Organization of construction based on the main management functions

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Abstract. The article is devoted to the issues of ensuring, managing and improving quality in the construction industry. Management is used as a tool, as the ordering and coordination of resources used in the organization of construction.

The material considers management as a process of performing the following managerial functions: planning the quality and safety of construction, organization of production technology and quality control, motivation, quality management of buildings and structures, diagnostics and control. We used the methods of quality planning, a system of quality indicators in construction, methods of calculating losses and costs, regulation of business processes, a system of production maintenance of equipment and processes automation, effective methods of motivation.

Based on the proposed measures, the management functions’ application effectiveness in the construction organization is proved.

Introduction

Current market conditions, the possibility of using innovative building materials and new technologies for the construction production and installation works, strict standards in construction make it necessary to implement the effective methods of organization and management. First of all, the ability to rationally organize the production process, effectively manage it, manage the work team makes it possible to achieve high results.

The activity of developing goals, evaluation criteria and organizing work to achieve them is management. It is management that can bring success and production efficiency in every industrial branch, including construction.

In our work, we set the following management goals - streamlining of material, production, labor and information flows; coordination of certain types of interrelated production units’ work; minimization of non-conformities and defects for organizational reasons [1].

To achieve this goal, management is considered by us as the process of performing the following management functions:

- Product quality planning
- Organization of production technology and quality control
- Motivation
- Product Quality Management.
- Digitalization.
Product quality planning.

Product quality planning is understood as the process of development and decision-making of sound technical tasks at all stages of the project life cycle - the construction of buildings and structures for industrial and civil purposes with the required values of quality indicators [2].

The purpose of quality planning is to ensure the quality and safety of buildings and structures that meet the established standards and parameters, and to identify the areas for improving the quality characteristics.

Solving the quality planning tasks within the management framework is possible by:

- ensuring the buildings and structures’ construction with maximum compliance with the requirements of not only normative documentation for standardization, but also of consumers;
- improving the technical level, quality and safety of buildings and structures;
- ensuring strict compliance with the regulatory requirements in construction;
- developing and implementing the specific measures to achieve a certain quality level.

We propose the following activities aimed at fulfilling the controlling function of management “product quality planning”:

1. Improvement of the interaction process with the external environment:
   - product quality planning should be based on a thorough study of current and future demand;
   - analysis of product reviews, operating behavior should be performed;
   - elaboration of contracts with the customer [2] should be reached.

In order to ensure the quality improvement of their own products, it is necessary to require the suppliers to improve the quality of their raw materials, materials and components [3].

2. Minimizing losses from internal and external defects. It is advisable to plan possible losses from failure or defects. Construction industry enterprises are encouraged to implement the methods of calculating “Losses during the final production defect” and “Costs of the enterprise to correct the internal defects”.

3. Creation of a special structural unit (to train individual employees) professionally involved in quality planning.

4. Development and implementation of an independent enterprise standard: A plan to improve product quality. A product quality improvement plan should include:
   - planned indicators and tasks to improve the finished products’ quality;
   - planned indicators and tasks to improve the internal units’ quality;
   - planned measures for material and technical support for improving quality;
   - planned measures for organizational support of quality improvement;
   - planned measures for staffing to improve the product quality [4].

5. The management of construction enterprises needs to determine the requirements for the resources used and issue them in the required amount to ensure that the measures are taken to improve quality. It is advisable to use the following resources:
   - human resources and specialized staff;
   - production equipment;
   - control and testing equipment;
   - computer software.

6. To develop and implement the Quality Policy, in which the main goal of the enterprise, the stable provision of product quality that meets the requirements and expectations of both internal and external consumers should be indicated.

Production technology organization and quality control

The main element of management is an organization represented by logical business processes related to the material and technical supply, production, sales of finished products.
In the construction industry, various models of the construction organization are widely used, but the construction organization modeling through the regulation of business processes has not received the deserved implementation.

In this regard, we propose to introduce modeling of business processes when organizing construction. Since any process carried out in construction is a set of interconnected resources and activities transforming the input into the corresponding output of the process, the general model of the process (for example, construction and installation works) can be represented in the form of a diagram, shown in Figure 1.

In addition, it is important to maintain the importance of a systematic approach to the construction organization. The system in this case is defined by us as the totality of our own elements. These elements are the organizational structure, ongoing processes, adopted procedures, and necessary resources. The absence of one of the four elements suggests that the system is not complete. As a result of the above-mentioned, an effective quality and management system is an organic combination of elements [5].

![Figure 1. Scheme of business processes modeling in construction](image)

In the conditions of a construction organization, it is recommended to use the list of processes in accordance with GOST R ISO 9001-2015 and GOST R 55048-2012 when modeling the production processes. These processes include:

1. The functioning processes of the quality management system (QMS).
2. Resource provision processes.
3. Product life cycle processes
4. Measurement, analysis and improvement processes.

The first step in the business process modeling implementation is the construction organization root processes model development. In our work, we presented an example of the root model for a construction organization. An example of the model is shown in Figure 2.

![Figure 2. An example of a root model of a construction organization](image)

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processes can be carried out in any form of notation convenient for the enterprise. A prerequisite is the processes indexing, and the completeness of the functions list.

Next, the processes and functions are distributed among the owners of these processes. In other words, responsibility is shared. To do this, it is possible to use the responsibility distribution matrix and CFFC charts of the organization’s main business processes as tools. CFFC procedure of the main business processes (Cross Functional Flowchart, functional flowchart, cross-functional flowchart) is a notation for displaying the process at the lower level of the [8] business model.

As an example, CFFC diagrams of the organization’s main business processes, we present a diagram for the “Preparing an object for construction” process. An example is shown in Figure 3.

The resulting CFFC charts of the main business processes can be used by the organization as a universal model. For the specific construction objects, it is possible to coordinate them with the traditional scheduling tools: Gantt charts or network models.

Similar modeling approach covers four elements simultaneously: processes / subprocesses / functions, executors, time and resources.

**Motivation**

In matters of motivation, we have involved the basic concepts and principles of the personnel management theory. The following tasks that solve the problems of labor management are identified [9]:

1. The formation of the necessary organizational structure. It is recommended to apply not only the traditional hierarchical organizational structure, but a matrix structure with a clear distribution of responsibilities among the functions. It is this approach to the demonstration of organizational structure that makes it possible to optimize authority, functionality and clearly share responsibility.

2. Analytics of the organization personnel, a set of new labor resources, taking into account the personnel reservation.

3. The establishment of the procedure (regulation) of the personnel consolidation in working places.

4. Work implementation on vocational guidance and adaptation.

5. Determination of the stimulating factors’ composition, assessment of their impact on labor resources.

**Digitalization**

Russian industry has recently passed the transition from mechanization to automation, and now digitalization has replaced automation. For the construction industry, the priority is the introduction of BIM - technologies (English: Building Information Modeling), i.e. information modeling of buildings [6].

This is a new technology in our country, which makes it possible to create the intelligent building projects, to provide quality control over the construction and operation of structures. Using BIM, it is possible to organize the planning of not only work on a project, but also the object’s construction and operation.
Summary

Figure 2. Example CFFC chart of key business processes
Information modeling has favorable differences from other design methods in the collection and complex processing of architectural, engineering, technological and economic information using a single BIM-model. All elements of the model are interconnected and dependent, which brings processes as close as possible to the real situation.

In many ways, the low level of construction organization remains the main cause of the problems in the construction industry. It is the professional use of management tools, total quality management, the introduction of business process engineering and a systematic approach that will solve the problems associated with organizational reasons. The measures reflected in the article aimed at improving the organizational activities of enterprises and organizations in the construction industry, with a focused approach will certainly be able to positively affect the quality and safety of buildings and structures under construction.

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