

Application of the Value Engineering Method in a Construction Company

Silka D.N.

Moscow State University Of Civil Engineering, National Research University

e-mail: silkadn@mgsu.ru

Abstract—Technologies of value engineering are quite actively used at foreign enterprises. Russian enterprises that implement complex industrial facilities also confirm the relevance of engineering methods in solving various tasks for project management. The paper shows the principles of the value engineering application, as well as the parties concerned. The contents of the competences that relate to the value engineering are provided. Basic methods for the application of engineering methods by the Russian companies are given that allow using the advantages of the value engineering at all stages of the project implementation. All the conclusions and proposals are based on the analysis of many works of researchers in the field of construction economics and investment and construction engineering. The need to take into account the information flows rapidly generated due to the active development of information technology is considered as the challenges for development and application of the value engineering. The role of these technologies is shown to solve the practical problems of construction enterprises. Monitoring the cost of resources, their movements, BIM technologies are recognized as the main drivers for the development of the value management methodology.

Keywords—*Cost engineering, construction costs, investments, price monitoring, building structures.*

I. INTRODUCTION

Issues of pricing in construction are extremely important in the implementation of projects, as the cost of work is calculated at the pre-investment stage and determines the efficiency and effectiveness of both the investment stage and the subsequent operation. Investment resources should be allocated in a balanced and rational manner to ensure work at all stages. This primarily depends on the professionalism and competence of specialists in the field of pricing and estimated rationing. At present, in conditions of constant improving the efficiency of construction processes, seeking development reserves, pricing competencies are increasingly implemented when applying the value engineering. The value engineering is focused on the study of cost factors, the methods for determining it, the tools for choosing rational options, the use of materials and constructive solutions, etc. It follows based on the analysis of the regulatory and legal framework in construction that not all issues of determining value are reflected in methodological and other documents. The application of the value engineering methods is extremely demanded at construction enterprises, but requires careful study of the relevant issues, as well as an understanding the nature of the calculation methods. The value engineering is an extremely complex activity, as it requires the application of competencies, both in the field of engineering

solutions, and in the field of organization and construction economics.

II. RELEVANCE, LITERATURE REVIEW

The value engineering is a type of activity necessary at all stages of the project implementation, primarily used to justify investment in construction. The problem of increasing the efficiency of investments is considered by scientists, both for state contracts and for private ones, and remains very acute [4, 5, 17]. With a large scale of construction controlled by the state, the scale of various violations and losses of investment resources prove to be quite large [1, 2, 7, 9]. Experts note that in recent years the volume of state orders for the economy as a whole was about 23-25 trillion rub. (not counting the closed data on the defense order, etc.). With such volumes, the share of construction is in the range of 28-30%. Taking into account related industries, investments in construction can reach up to 40%. In the first half of this year, the share of construction was about 20%. But as is known, the bulk accounts for the second half of the year. It should also be noted that the state order for 30% consists of contracts concluded in trades subject to 44-FZ, and for 70% - to 223-FZ. This ratio remains stable when considering the annual volume of purchases. The general situation in achieving goals pursued by the state order is given below.

The Accounts Chamber of Russia notes [6] that the total amount in the economy allocated from the budget "without achieving a socio-economic result," increased by 12.5 times in 2016. The information was provided in the official materials of the Accounts Chamber, as part of the report to the deputies on the results of the audit of the budget investment discipline for 2016 [6]. Only 244 projects were completed with construction from the list of 443 objects of the Federal targeted investment program planned to be implemented in 2016. Because of this, the amount of unfinished construction reached 2.2 trillion rubles, or 12 thousand objects. The Accounts Chamber directly records that this state of affairs requires the most serious assessment and taking measures, for which the corresponding instruction of the Russian President in August 2015 was issued. Experts critically notice that the tasks set are far from their solution [6]. In general, the falsification of reporting on state construction projects reached 655 billion rubles. This is five and a half times higher than figures of the previous year.

The above facts evidence the existence of problems both at the level of calculating the justification of investments and in terms of subsequent monitoring [13, 14]. In this respect, the

development of the value engineering methods is extremely relevant, as it allows to expand management capabilities for a variety of management levels. Statistics and facts show that the existing methods of managing investments and the cost of ongoing work have great shortcomings. Control is also insufficiently effective as the results of investment activity cause serious concerns among specialists.

III. PROBLEM STATEMENT

The application of the value engineering in the management of investment projects in construction requires the development of methods for the value engineering and the definition of methods for their application to solve specific problems.

With some differences for various participants of investment and construction activities, the following persons should have competencies in the value engineering:

- specialists of pricing departments, project managers, heads of subdivisions for financial and planning/economic support of projects at the level of the investor and the customer;
- inspectors of technical supervision, engineers of technical services, cost engineers, economists, project managers, heads of subdivisions of contracting enterprises.

If we consider the field of application of the value engineering at the level of various participants and hierarchies of investment and construction activities, we can note the following. The investor needs to develop a concept, justify the investment, draft a feasibility study, calculate the investment project effectiveness, calculate the maximization of income from investing capital. Forecasting the value of the investor's share in the project. Risk management. For customer service - making modern effective technical and technological decisions, including in terms of further effective operation and optimization of costs when implementing investment projects. Acceptance of the results of the designer's work (project documentation). The project defense in the state expertise. Acceptance of works and equipment. For general contracting enterprise - organization of the facility construction, controlling and registering the scope of work performed in the acts of work performed, etc. As a basis for the implementation of competencies, it is necessary to apply the provisions of normative and legal regulation of investment and urban development activities in the territory of the Russian Federation and established methods for effecting settlements. In addition, the study of modern Russian and worldwide operating methods, norms and rules, construction technologies, technologies in terms of engineering and technological equipment, and other advanced technologies is becoming demanded. Applying network planning methods. Other graphs of different levels. When deepening into the subject area - the study of modern fundamentals, methods, rules and pricing norms in construction. Studying the modern foreign bases of construction pricing. Determining the cost of construction at all stages of the investment project life cycle. The IT issues are also considered. The implementation of modern methods of information design and modeling in construction, the study of relevant foreign and Russian experience gain key importance. The set of tasks to be solved also include modern foundations, methods, rules for rationing pricing in construction in the

Russian Federation. Application of modern world practices of rationing in construction. Development of estimation norms and standards in construction at all stages of the life cycle for unique construction services and works.

IV. THEORETICAL PART

The effective application of the value engineering, methods of the value engineering requires considering all managerial tendencies characteristic of advanced construction enterprises.

First, it is a modern set of tools provided by the BIM modeling. When developing solutions aimed at determining the reliable cost of work, it is important that the materials, resources, structures, etc. specified in the estimates do not lead to a decrease in the use value of the object. With regard to the BIM, we note that from March 1, 2018, three new sets of rules for the direction of information technology will take effect [16]. These are the "Information modeling in construction. Rules for the description of components of the information model." The "Information modeling in construction. Rules for the formation of the information model of objects at different stages of the life cycle" and the "Information modeling in construction. Rules for the exchange between information models of objects and models used in software complexes." The created system of national documents in the field of information modeling technologies in construction includes basic standards and codes of rules that provide a digital infrastructure, including defining the basic provisions, principles and terminology of the BIM, as well as standards and codes of rules that define the conceptual framework and methodology for implementing information modeling in practice at separate life cycle stages - from justification of investments to utilization and demolition of buildings and structures. The information model created based on the BIM should be implemented to evaluate the consequences of price decisions on material, constructive and other issues. Thus, the method of modeling the value of an object at all life cycle stages is the base for the value engineering.

Second, methods are required to form a reliable cost of construction resources and materials in the project implementation. At present, both at the initiative of the state and large business, systems for assigning electronic identifiers to different goods (RFID, etc.) are being developed. These systems allow both tracking the way of the resource promotion, and also registering the cost of these resources in various databases. For a construction company, the methods of working with databases recording and having a flow of the resources used for construction are also of great importance when implementing the value engineering.

Third, taking into account the specifics of the construction industry, it is necessary to interact with all participants of the construction project in real time. Different stages of project implementation are associated with the fulfillment of contractual obligations of local participants. The use of information technology for recording work performed, performing other obligations, receiving payment also refers to the content of the methods required for the value engineering methods.

V. PRACTICAL IMPORTANCE

The application of a set of the value engineering methods has a high practical importance, which is to ensure the timing, cost of work, the set results at the stage of operation. The issues of determining the effective concept of the value engineering as a set of methods for managing the cost of work has shown its practical importance in the implementation of major engineering projects, which in most cases represent the construction of large industrial facilities [10, 11,12, 15]. The value engineering itself is not sufficiently developed in the practice of Russian construction companies, and therefore the potential of the corresponding methods is very high. Companies that, according to their activities, are engineering ones, have not only Russian significance. Similar companies are represented all over the world. They implement the best solutions from the point of view of technical and economic performance. The solution of various issues of urban planning, construction economics requires special engineering competencies [18, 1, 20].

VI. CONCLUSIONS

The application of the value engineering, with all its advantages, has not yet been fully implemented. The problem is that when implementing a project, it is necessary to take into account many parameters, both planned and spontaneous, chaotically arising factors. The engineering methodology lags behind the requirements of practical tasks in conditions of chronic deficiency of the levers to manage stability in the parameters of investment and construction projects. But absolutely new prospects for project management appear with the accelerating development of information technology, the implementation of the "Digital Economy" and the "Smart City" state programs. In this regard, the value engineering which can be based on a significantly larger volume of figures and factors, is highly relevant for the theory and practice.

REFERENCES

- [1] Booleigh N.V. Management of public procurement in construction // Building. Economics and Management. 2014. № 2. P. 32-40.
- [2] Booleigh N.V. Transformation of public procurement in construction as part of the transition to a contract system // Economics and Entrepreneurship. 2014. No. 12-3 (53-3). Pp. 562-567.
- [3] Belousov VE, Vrublevskaia SS. Engineering of business processes in the system of organizational management // Bulletin of the Voronezh State Technical University. 2010. T. 6. No. 9. P. 103-107.
- [4] Lukmanova IG, Yaskova N.Yu. Development of the scientific foundations of the evolutionary economy in the current conditions of investment and construction activity // Economics of construction. 2014. No. 4 (28). Pp. 13-19.
- [5] Lukmanova IG, Yaskova N.Yu. On words and deeds in solving the problems of building development // Economics of construction. 2016. № 5. P. 3-10.
- [6] The Chamber of Accounts: public investment without result // Expert. - 2-8 Oct., 2017. - No. 40 (1046). - C. 4.
- [7] Kalugin P.I., Mescheryakova OK, Pyatigor OP, Pyatigor D.A. On the improvement of the mechanism of public procurement in construction // High technologies in the construction complex. 2014. No. 1. P. 50-53.
- [8] Kartoshkin N.V. Modern integrated engineering and project management "turnkey" in electric power engineering // Energetik. 2010. № 9. With. 09-12.
- [9] Mustafin NS, Baryshnikov AA, Gorelov SA Features of the conduct of public procurement for contract work in construction // Regional development. 2017. № 6. S. 5.
- [10] Mukharramova E.R. Engineering in construction // Russian Entrepreneurship. 2016. T. 17. № 16. P. 1959-1974.
- [11] Pavlov A.S. Engineering in the construction // Bulletin MGSU. 2011. № 8. With. 442-450.
- [12] Ptukhina IS, Vyatkin ME, Musorina TA Cost engineering in construction // Construction of unique buildings and structures. 2013. No. 5 (10). Pp. 58-67.
- [13] Rzun IG, Rzun V.V. Foreign experience of state procurement of construction services // Scientific works of the Kuban State Technological University. 2015. № 9. P. 239-253.
- [14] Suzdaltseva Y.Yu. Perfection of the system of public procurement in construction // Questions of economic sciences. 2015. № 4 (74). Pp. 101-103.
- [15] Silka DN, Ermolaev EE, Durov RA, Kopelchuk S.Yu. Engineering of investment and construction projects for industrial purposes. Moscow, 2014.
- [16] New sets of rules on BIM // Ministry of Russia were approved. URL: <http://www.minstroyrf.ru/press/utverzhdeny-novye-svody-pravil-po-bim/> (expiration date: 16.03.2018).
- [17] Yaskova N.Yu. Modern contexts of the project approach in the sphere of real estate // Real estate: economics, management. 2017. № 3. P. 35-38.
- [18] Yaskova N.Yu., Voloshin A.V. The administrative context of urban development // Real Estate: Economics, Management. 2016. № 1. P. 12-17.
- [19] Yaskova N.Yu. Modern methods of real estate development // Vestnik of Irkutsk State Technical University. 2015. No. 4 (99). Pp. 358-364.
- [20] Yaskova N.Yu. Cyclic "deja vu" paradigm of the real estate sphere development // Bulletin of MGSU. 2015. No. 1. P. 112-119.