

Reasonable choice of materials for project management in transport construction

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Abstract. Material and technical supply is traditionally considered as a set of activities united by one project purpose. As a rule, a hierarchical approach to management functions is not applied and the links between management functions are determined by the classical form of the implementation of a construction project. The selection of the best types of material resources and its component that is the costs determined by the properties of the applied materials are becoming a key link in project management in modern Russia. This is an important scientific phenomenon. The research of this phenomenon allows finding the problem points in costing and the solution to the problems of the increase in the efficiency of building materials assembly through them. The relevance of this research is important for those countries where there is strong regulation of the estimated cost. The authors of the paper propose the measures to improve the efficiency of the choice of construction materials due to a more reliable determination of the estimated cost. For this, there are two ways to improve the project bill of materials: through the improvement of the regulatory framework and management of the process of the application of this framework. The quality level of resource and cost norms is a paramount problem in conditions of state regulation. This is intensified by the use of the basic costing method. The lag of norms calculated at the basic cost level can not be compensated for the use of conversion indices due to territorial and industrial classification. The attempts to create in Russia a unified information system for setting costs for construction products have not yet had measurable results. This results in a large percentage of outdated regulations that take into account materials with insufficient usability. The participants of the construction process have to spend large human resources to manage material resources in projects. The process of management in terms of material and technical equipment of construction is on top in terms of importance in the field of project management in transport construction. The quality of the projects being implemented largely depends on the success in the improvement of the regulatory framework.

1. Introduction

The purpose of the paper is to study the problem of the choice of construction materials that correspond to the goals of the project through the determination of the reliable estimated cost of construction of transport facilities associated with the shortcomings of the estimated regulatory framework and the search for the causes of errors. The existing possible ways to improve the accuracy of economic calculations is a well studied area of economics. At the same time, the performance properties of materials that make up a significant part of project costs are studied separately. Thus,



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materials science and costing are not related areas in the actual engineering design process. According to previous studies [1], a qualitative system of norms is the basis of the final cost of an object. This is most reasonable for the creation of high-speed passenger transport [2], including the creation of tourism infrastructure [3].

Nowadays, there is a steady growth in the construction sector of economy, accompanied by a significant amount of work on the design, construction and commissioning of both new construction and reconstruction projects. This is most reasonable for high-speed rail lines, built using new structures and extended overpasses [4]. The choice of the best design of the railway track becomes directly related to the degree of accuracy of the cost estimates [5]. As it is noted in the work [6], the issues of the formation of construction project management systems are becoming relevant. The project management system allows overcoming the difficulties associated with the uncertainty of both the external and internal environment and the chronic lack of resources necessary for the production of construction products.

Under these conditions, high requirements for the quality of project planning are formed, which allows organizing and controlling the processes of project implementation as efficiently as possible, despite external constraints and risks for participants [7]. The criteria for the success of a project are its timely completion with a given level of quality and within the allocated budget. Therefore, it is not surprising that the issue of the determination of the project budget in conditions of a permanent shortage of investment resources is becoming increasingly important.

The issues of the management of the cost of construction projects are widely reflected in the works of different authors. The determination of the estimated cost of construction and the development of estimated standards at the present stage in Russia, Europe and China are more and more focused on filling the gaps in the construction of high-speed transport [8, 9], while in Russia there is an additional tendency to develop consolidated cost standards [10].

The features of construction projects include non-stationarity, non-uniformity of construction production and the nature of final product, the participation of a large number of organizations, which determines a high degree of cooperation in construction production, the role of climatic and natural conditions. Construction projects, especially in the construction of atypical facilities, have many risks and problems in the field of organization and communication. Design features also greatly complicate the organization of construction production [11]. They require significant capital investment and tight coordination of realization, financing and quality control processes. This is compounded by the presence of several actors (contractors, designers, customers) who are forced to work closely together.

Nowadays one of the most relevant areas of the construction industry is transport construction, since through the provision of transport accessibility to regions, uniting them into a single economic space and creating the basis of national economy, it contributes to the provision of the strategic and economic security of the state [12]. Large-scale construction of transport infrastructure facilities requires increased attention to project management issues. Apart from all the above-mentioned difficulties in the management of construction projects, the implementation of road construction projects is complicated by the linear nature of the work, the territorial remoteness of objects from production bases and head offices, which complicates the speed and accuracy of decision-making on the project, requires consideration of the lag of managerial decisions, leads to significant restrictions on logistics providing the project with material and technical resources and equipment, technical limitations and inaccessibility of materials at operating units. An interesting example in this aspect is the example of construction in Singapore, when climatic risks influenced the construction management model [13].

The management of any project has similar tasks: implementation schedule, creation of conditions for the normal functioning of the organizational and economic mechanism of a project, systematic movement towards the set goal [2]. One of the main tasks solved in the field of project management is the task of construction cost managing, the solution of which is aimed at the provision of the process of the implementation of a construction project with financial resources in the required volumes and within a given time frame. Project cost management provides its implementation within the approved

budget by sequentially carrying out the stages of budgeting, cost control and cost adjustments [14]. The key stage is budgeting i.e. the determination of the costs of a project. The budget for a construction project is developed on the basis of the determination of the estimated cost of the project after all the structural and technical characteristics of the future structure are identified [15]. A reliable determination of the estimated cost of construction largely determines the further implementation of the construction project, which allows project executors to focus on the solution of other issues of project management [16]. As it is noted in the work [17], this improves the efficiency of project management.

The resource method is among the methods for the determination of the estimated cost operating in the system of estimated costing, the most reliable and appropriate one to the conditions of a market economy, since it allows determining the cost of construction based on the consumption of resources and the real current cost for them in a territorial context. At the same time, in Russia in construction costing the base-index method has been used since the days of the planned economy, in the overwhelming majority of cases, which is characterized by unreasonable averaging of the cost of resources [18]. Therefore, in order to eliminate the current situation, in December 2017 the Federal State Information System for Costing in Construction (FSISCC) was created in accordance with the roadmap for the development of costing. The main task of which is to monitor the cost of construction resources in a territorial context for each region of the country.

The state monitoring system will increase the accuracy of estimate calculations due to the transition to the resource method to estimate documentation. This is relevant both for general construction and specialized construction work [19]. At the same time, the quality of implementation of investment projects is growing and target indicators are improving [20]. Unfortunately, for a number of reasons, the transition to new costing system is being delayed. The launch of FSISCC was expected in 2019, but now it is already obvious that FSISCC will fully work even later. Therefore, the use of the most reliable resource method to determine the estimated cost of construction is currently not possible. To continue the work on the introduction of this progressive method, a number of priority measures should be taken, namely it is necessary to clarify the list of building resources by types of capital construction objects “Highways” and “Artificial road structures”, “High-speed railways” and organize monitoring of the current costs of building resources, used for road and bridge construction. The creation of inter-industrial center for monitoring the current costs of construction resources on the basis of the Ministry of Transport and monitoring the costs of construction resources in accordance with the list provided by industry departments will help solve this problem and timely update the estimated costs for construction resources in FSISCC necessary for this work.

2. Materials and methods

The base-index method of estimates used as the main one is based on a well-tested, but not devoid of shortcomings, estimate and regulatory framework developed long time ago. Due to scientific and technological progress, stimulating the emergence of new equipment, technologies and materials, the estimated and regulatory framework of the construction industry is rather outdated. For several years (since 2014) a costing reform has been ongoing. It includes active work on updating the existing ones and developing new regulatory and methodological documents in the field of costing. According to the analysis carried out by the authors, 42% of resource-technological models explicitly contain outdated types of construction materials. Another 26% require replacement of technological schemes and production methods. The results of the study show that the system for the determination of the cost of construction needs to eliminate a large number of identified shortcomings, which reduce the reliability to determine the cost of construction products.

3. Results

One of the most serious shortcomings negatively affecting the reliability to determine the cost of transport construction and requiring urgent elimination is the lack of industry index for recalculating the estimated cost from the basic to the current cost level. For this reason, the projected indices for the

cost element “Other objects” used during the calculation of the cost of work in road construction do not reflect the actual costs spent by contractors, due to the significant difference in the composition and list of construction resources used in the construction of road structures in comparison with others objects. A depressing situation is emerging when road construction contractors hardly cover the costs of construction work and excavations in accordance with the level of payment under the current estimate and regulatory framework cause significant losses. The current situation leads to the smashup of construction and installation organizations and their withdrawal from the market, which threatens the existence of a strategically important sector of the national economy and the implementation of a long-term transport strategy. In this regard, it is urgently necessary to organize the procedure for the development of indices to recalculate the estimated cost of transport construction.

One more problematic issue for the road industry is the task of the development of new estimated standards necessary to ensure the possibility to consider industry facilities of innovative technologies and materials in design documentation. Since 2016, more than 450 proposals have been formulated for the development of estimated standards necessary for road industry and only seven have been approved so far.

The development of estimated standards is carried out in the industry on the basis of current legislation. During practical application of standards, the problems of interaction between participants arise. They are associated with the uncertainty of the scope of responsibility of participants in processes and deadlines. This requires the adjustment of laws and methods in terms of the structure and composition of requirements for the participants involved in all processes of the development of estimated standards. The question of the formation of a transparent mechanism for the approval of the procedure for the development of new estimate standards, which allows the implementation of the design of facilities within the time frame established by the contract, is still open.

It is necessary to determine the financial source for the development of estimated standards, to optimize the “Procedure to approve of estimated standards” in terms of the reduction of time for their consideration and approval. Today, approval is 1.5 - 2 years, which exceeds the duration of the design of a large facility. At present, a new variant of the normative document has been prepared, taking into account the recommendations of industry experts. The approval of the document will eliminate the above mentioned problems, which will allow intensifying the development of new estimated standards.

For the purpose of technical support of work on the preparation of draft estimate standards and their subsequent examination, it is necessary to create an industry-specific software package that would systematize work on the development of estimate standards using technological processes of reuse, which reduce development time. During the solution of the tasks of the increase in the efficiency of project cost management in the industry, it is recommended to work out the issue of the harmonization of estimated standards as part of the estimate and regulatory bases of various levels (federal, industrial and territorial), on the basis of which the estimate documentation for transport infrastructure facilities is made.

The analysis of cost management at transport construction projects showed that cost management plays an increasingly important role in project management system. The classical model, in which cost management had a separate role, is less and less consistent with the reality of Russian construction. The reason for this is the incorrect explanation of the cost of work as a part of estimate and regulatory framework. Outdated costs for construction work lead to the fact that even with highly qualified engineers, it becomes impossible to ensure the compliance of the technical and economic parts of the project with the specified requirements. As a result, a company managing a project is forced to adjust the cost of a project throughout the entire engineering cycle, from investment concept to commissioning. This gives grounds to state that the management of a construction project in Russia is, first of all, the management of cost, its accuracy and reliability.

This result is quite new and even unexpected since it was previously believed that it is necessary to manage production and processes. Nowadays the tasks of financial management, implemented with the help of estimated costing tools, have become the most important. These conclusions are important

both for the determination of the directions of future scientific research and for training future specialists of project management.

4. Conclusion

The relevant problems of costing considered in the article, occurred in transport construction of Russia, have led to the transformation of the project management scheme in construction. Instead of the applied role of costing as an additional control element, the subject of cost management becomes dominant in the structure of project management. Accordingly, the problems of costing, which were previously private, are becoming global.

The proposed recommendations for the solution of problems are reduced to the following main provisions: it is necessary to continue work on the implementation of FSISCC, defining the range of used resources and monitoring of current costs for them. In addition, it is necessary to organize a procedure for the determination of the indices to recalculate the estimated cost from the basic cost level to the current one. Since the final transition to the resource method for the determination of the estimated cost is delayed, the development of new estimated standards does not lose its relevance taking into account the use of modern technologies and means of production.

The implementation of the above mentioned measures objectively should not only increase the reliability of to determine the cost of road construction, but also ensure the introduction of materials with better operational properties. It will ultimately improve the efficiency of project management for their construction as a whole and thereby ensure the implementation of the transport strategy throughout the country.

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