Building Studio, one of the leading energy modeling programs. The Green Building Studio uses different orientations of buildings and explores their impact on the energy of the entire building [6].

The authors Gorbachev A.Yu., Gulyakin D.V., Laskarev A.I. presented a comparative analysis of modern software tools for automation of estimated calculations [7].

Modern information technologies undoubtedly have an impact on the construction industry. In business processes, information technology plays a key role in the development of enterprises. The use of modern equipment, as well as software, leads to an increase in productivity, and, as a result, to an increase in the profit of the enterprise. The paper shows issues related to the introduction of artificial intelligence for calculating estimates, as well as virtual construction technologies (BIM technologies) [8]. The prospects for the development of estimates in construction are shown in Figure 2.

Solutions		
Modernization of the regulatory framework, including the introduction of new pricing methods that take into account modern conditions for the development of the construction industry	Increasing the transparency and validity of estimated prices, including by disclosing information about the composition of costs used in the formation of estimates	Automation of the budgeting process, which will reduce the complexity and complexity of this work

Fig. 2 – Prospects for the development of estimates in construction

Development of new pricing methods [16, 17]. Currently, new pricing methods based on market principles are being developed in Kazakhstan. These methods allow for more accurate accounting of current prices for construction materials, equipment and services.

The author F. M. Saifullina identifies key areas for improving the methodology of pricing in construction, which are applicable for many countries. This is the determination of the most optimal and reliable estimated cost of construction at the earliest stages of the investment project, as well as the development of information technologies for processing large amounts of information with the interconnection of all participants in the construction industry.

A promising direction is the development of a fundamentally new enlarged estimated regulatory framework [9].

The main requirements and conditions of pricing in construction in Kazakhstan are shown in Table 1 [10].

To increase the transparency and validity of estimated prices, it is necessary to disclose information about the composition of costs used in their formation [18, 19]. This information can be made publicly

available, which will allow customers and contractors to independently assess the validity of estimated prices.

Automation of the budgeting process will reduce the complexity and complexity of this work. It is necessary to develop special software products that allow you to quickly and accurately calculate the estimated cost of construction work.

Korean scientists have researched and conducted case-based justification, which can be an effective approach to achieve reliable accuracy in estimating the cost of construction projects, especially in the early stages of design, when only limited information is available. Automation of basic data is an urgent direction for improving and efficiency of the construction cost assessment process [20].

Construction automation has demonstrated the potential to improve construction productivity after years of technical development and experimentation in its field. However, exactly how and the possible benefits and challenges of construction automation are unclear and lacking in current research. Research has been conducted on the potential of construction automation to improve construction productivity and its possible implications. A review of the literature on the use of automation technologies in construction was conducted. Text analysis software VOS Viewer and Rapid Miner Studio were used to identify the most promising areas of research through analysis of scientific publications. These research areas and issues are summarized in one topic, and based on them, suggestions are made for industry to help advance the adoption of automation in construction [21].

An innovation in the construction industry is smart construction, which means that smart data and associated technologies will be fully utilized in the construction process. The intellectual level of the construction process will be increased through the creation and use of intelligent systems. Intelligent construction is a complex including intelligent design, intelligent construction site and intelligent management. Intelligent design focuses on the interior of the design enterprise, and intelligent construction site focuses on the construction site. Building information modeling (BIM) can combine data modeling and virtual reality and compare them with real construction projects to work together between the site and the model, which reduces a large number of errors in the early stages, thereby increasing construction efficiency. The paper proposes the structure of a smart construction automation system based on technology and a collaboration platform, and discusses the configuration of smart construction elements based on the BIM and a collaboration platform. A working mechanism for an automated system based on the BIM and a collaboration platform has been developed. The study results show that an automation system based on this technology and collaboration platform supports the rapid construction of large-scale 3D spaces and the accurate integration of data from multiple sources. The application of intelligent construction technology in construction cost management has brought enormous economic benefits, construction efficiency has been increased by 65%, construction time has been reduced by 30%, labor intensity has been reduced by 27%, and labor productivity has been increased by 39%. The result is significant benefits in the design of buildings and structures [22].

In addition to the problems listed above, there are others in the budget business. These include:

1. Insufficient development of the regulatory framework. Despite the fact that in recent years Kazakhstan has been actively working to modernize the regulatory framework for estimated pricing, it still does not meet modern requirements.

2. An inefficient price control system. Currently, Kazakhstan does not have a unified price control system for construction materials, equipment and services. This leads to the fact that the estimated prices are often overstated or underestimated.

3. The imperfection of the personnel training system. Currently, there is a shortage of qualified cost estimators in Kazakhstan. This leads to the fact that estimates are often made by non-professionals, which can lead to errors and inaccuracies.

Table 1 – Basic requirements and conditions of pricing in construction in Kazakhstan

№	Requirements	Note
1	2	3
1	The estimated cost of construction (ECC) takes into account the cost of all work.	They are determined at the stage of development of pre-design, design and estimate documentation (DED).
2	The ECC is determined based on the design assignment and other initial customer data.	-

3	The ECC as part of the pre-project documentation is determined in accordance with the procedure using aggregated cost indicators (ACI) for the construction of buildings and structures.	If necessary, at the stage of development of pre-design documentation, enlarged estimated standards of structural elements of buildings are applied/structures and types of work.
4	The ECC as part of the design and estimate documentation is determined in accordance with the Procedure using enlarged estimated cost standards for technologically completed units and types of work, single estimated prices for types of work, elemental estimated resource consumption rates for types of work and existing collections of estimated prices for construction resources.	If necessary, to determine the estimated costs for the construction of engineering infrastructure facilities that are not the main construction facilities, enlarged estimated standards per unit of measurement of the capacity indicator are applied at the project stage.
5	The estimated cost of construction of the projected facility is formed on the date of submission of pre-design, design and estimate documentation to an expert organization for conducting a comprehensive non-departmental examination.	When developing the design and estimate documentation for the stages of the estimated cost of construction of the projected object, the design and estimate documentation of the corresponding stage is formed on the date of submission. All necessary amendments are made no later than the date of entry into force of the agreement.
1	2	3
6	For facilities that are planned to be built in the upcoming calendar year, the estimated cost of construction is determined by indexing the volume of investments in the upcoming periods through cost indices for construction.	The breakdown of investment volumes by calendar years is carried out in accordance with the regulatory duration and standards of the groundwork in construction, based on information about the beginning of construction provided by the customer.
7	The estimated documentation, compiled on the basis of estimated standards, is intended for planning investment activities and determining the maximum construction price for conducting a tender for the purchase of contract works and services.	The customer's estimate is transmitted to potential suppliers in the form of an electronic copy (PDF format) and in a universal format for presenting the source data and calculation results of estimates (KENML format).

#### Prospects for the development of estimates in construction

Solving the problems of cost estimation in construction is an important task that will increase the efficiency of using budget funds and improve the quality of construction. To solve this problem, it is necessary to take a number of measures aimed at:

1. Improving the regulatory framework.
2. Creation of an effective price control system.
3. Improvement of the personnel training system. It is necessary to improve the skills of personnel in the field of estimates.

**Conclusion.** Solving the problems of cost estimation in construction is an important task that will increase the efficiency of using budget funds and improve the quality of construction. To solve this problem, it is necessary to take a number of measures aimed at:

1. Improvement of the regulatory framework. It is necessary to develop a new regulatory framework for estimated pricing, which will meet modern conditions for the development of the construction industry. This database should take into account modern technologies, materials and equipment, as well as market conditions.

2. Creation of an effective price control system. It is necessary to create a unified price control system for construction materials, equipment and services. This system should ensure the reliability of information about prices and exclude the possibility of artificially inflating or underestimating them.

3. Improvement of the personnel training system. It is necessary to improve the skills of personnel in the field of estimates. This will ensure that estimates are prepared by qualified specialists, which will increase their quality and validity.

The implementation of these measures will create an effective system of estimated pricing, which will meet modern requirements and contribute to the development of the construction industry.

In addition to the measures listed above, the development of cost estimates in construction can be aimed at solving the following tasks:

- Development of BIM technologies. BIM technologies allow you to create a virtual model of a construction object, which can be used to calculate the estimated cost. This will improve the accuracy and validity of estimates.

- Using machine learning. Machine learning can be used to automate the budgeting process. This will reduce the complexity and increase the efficiency of this work.

- Development of information technologies. It is necessary to develop information technologies that can be used to exchange information about estimates between participants in the construction process. This will increase the transparency and efficiency of the process of determining the estimated cost of construction.

The implementation of these tasks will make the estimated pricing system even more efficient and modern.

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## РЕЗЮМЕ

Сметное дело - это один из главных частей строительного производства, которое представляет собой сочетание методов и средств, которые используют для определения стоимости всех строительных, монтажных работ, а также затрат на эксплуатацию и ремонт зданий и сооружений.

В работе показан литературный обзор зарубежных исследовательских статей по сметному делу в строительстве. Рассмотрены и исследованы проблемы ценообразования, а также современные проблемы и перспективы развития сметного дела в строительстве. Представлены основные требования и условия ценообразования в строительстве в Казахстане, в том числе показаны некоторые особенности образования строительной цены объекта. Произведен анализ основных направлений реформирования сметного нормирования и ценообразования, а также перспективы внедрения новых технологий в сметную деятельность. Рассмотрены варианты применения компьютерных технологий (компьютерных продуктов) при расчете сметной стоимости строительства, предложены варианты развития сметного дела в строительстве, куда включена автоматизация процесса составления смет (сметные программы АВС-4, САНА), развитие информационных и BIM-технологий, совершенствование системы подготовки кадров и нормативной базы, создание усовершенствованной эффективной системы контроля за ценами.

## ТҮЙІН

Бағалау – құрылыс өндірісінің негізгі бөліктерінің бірі, ол барлық құрылыс-монтаж жұмыстарының өзіндік құнын, сондай-ақ ғимараттар мен құрылыстарды пайдалану мен жөндеуге кеткен шығындарды анықтау үшін қолданылатын әдістер мен құралдардың жиынтығы болып табылады.

Жұмыста құрылыстағы шығындар сметасы бойынша шетелдік ғылыми мақалалардың әдебиеттік шолуы көрсетілген. Құрылыстағы баға белгілеу мәселелері, сонымен қатар қазіргі заманғы проблемалар мен құрылыстағы сметалық құжаттаманы әзірлеу перспективалары қарастырылады және зерттеледі. Қазақстандағы құрылыстағы баға белгілеудің негізгі талаптары мен шарттары, оның ішінде объектінің құрылыс бағасын қалыптастырудың кейбір ерекшеліктері көрсетілген. Сметалық реттеу мен баға белгілеуді реформалаудың негізгі бағыттарына, сондай-ақ сметалық қызметке жаңа технологияларды енгізу перспективаларына талдау жасалды. Құрылыстың сметалық құнын калькуляциялауда компьютерлік технологияларды (компьютерлік бұйымдарды) қолдану нұсқалары қарастырылады, құрылыста сметаны әзірлеу нұсқалары ұсынылды, яғни калькуляциялау процесін автоматтандыру (ABC-4, SANA сметалық бағдарламалары), ақпараттық және BIM технологияларын әзірлеу, персоналды оқыту жүйесі мен нормативтік-құқықтық базаны жетілдіру, бағаны бақылаудың жақсартылған тиімді жүйесін құру.