Development of cost engineering system in construction

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Abstract

Shaping the methodological basis of professional construction management it is possible to speak about a new direction in the development of the construction pricing – the development of cost management system in construction (cost engineering in construction) integrating the assessment of investment costs, estimated pricing, contract pricing, evaluation of the actual construction costs, and enabling to connect and manage the aforementioned processes. At the same time the concept of cost engineering in construction fixes the engineering, technical and technological basis of all processes directly or indirectly related to the definition of construction costs. The article presents the authors' considerations on the creation and implementation of cost engineering systems in construction at the national, territorial and corporate levels.

1. Introduction

The modern system of construction pricing includes not only the budget development at the design stage but also determination of the construction products cost at other stages of the investment and construction process. The current pricing system in construction no longer meets the needs of the participants of investment and construction (primarily the needs of the state as the main participant in the efficient budget investment). Fundamental changes in approaches to the whole system of formation and management of construction costs are necessary [1-5].

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In this regard, the improvement of the construction pricing should be implemented through the transition to a new system of construction cost management (cost engineering in construction) that would combine the preliminary assessment of the investment costs, the estimated pricing, contract pricing, the system of the actual costs determination, and allow to connect and manage the aforementioned processes.

Construction cost management provides for interconnection of the investment and construction process stages, and transitions from one kind of cost to the other – from investment to estimated, from estimated to contract, from contract to actual, from actual to operation cost (with regard to reconstruction, capital and current repairs) and the investment cost of such facilities planned for implementation in the future [6,7].

Cost engineering involves the engineering approach to pricing in construction, therefore the regulatory framework consists of the rules of town planning, civil and investment legislation, provisions of the technical regulations, etc. At the same time the listed legal acts regulate only some issues addressed by cost engineers. There is no systematic specialized regulation in this sphere. The authors believe that the conceptual model of such system should include the following:

- national regulation (laws, regulations, national supervision);
- self-regulation – standardization, professional certification (standards, rules, procedures, admissions, responsibility, control);
- territorial regulation of cost engineering in construction system development and management in Russian regions taking into account regional peculiarities (sets of rules, orders, control, supervision);
- corporate regulation – development and implementation of cost management systems in construction in government and other corporations (corporate standards, local regulations, relevant departments, internal control).

The need to develop efficient and manageable cost engineering systems is now recognized by many major players in investment and construction business – state, regions of the Russian Federation, state corporations and other companies [11].

2. Development of corporate cost engineering systems in construction

Internationally cost engineering has long been an independent kind of professional activity. Engineering approach to the management of investment and production costs is widely used in industry and capital construction [10,12]. In Russia the idea of cost engineering and its adaptation to the Russian construction sphere are being primarily developed by large public corporations with large amounts of construction.

Several large corporations have voiced the need for the development and implementation of full time cost management systems in construction. In the field of cost engineering self-regulating professional communities are being created, designed to regulate the activities of their members through the development of a single regulatory and methodological approach to the formation and management of construction cost at various stages of the investment and construction process through the development of cost engineering standards system.

Capital investments in construction are an integral part of the investment policy of a large company regardless of its main activities. Therefore, development of a system of reliable and transparent definition of construction cost is no less urgent for corporations than for state and municipal customers.

In recent years more and more companies aiming at optimizing their capital investments at each stage of construction have been developing and implementing cost engineering systems. The proposed project of such system designed according to the road map principle of process planning [13,15] and including a set of local regulatory company documents (standards, procedures, regulations) is shown in Fig. 1.

The use of the proposed system allows companies to control the pricing process at any stage of investment and construction projects life cycles [18].

3. Implementation and development of the cost engineering system in construction at national and regional levels

The area of effective application of cost engineering systems is not limited to self-regulated professional organizations and corporations [16].
National and municipal regulation of pricing ultimately pursues the same goals as corporations – the creation of a single system of formation, management and control of construction costs. Consequently, the concept of cost engineering is desirable to be adapted and form the basis in the development of the construction pricing control systems at national, regional and municipal levels.

Industry pricing is now being actively developed [14]. For example, the Russian Ministry of Construction has prepared and published the following: project of the Federal Law “On Amendments to the Russian Federation Town Planning Code and certain legislative acts of the Russian Federation regarding regulation in the field of town-planning pricing and budgeting” (so-called law on pricing in construction) [8], the Concept of pricing and budgeting in construction reform [9].

This implies changes not only to the Town Planning Code of the Russian Federation regarding the regulation of pricing and budgeting at the architectural design stage, but also to the legal acts regulating the procedure of construction cost formation at the stages of capital investment planning and of procurement procedures. Thus, the planned legislative changes comprehensively cover construction pricing at various stages of the investment and construction process.

Since construction pricing falls within contiguous legislative regulation in order to develop the system of cost engineering in construction it is necessary to create and approve the document that will occupy a central place in the system – the federal standard of cost engineering in construction (standard of construction cost definition) regulating a uniform procedure, purpose and general principles of cost formation and control at various stages of the investment and construction process. This document will provide an unambiguous legitimate connection between the requirements of laws and regulations of procedures, and procedures of transition from one kind of cost to another, the process of expertise and cost control.

Coverage of the whole investment and construction process and a unified regulatory methodological approach to the formation of the construction cost will set unambiguous rules for determining all kinds of costs:

- marginal cost – at the stage of planning capital investments allocated for the capital construction projects;
- budget cost – in the preparation of project documentation and its expertise of the capital construction projects;
- initial (maximum) contract price – in public procurement of works on construction of capital construction projects and certain types of work;
- factual cost – at the construction and commissioning stages of capital construction projects;
- cost of repairs – during the operation of capital construction projects.

The federal standard must provide for and support the essence and principles of construction pricing system reform and become the first tool for efficient renovation of construction pricing system that allows to determine and manage the cost. The adoption of such a document will allow the transition to a system of cost engineering in construction. Development of this document must provide for the uniformity in approaches to determining the cost of construction for all investment and construction projects funded from any source.

The principles of creating the federal standard as the main instrument of cost management system are determined by the following provisions:
- “through” pricing regulation at all the stages of the investment and construction process;
- continuity, transparency and accountability of the cost at every stage of the investment and construction process and in transition from one stage to another;
- compliance with town planning legislation and other federal laws and regulatory legal acts of the Russian Federation containing the rules governing the pricing issues, and compliance with the state pricing policy in the sphere of urban development implemented by the Ministry of Construction of Russia.

The federal standard sets the following for each stage of the investment and construction process:
- kind of cost;
- system of applicable regulations;
- general procedure for determining the cost with reference to the corresponding normative and methodological regulations;
- regulations, subject-matter and area of cost control.

The system of state normative methodological regulation of cost engineering in construction developed by the authors is shown in Fig. 2.

![Fig. 2. Regulatory and methodological basis of the state cost engineering system in construction.](image-url)

Development and approval by the Russian Ministry of Construction of construction cost determination and control system for the whole investment and construction process will ensure an unambiguous link between the legal
requirements and normative regulations, as well as consolidation of the foundation and structure of the cost engineering system in construction.

4. Conclusion

Thus, the processes of determination and examination of the construction cost are not only subject to economic laws. They certainly have a major engineering and technical basis and require the appropriate knowledge and skills in construction pricing specialists. Name and functional content of professional cost engineering in construction reflects the synergy of its economic and engineering components. Cost engineering integrating the methods and means of construction cost management is the topical system of construction pricing, while acost engineer becomes a modern expert on pricing in construction.

References