The necessity of training the new specialists in the sector of construction price formation

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***Abstract*—This paper considers the recent problem of the cost engineers training to ensure the efficiency of the construction companies. The weak pockets of today's specialists in the construction pricing system are specified and such decisions as training the specialists of international level are proposed. The definitions of such concepts as "Cost engineering" and "Cost engineer" are given and the advantages of the new framework specialists are proved. The materials of the article can be used and have practical significance for representatives of the investment and construction complex, as well as used in the educational process - in training future engineers and economists, advanced training and professional retraining of employees of enterprises of the investment and construction complex.**

Keywords—construction sector; construction operations participants; construction pricing system; cost engineering; cost engineer.

I. INTRODUCTION

The current situation with the lack of highly-qualified multifunctional specialists in the construction sector demands careful examination. Existing educational specializations of training the bachelors do not assure fully the increasing demand in construction job market with the necessary personnel whereof the employers declare insistently. Besides, the necessity of reforming the system of construction specialists training is also particularly assured by all the participants of the investment and construction activities.

II. PROBLEMS OF PROVIDING THE CONSTRUCTION WITH THE MULTIFUNCTIONAL SPECIALISTS AND WAYS TO SOLVE THEM

The entire construction complex of our country faces an acute dilemma - the available specialists do not fully comply with international requirements and standards. And in the era of adaptation of production processes of domestic construction companies to the global political and economic realities, this issue is becoming increasingly important. Construction is the largest sector of the country's economy, which plays a leading role in the development of productive forces and the level of welfare of the people. Construction includes organizations that are engaged in the construction of industrial, civil, residential facilities, as well as organizations that provide building materials and structures. Building production has its own characteristic patterns only for the certain branch of the economy, causing the uniqueness of its organization and management [1].

Construction is one of the major industrial sectors of the country, which is responsible for the creating new, development and reconstruction of the active fixed capital assets (buildings and structures), as well as the foundation of new nonproductive assets (residential buildings, schools, hospitals, household and municipal purposes objects). Construction sector possesses a set of specific features. First of all it is related to the fact that it releases the products playing a major role in the development of all the sectors of economy. The construction products are strictly fastened to the demands of the relevant productions. Therefore, it becomes necessary to release highly extended product range (buildings and structures) with the limited capacities on unification of products and replicating. Communication with all the sectors of economy predestinates the division of the construction as the sector on the number of sub-sectors: housing and civil, energetical, transport, agricultural, pipeline, amelioratory etc. This division mainly corresponds to the organizing structure of construction controlling bodies, covered by areas of construction companies on objective grounds. At the same time territorial subordination is widespread. Therefore the important feature of the organization of construction controlling bodies is the combination of both territorial and branch principle. The necessity of reforming the system of construction pricing is particularly assured today by the participants of the investment and construction activities. The relevance of the process enhances by the recently declared findings about the disbursing public funds during construction of the objects of federal standing resulted in negative properties of the existing pricing system on a nationwide scale – its opacity, detachment from the market and technological reality as well as the possibility of corrupt practice. The pricing concept in construction adopted by the Russian Federation Construction Committee in 1991 included a lot of essential provisions but the most part of them was not implemented. At the same time they have to be used when offering a proposal on a modern development strategy of construction pricing system. The system of construction cost engineering has to become the basis of the necessary radical changes in approaches to construction pricing management. It is well known that construction is one of the most capital-intensive sectors of the modern economy, that's why the problems of

construction value formation have always been urgent and still remain urgent today. And modern conditions of functioning construction necessitate the development and improvement of the existing methodological approaches to construction cost certification, control and auditing the expenditure of capital assets. In this context no wonder that the major construction companies are more and more interested in training the specialists with the qualification not only in economics but in engineering also in order to optimize costs at all the stages of the investment process (justification of investment, project planning, contract tendering bids, contracts signing, performing mutual settlements between the parties, facility commissioning). Any investor won't deposit money in construction without relevant costing document proving the practicality and propriety of investment. It is an estimator-engineer who is engaged in many stages of construction from technical and economy feasibility of investment, evaluation of building objects, reconstruction and repair of existing objects, to construction progress control.

If speaking about the specialist who performs a wide range of duties on assessment of pricing policy in the construction company, the term "estimator" is not quite correct. It is more accurate to name the employees of such level as specialists on cost engineering because they are to possess a wide range of engineer and economic knowledge. The result of work of such specialist is to satisfy the Customer, the Contractor, the Investor, the legal services and the tax authorities. The statutory instrument raises the work of specialist on cost engineering on a principally new, higher level [2].

In the last few years the new terms have been used regarding the specialists of the construction engineering sector - "engineering", "engineering services", "cost engineering", the last one is associated with the concept of "construction costs" [3].

Engineering is one of the forms of international commercial interaction of science and technology and is aimed at providing services for development and research to the production stage.

Engineering includes the following modifications: integrated engineering, consulting engineering, technological engineering, construction engineering.

The concept of "engineering" in construction [4]:

- means an independent professional activity carried out by engineering companies and professional consulting engineers;

- is carried out on a reimbursable basis under contracts, i.e. is commercial in nature;

- includes a complex of engineering, intellectual and consulting services in order to obtain effective and the best possible results from the investments (costs) associated with the further implementation of investment and construction projects throughout the life cycle from the investment plan to setting to work;

- is based on the mentality, improvement, control and implementation of technical, technological, organizational, managerial, financial economic and other models of investment construction projects according to the goals;

- differs from engineering activities by realisation the useful effect in the form of project and technical documentation, drawings and charts [5].

The subject area of engineering in construction presents the processes of implementation of investment and construction projects, focused on new construction, renovation and technical re-equipment of objects of any purpose, including industrial, civil, housing, transport, energy, etc. based on the use of modern scientific approaches. These results in the inclusion in the standard of basic terms in the field of investment and construction projects.

Cost engineering as a branch of activity on the performing of the cost estimations (the reasons) throughout all the stages of investing and constructing project determines the economic intercourse between the parties. The demand for competent specialists in this branch is not satisfied with the construction market. The reason is simple – there is no qualification like a specialist of cost engineering in Russian higher education establishments. There is a discrepancy in the training of the construction specialists: the lack of engineer training for the students of qualification "Economy and management in construction" takes place; the graduates of construction qualifications know about building technologies, project design basis, estimate structural engineering but they are not competent enough in economic calculations. The need for the natural integration of university specialties is observed.

Brisk development of construction system insists on engaging high-qualified staff of budget norming. Today the estimator is expected to know not only software applications and budgeting skills. The estimator today has to be aware of the legal matters, has to define the scope of work and be informed about all the recent changes in building legislation as well as know the technology of construction process.So the construction branch doesn't need the single-discipline specialists competent in building up budget only, but the professionals who have a wide range of knowledge and are able to manage construction costs at all the stages of construction and investment cycle are needed. There is an exigency in specialists of the high level also due to politically charged issued about the cost of construction, being government sponsored. When the anti-corruption efforts are enhanced the budget norming branch attracts the representatives of many supervising bodies. At the same time the inspection authorities' staff has a very general idea about cost engineering. Thereby the estimator-engineers often have to stand up for their competence and provide teaching among the representatives of state authorities. These problems arise mainly due to lack of duly formulated professional standards that are to be elaborated in the nearest time.

Such qualitative changes in the training of the experts are supported by AACE (Association for the Advancement of Cost Engineering), International non-profit organization "Association of the Universities of construction", and also by Presidium of educational and methodological association. Besides, some Russian Universities among them Moscow State University of Civil Engineering starting in 2013 trains the students the discipline "Cost engineering" [6]. The present problem has risen many times in the works

of Russian scientists, such as Vyatkin M.E., Ptukhin I.S., Musorina T.A., Nekrasova O.O. [7].

And for all that, within the framework of the indicated problem the category “Cost engineering” and qualification “Cost engineer” are worth investigating more detailed.

Cost engineering is a complex of approaches and facilities of investment project cost management at all the stages of its life cycle including project budgeting, investment-effectiveness evaluation (project evaluation), estimating price formation, expert examination (verification) of the estimated cost of construction, value formation of construction, project realization process cost checking, analysis of outturn costs (cost of construction).

Cost engineer is a well-educated, trained and qualified specialist for the development and practical application (based on principles of designing, technical skills and technical process) of approaches and facilities of project cost management including estimation of expenditures, the value cost control and project budget in general, costing, construction management effectiveness, assessment of investment (investment value), risk analysis and effective value of the project [8].

It is definitely today that the Owner should not be less qualified than the Contractor. And he should be more engaged in construction value formation. The new technologies in construction, all the changes in construction resources value and their disclosure in the budget, correct and prompt applying of index-numbers to be concerned. So it is the Owner who is to manage construction cost.

The training system of professional engineers should include all types of educational activities. Training of the cost engineer should be in this row and the beginning of the specialization is to be included in high school. It is also necessary to create an integrated training system of the experts according to the market requirements who could work professionally in the companies of the customer, the contractor, design enterprises and other infrastructure enterprises at the construction market and services. In this case, all existing staff training methods should be used in the form of training and retraining, with internships and workshop training, getting the second higher education [9].

Cost engineering as a comprehensive solution for the customer is really a trending product that will be in demand in the market. It is especially essential nowadays, when every company working in the real estate branch has a key task to reduce the costs. Advanced structure of the cost engineering system in investment and construction sector can be represented by such components as control of the cost of projects financed by the state or regional budget; the companies involved in investment and construction activities; investment and construction projects.

The main problems of the cost engineering in the investment and construction branch to be highlighted are the following:

- information database development about the cost of products, works, services;

- development of a competitive system of placing orders for products, works and services during planning and implementation of investment projects;

- improvement of the theory, methodology and generalization of valuation of fixed assets;

- western economics face a lot of problems when working with the Russian system of “single” prices, that will result in moving to western systems.

The cost of construction is a part of the project and it is the wherewithal for capital construction. In other words, the project price is an estimate of all project costs.

Thus, cost management and cost control are identical concepts. The cost management system belongs to developing procedures, methods, and the policy itself that allows cost plan and control.

When managing the cost (cost control) of a project, such processes as estimating the project cost budgeting, costs assessment and control, comparing costs with the planned ones, as well as developing preventive measures, sometimes even corrective are taken into account.

Such document as the budget is very important as it allows to manage the costs of the project. This document is presented in the form of a register of planned expenses and revenues that should be apportioned between the items and for a certain period of time.

In other words, the budget is a document that shows the project resource limitations. In this case, the cost component of the project budget comes to the fore. Project estimate is a document that contains the calculation and justification of the project cost, based on the volume of work and the required resources and prices [10].

During construction works are required such resources as materials, equipment, as well as cash costs, are needed. It should be mentioned that cost management is based on the project life cycle.

It is obvious that management processes are implemented in their own way at all times.

It is known that at the project implementation the main decisions determining the project cost are taken during the pre-investment step of the project.

It is obvious that the cost management throughout the project life cycle is apportioned unevenly. In this way, the project cost includes such components as the cost research and development, the production costs and construction costs, operating costs and withdrawal costs [11].

The basis of the project costs planning process is budgeting. The main point of budgeting is to determine the values that can be used within the project. Budgeting is the basis of the formation process project that contains fixed costs by time and type of work, as well as the cost items. The investment policy is often based on strategic objectives of the enterprise and determines the main directions and ways of investing, criteria of the significance of investment projects.

An investment project is an object of investment budgeting. Being a tool for implementation investment projects within the investment programs investment budgeting is designed according to the enterprise investment policy.

As a rule, during the implementation of the project all the indicators deviations from planned by all means should be reflected in current budgets. And only after all the work is done the actual budget is created as a final document reflecting real figures.

It should be paid duly attention at the estimations that represent budget expenses. In the large investment projects the most important component of the budgeting makes budget documentation. There are various types and methods of estimating the project cost taking into account the life cycle of the project.

As a rule, all the expenses can be divided into direct, overhead and one-time expenses. In the context of budget items the cost structure of the project cost is based on a specific structure of the project chart of accounts. All this is presented in the form of expenses from the top to the bottom of the cost per unit of resources. The actual costs reflect the expenses that may occur during the project implementation or when paying the funds.

General understanding of the difference between the described "cost expressions" will allow you to manage effectively the total costs of a project. Thus, based on the structure of the project life cycle its cost includes such components as the cost of research and planning; production costs; construction costs; current expenses as well as production.

There are several methods of evaluation. The "top-down" cost estimation method is used to estimate the costs at the earliest stages of the project when there is a shortage of information about the project. Such a method is sometimes needed in order to work out an agreed basic project price or for final cost evaluation of the project.

The main point of the evaluation method "by the analogy with" is that when evaluating a project, actual information on the cost of previously completed projects is used. All the projects are similar but if there is no similarity, the results of the evaluation could be incorrect.

All the methods provide the required accuracy of the evaluation of the monetary and labor costs for the most exact valuation throughout the appropriate opportunities.

Project cost control results in the influence of factors causing the deviations from the early planned budget. This is intended to the managing the changes in the project cost in order to reduce in future its negative aspects and increase the positive effects of changes in the project cost.

The main disadvantage of the traditional method is that it takes into consideration the actual work at the expense of the money spent. The difference between actual and planned costs makes the difference in costs.

The existing earned value method allows determining the ratio of actual costs to the volume of work. This is the exact amount of work that must be completed by a certain date. In this case, information about the cost, schedule of works and the overall assessment of the current status of works are taken into account.

This approach gives you the opportunity to get the most accurate and complete information on the project in the form of reports providing them to the top management or to the customer.

It should be noted that the advantage of the method is in the capabilities to diagnosticate at early stages of the project the irregularities of the real project indicators with the planned ones. In-time and results-based forecasting of the project implementation, taking into consideration the timing and cost contributes to the prompt impact and adjustments. Sometimes it can result in suspending the project.

The calculations usually consider investment construction project, as the example of the construction object the cost management is made gradually.

As a result, at the first stage the planning of resources is taking place, the necessary project resources are determined (labor resources: number of employees and their wages; construction and finish materials; construction equipment and machinery, their rent).

At the second stage, the estimate of the construction cost is compiled, when knowing the value of the estimated cost, the cost is determined using the "by the analogy" method. An amount equal to the estimated cost will be received, that reflects the accuracy of the selected method.

At the stage of budgeting, the source of project financing is determined. The project budget is apportioned gradually, the budget amount covers the estimated construction cost.

The final stage is the control of the project cost. It consists of monitoring changes of the actual cost at the current date and the budget cost of the work.

At this stage, it is possible to carry out control only within the framework of the total estimated cost and the project budget, since no construction work has been completed yet. The adopted budget covers the estimated cost, therefore, no changes are made to the project cost.

In modern practice, engineering is regarded as a form of projects efficiency increasing. Providing the design, research, analytical, production services, including the investment justification, as well as the development of recommendations within the production management as well as the project implementation, in general, are the main points [11].

Today engineering has become such a comprehensive phenomenon that almost every sphere of human activity possesses its own engineering. Whereas in the branch of pricing it is necessary to speak about cost engineering.

Thus, cost engineering is an area of activity on the implementation of cost calculations and substantiations at all the stages of an investment and construction project, defining economic relations among its participants [12].

All the above-mentioned results in the conclusion that in general the task of the cost engineering is to optimize the cost of products and services of investment and construction activities at all the staged of the investment and construction project. Cost engineering system includes the following subsystems: cost management system; pricing system; market aspects; organizational and managerial aspects; technical optimization of the construction material costs;

information support system; system of training cost engineers [13].

III. CONCLUSION

Therefore, cost engineering is needed. The ability of an enterprise to organize the construction of an object as soon as practicable is one of the main criteria of its competitiveness. And the greatest amount of faults in the estimations during construction is connected with the imperfection of design solutions. Project management is cost management whereby all cost processes are carried out and the inputs and outputs of the processes at each step are under control. At the same time, the creation of the cost management system is reasonable as it corresponds to each step and the estimated regulatory framework.

An integrated approach to training the specialists of new framework “Cost engineer” will allow the construction cost system to reach the new professional level – the level of international standards that will facilitate the customization of production of national construction companies to the worldwide political and economic realities. The future of construction branch belongs to the cost engineers!

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