Project management and digitalization - the path to success for the Russian construction

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Abstract. This article examines the various options for design structures and their application in construction organizations. The hypothesis on the management company role importance in improving the efficiency of the design structures’ use in construction in the Russian Federation has been put forward. The scheme “Project management - management company function”, which reflects the composition and place of the team, the relationship between project participants has been presented. The project’s resource support has been described with such a scheme for organizing a construction project. The authors have analyzed and described the differences between the management company and the developer or technical customer. Based on the system analysis methods, the authors determined the advantages of completing a construction project with the management company involvement, listed the advantages of digitalizing the project participants’ interaction and organizing a single information space. The synergistic effect of attracting a management company to carry out the construction project management function and the organization of this interaction in a single information space has been analyzed. The potential arising from the combined action of these factors is described. The options for organizing a single information space that makes it possible to unite the project participants and complement the positive impact of the management company’s participation in the project are indicated. The methods of organizing the information exchange between the construction project’s participants within the project team have been described.

Introduction
Digitalization is currently actively the gaining momentum in all sectors of the Russian economy. The construction industry is not aside of these processes. A number of large construction corporations in Russia are actively introducing the latest technologies and information systems [1-4]. The industrial enterprises that are considered to be a part of these corporations are trying to apply the technology and produce products within the framework of the requirements of the concept of Industry 4.0 [5, 6]. State authorities and local self-government do not remain aloof from digitalization. For example, the Moscow City Planning Policy Department is actively testing the experimental territorial information model of the construction activities at the city level.

But the construction participants’ interaction using digital technology is possible not only at the city level or by one large corporation. Digital cooperation of the construction participants can be carried out both in value-creating networks and in the large construction projects’ implementation [7, 8]. Implementing such projects, the large construction corporations are able on their own to carry out
most of the stages of manufacturing the construction products at a high technological level, establishing digital interaction between the construction participants within the corporation and increasing their activities’ digitalization [9-11].

However, there are the construction projects that cannot be built by one, even a large company, since it may not have enough labor, financial or production resources to deliver the object to the customer on time. The number of such projects in Russia in recent years has started increasing. Large, unique objects started being built in a number of the country regions, in the construction of which the dozens, and sometimes hundreds, of organizations with various specifics of activity take part. The Crimean bridge connected the Crimea and Taman can be considered as a striking example of such objects. And when the interests of a large number of companies from different areas intersect during the large objects’ construction, it is necessary to organize the construction management properly.

Materials and methods

The scientific literature has been discussing the transition from the linear-functional management structures that had been developed in the Soviet era to the organizational project management structures that were more progressive in a market economy for several years so far [12, 13]. These include: a dedicated organizational structure (a project is created based on the parent organization’s resources), project management (a temporary project is created inside the parent organization), general project management (the activities of the parent organization are the project activities), a dual organizational structure (the implementation of the project with the equivalent participation of two parent organizations) and complex organizational structures. Complex organizational structures, in turn, are divided into three types, depending on the executor of the project management function, which may be the customer, general contractor or the specialized management company.

The authors of the studies [14, 15] emphasize that the design structure of the construction organization is effective in large, significant projects, as a rule, lasting more than two years, the result of which are the special or unique objects. Moreover, the three simple and dual organizational structures of the last 2-3 years have been effectively applied in the large Russian construction companies when implementing in-house investment and the construction projects related to the construction of modern comfortable housing [16]. The attempts to use these options for the organizational structures for the large cultural, social or transport facilities’ construction have been implemented with varying success.

According to the authors, one of the modern and effective options for organizing the construction at significant, unique objects today is the approach, in which a specialized management company performs the project management function.

Results

When organizing the large facilities’ construction management in cases where the management function is transferred to the customer or the general contractor, the interests balance of the construction participants may be disrupted [17], having a negative impact on the construction project’s results. In such cases, the gravity center is shifted towards the organization-holder of the management function, infringing on the interests of other participants. To exclude such a development of events and increase the construction project’s efficiency, an option to involve an intermediary company in project management is proposed. The participation of such a company will allow to link the interests and opportunities of the construction participants. And the interests of the management company itself (MC) should lie in the field of increasing the overall project’s profitability, affecting its profit.

When involving a management company in a construction project and implementing the “project management - management company function” scheme, the management company’s reputation, its market position, previous work experience, staff and its software are important. In carrying out its work, the management company undertakes to resolve the issues related to the construction project’s management. To conduct the project, the contract is concluded for the customer. When choosing a
management company, the cost of an error is very high, because the implementation of the project largely depends on its specialists and the decisions they make.

Summarizing the above-mentioned ideas, it is possible put forward the thesis that the MC is, first of all, a team and highly qualified specialists should be selected into it taking into account the knowledge and experience in the corresponding direction.

The project team is an important link in the organizational structure of the project management, its role and the project manager’s role are very significant in the project management [18-20]. The team’s structure has been repeatedly discussed in different areas using the project approach. For the construction simplicity this article considers the model “Customer - Asset Management Company - Contractor”, which does not reflect the expanded composition of the project team (investor, authorities, stakeholders). The project specifics have an undeniable impact on the final structure of the project team [21]. The author’s view of the team structure, place of the project team and the relationships within it is reflected in the scheme “Project management - the function of the management company”, presented in Figure 1.

**Figure 1.** Scheme “Project management - management company’s function”

The resource support of the project in such a scheme, according to the authors, looks like this: the customer - finances, management companies - labor management resources for the project management team, the remaining project participants (contractors, suppliers) - human resources and material and technical resources.

**Discussion**

So, as it has been noted above, the management company is a company that brings together the highly qualified specialists in various fields with the knowledge of the specifics of the industry. What is the difference between a management company and a developer or technical customer? The management
company develops the organizational structure of the project and implements only the most important project management functions, unlike the developer, who carries out the construction activities on his own behalf, at his own expense, taking risks on himself for the purpose of the subsequent sale or lease of the construction projects. There are various understandings of the term “technical customer” and a set of the functions related to the construction participants’ activities. According to one of them [22], the technical customer in construction is the organization that provides a full range of engineering services, from the development and implementation of the project documentation up to the completed facility commissioning. Unlike the developer and the technical customer, the MC generally does not develop the technical documentation, does not carry out any construction work on the project, transferring them to contractors for implementation. The management company does not invest its funds for the construction activities’ implementation, does not share risks with the customer. The management company only implements its project management through its experience, proven management technologies, a knowledge base and also with the help of highly qualified specialists, involved in project management.

A logical question may arise: what benefit do various project participants receive, including the construction organizations participating in the project with such a scheme for its organization. In our opinion, the implementation of a construction project involving a management company has a positive impact on the process of its implementation:

- the imbalance in the interests of the construction participants in the project management process is reduced (work performers are selected taking into account the impact on the project’s outcome, and not the benefits of a particular project participant at a particular stage of the project) [23];
- there is an opportunity to attract not only the large players in the construction market, which makes it possible for the small and medium-sized businesses to work with large or special construction projects (healthy competition and a reduction in the construction market’s monopolization increases the services and materials’ attractiveness and makes it possible to reduce the project costs);
- there is an opportunity to attract the highly qualified experienced specialists to the project management, including, not excluding the personnel of the organizations participating in the project, which, in turn, allows the latter to gain / accumulate the experience in managerial decisions in organizing, planning and managing projects; - it becomes possible, when implementing a construction project, to use the MC rules, the own management technologies that reduce the uncertainty of each individual project, building a system of templates (phases, works, results) of the management as a whole;
- focus on results by reducing the conflict situations (reducing the differences in the views on the project priorities, on project management, choosing the equipment and technologies for organizing the work, staffing a team), increasing the actions’ interconnectedness and cohesion of the project participants [20, 24] (mainly due to recruiting the project team from the staff of the management company);
- it becomes possible to use a detailed “well-developed” customized information system, focused on the project management’s specialized tasks. The costs of developing / finalizing such a system for each subsequent project will be minimal, since this system will not be a single use tool, but a universal tool tested on previous projects and suitable for use in the subsequent MC projects.

According to the authors, the digitalization of the project participants’ interaction and the organization of a single project information space should become an integral part of the information system mentioned in the previous paragraph. The implementation of these elements of the information system will provide all the participants in the project with the new advantages (Table 1).

Table 1. Benefits from the interaction digitalization between the project participants and the organization of a single information space

| No. | Advantage                                      |
|-----|-----------------------------------------------|
| 1.  | Increase information exchange and reduce paper workflow. |
2. Reduce the reaction time to the events and accelerating the process of interaction between the project participants, increasing the level of decisions’ promptitude.

3. Elimination of duplication and inconsistency of information, ensuring the decision-making process with relevant and accurate analytical information.

4. Fast and flexible generation of high-quality analytical reports.

5. Providing opportunities for the organization financing the project to exercise the direct control over the design decisions’ and increase the accuracy of the project’s assessment.

6. Organization of the project team members’ closer interaction.

7. Unification of the interaction interfaces within the framework of a single information space (when the customer and the implementing organization carry out the project work, it is possible to develop and / or adapt the external interfaces of their internal information systems to the external interfaces’ requirements).

The combined effect of the factors from attracting a management company to carry out the construction project management function and organizing this interaction in a single information space significantly exceeds the effect of each of them and their simple sum. According to the authors, their combined action contributes to the leadership action potential development, qualitatively increases the flexibility and dynamism of the project participants’ interaction processes, the effectiveness of the implementation of all management functions (analysis, planning, organization, control, regulation), helps to maintain the continuity of the management process and organize the effective management resources. The resulting quality as a result of the described solutions individual advantages’ integration into a single system will allow balancing the values of quality parameters, terms and cost in the final result of the construction project, allowing to achieve the customer’s satisfaction.

The organization of a single information space, allowing to unite the project participants and supplement the positive impact of the management company’s participation in the project, can be implemented according to one of two options. The first is the creation of a data center as one of the structural MC units. The second is the use of cloud technology. In the first case, the holder of the information resource is MC, in the second - an external organization that may not participate in the project at all. Both that and another way have their “advantages” and “disadvantages”. In the first case, this is full control of all information flows, but significant financial investments. In the second case, these are low costs (renting a “cloud”), but the presence of risk at some point will lose the access to information, even for a short period.

Regardless of the chosen management method for the information storage, information exchange between the participants of the construction project, that is, inside the project team, can also be implemented in two ways. This is either the information transfer between different software products through the development of inter-programming interfaces (if an organization owning software other than the one in which the project is involved in the project), or the provision of client access to the software product of the management company (which is convenient for the representatives of small and medium-sized business, as it allows them to avoid the cost of expensive software products).

Summary
Analysis of the materials presented in the article allows to conclude that the choice of approach in which a specialized management company performs the project management function is a critical factor for the successful implementation of significant, unique construction projects. When applying the described approach, various project participants, including construction organizations participating in the project, receive an inherent effect, which makes it possible not only to effectively implement the construction project, but to improve the quality of its implementation. The significance of this study is that the implementation of the described approach will allow attracting the organizations related to small and medium-sized business, which are now in a deplorable state due to the introduction of
escrow accounts in housing in the Russian Federation and the epidemiological situation in the world. Digitalization of the project participants’ interaction and the organization of a single information space not only contributes to a multiple increase in the described effect due to the achievement of maximum synergy in the described factors, but will also assist in organizing the remote work on the construction project management. The current situation emphasizes that the importance of this factor is becoming increasingly apparent to the market.

An open question remains the implementation of this approach in practice. One of the first steps in this direction is the development of an asynchronous interaction environment, which can be a single information portal used in large projects. To reduce the development and support costs, such a portal should be organized using the template technology that describes the most common sections of the portal, the filling of which will occur during the implementation of a specific project. This assumption may be considered in future studies.

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