Systematization of the major stages of the client in certain branches of construction production

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Abstract. The article contains substantiation of the need for investment and construction projects in various sectors of the construction production. On the basis of domestic and foreign experience it describes the concept of the client (customer) and his functions and tasks in the implementation of such projects. It also systematizes the main stages of the customer's activities, which are presented as a preparation for the construction, development of construction sites, monitoring the progress of the construction, commis-sioning and commissioning of facilities. There is also a determination of time intervals at each stage, the final formula for calculating the duration of the investment project due to the given the shared stages. The article also gives optimization variants in some sectors of construction production.

1 Introduction

Since the beginning of the 21 century the development of the construction industry in Russia allowed to implement major investment and construction projects in various spheres of social and housing construction.

Compared with Europe and North America, housing in the Russian Federation after the 2008-2009 crisis recovered faster. Resulting in 2014 year a record in terms of the volume of housing construction has been achieved (1.08 million completed construction of new residential buildings, that is 20.3% more than in the year 2013) [1].

In recent years, the dynamics of the Russian economy is influenced by two factors. On the one hand, under the influence of increasing sanction pressure drastically worsened the conditions of Russia's economic cooperation with key partners in trade and investment and technological cooperation. On the other hand, a steady decline in world commodity prices, first of all energy prices, led to a significant reduction in export earnings and revenue [1].

The negative impact of economic sanctions affected the ability to attract external resources for the financing of the Russian economy and international investment-construction projects. Along with this drop in investment attractiveness of the country which took place against the backdrop of sustained improvement in its position in the international ranking of Doing Business [1, 2, 3].

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At present, measures to improve the investment climate in the country should be comprehensive, taking into account both the economic and the administrative and foreign policy determinants of investor's decisions [3, 4, 5].

In these circumstances, the tip goes to import substitution, but there is a high level of capacity utilization and labor, as well as the hard deficit of investment resources in conditions of financial sanctions and the restriction of access to Western technology and the suspension of international cooperation projects.

In such circumstances, there is a need for the development of agricultural complex and all branches of construction production, modernization of existing and construction of new industrial complexes. Such projects could attract investors, but they need to understand timelines and outputs of their objects of construction onto the starting power.

2 Procedure

To determine the terms of implementation of investment projects by branches of the construction production, it is necessary to highlight the basic steps for creating an object of construction, identify changes in modern conditions and determine factors affecting the total duration.

Handling arrays of expert assessments developed by specialists within the survey study "Adaptation of client activity in market conditions", made it possible to highlight the main stages of the realization of investment projects and determine their relevance in the present (fig. 1.) [3, 6, 7].

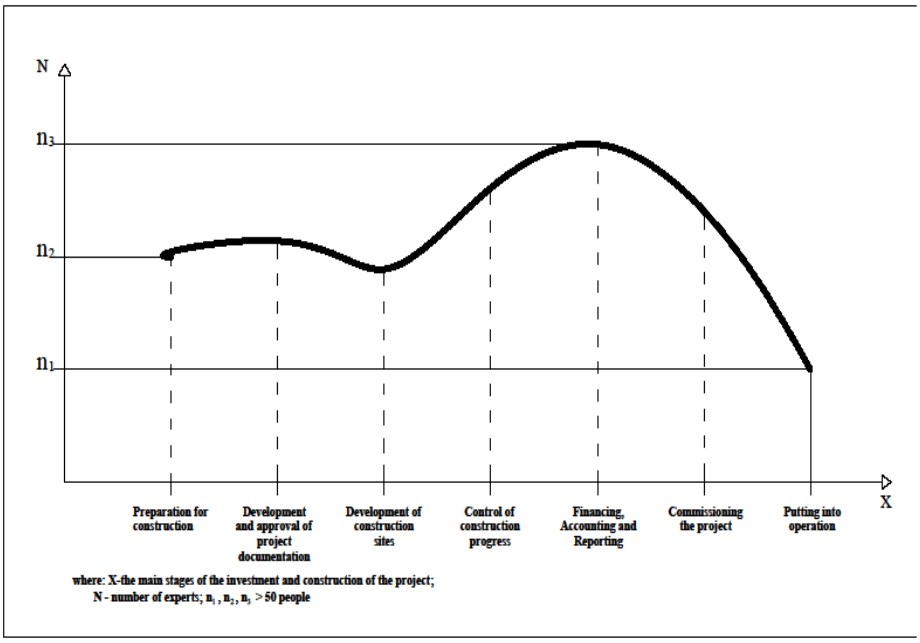

Fig. 1. Enhanced features on the major stages of creation of an object of construction.

It should be noted that an important consideration in the construction is the role of the client (customer) and who performs his functions [2]. In England, Sweden and Finland the representative of such a service is mainly an architect. He picks up the necessary expertise that define the provisional construction cost, perform work under the sub-contract, collect other data required for construction. In the United States, the client creates a group, which

includes economists, estimators, contract managers, engineers and manufacturers of constructional works. Then they develop all the necessary documentation and diagrams of construction production. In Germany the general contractor receives the work order, he chooses the specialized organizations and bears full responsibility for the timing of construction and the quality of the finished product. In Japan, when construction companies organize research laboratories and institutions with scientists as the main staff. Thus instead of the concept of "client" there is used the notion of "developer", whose responsibilities include the acquisition of venues, financing, construction and sale of the finished product [8, 9, 10].

In Russia the functions and tasks of the clients when implementing construction projects define the forms of investment (state, municipal, private, etc.).

Therefore, depending on the scope of investment and scale of the project, there are several forms of organizations that implement client functions [11, 12, 13].

Compare changes in the function of the client on the main stages of construction, in terms of state and commercial orders (fig. 2).

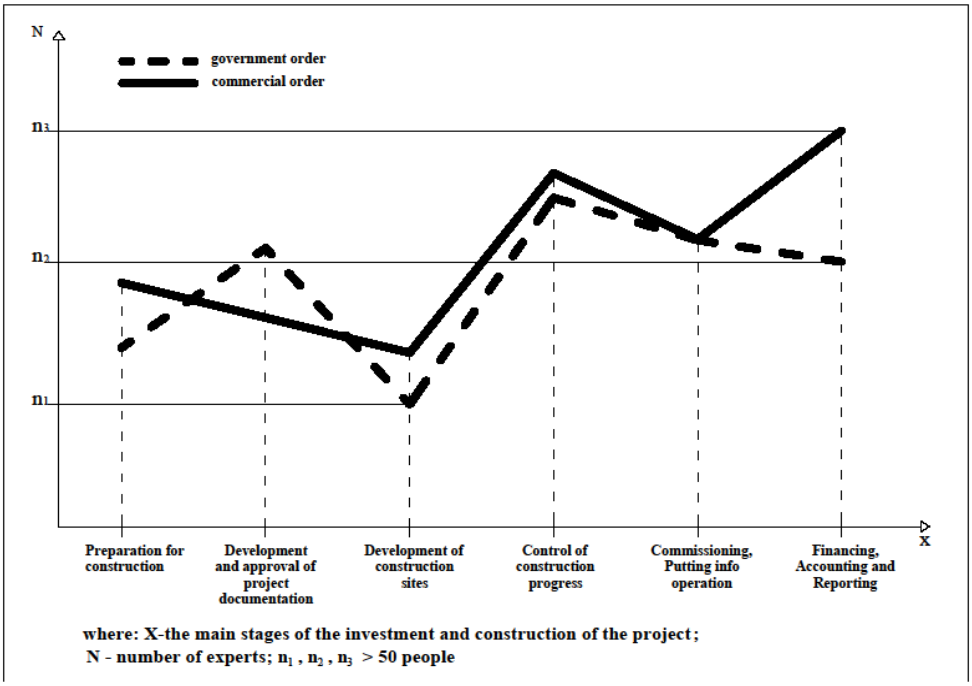

Fig.2. Comparison of the functions of the client on the main stages of construction, depending on the forms of investment.

Let's define the coherence of expert opinions [3].

The coefficient of the concordance can be found according to the formula:

$$W = \frac{12 * \sum_{i=1}^{m} D_i^2}{m^2 \cdot (n^3 - n)}, \quad (1)$$

$$\text{Where: } D_i = \sum_{j=1}^{m} r_{ij} - \frac{m(n+1)}{2} \quad (2)$$

Got: W=0.848214

to find the value: $m(n-1)W^3 = 17.26722$

Tabulated value: $\chi^2_{1-\alpha,n-1} = 12.6$ when the significance level is: ά=0.95

Because $m(n-1)W^3 = 17.26722 > \chi^2_{1-\alpha,n-1} = 12.6$, so the W factor is significant at the level of:ά=0.95

Therefore, the opinions of experts are coherent.

3 Main part

Let's organize the main stages of client's activities, influencing the duration of erection of the objects of construction:

-preparation of construction (including formation and approval of project documents);

-development of construction sites;

-monitoring of construction process;

- commissioning and putting into operation.

Time intervals of considered steps are summarized in table 1.

Table 1. Intervals of mastering the basic steps of creating an object of construction.

Name of the stages	Time intervals corresponding to the development phase	Average value of expert performance
Preparation for construction	$0.15T \le t_p \le 0042T$	0,37T
Exploration of construction sites	$0.05T \le t_o \le 0.35T$	0.25T
Monitoring of construction	$0.75T_c \le t_n \le 0.95T_c$	$0.85T_c$
Commissioning and putting into operation	$0.02T \le t_c \le 0.15T$	0.08T

Thus, the resulting formula for calculating the total duration of the erection of an object of construction can be expressed as follows [14]:

$$T = t'_p + t'_o + t_n + t_c, \quad (3)$$

where T is the duration of the investment construction project of the erection of an object of construction;

t'_p - part of the duration of the preparatory phase of the construction, not shared with the stage of development of building sites;

t'_o - part of the duration of the development phase of construction sites, not shared with the stage of preparations for the construction;

t_n - duration of construction monitoring;

t_c – duration of the phase of putting into operation and commissioning.

While the average duration of each stage, bearing in mind the linkage is as follows:

$$t_p = 0.26T;\ t_o = 0.39T;\ t_n = 0.62T;\ t_c = 0.08T.$$

The options for optimizing client's activities were designed for a number of objects of the following sectors: electric power engineering, gas refining and petrochemical industry, gas industry, ferrous metallurgy, heavy and transport machine building, chemical and petroleum engineering, the automotive industry, building materials industry.

The options for optimization of the client's activity on the main stages of the realization of investment construction projects of some sectors of construction production are presented in table 2.

Table 2. Options for optimization of the client's activity in certain branches of construction production.

Name of object	Characteristic	Time of realization of investment construction projects according to the stages of construction, month				
		t_p	t_o	t_n	t_c	T
Electric power engineering						
Expansion of nuclear power plant RBMK-1000	Closed type, single circuit, on nuclear fuel, with revolving water with pond-cooler or cooling tower	30	19	78	6	123÷125
Gas refining						
Installation of complex gas preparation	At gas condensate deposits. Power, bln. m3/year: 5	11	4	28	4	55÷57
Chemical and petroleum engineering						
Plant for the production of oilfield equipment	Production capacity of 50-70 million. rub. per year. The total area of all industrial buildings 70-100 thousand m2. The main building with an area of 45 thousand m2, height of 20 m, equipped with overhead cranes with lifting capacity of 50 t	17	12	38	5	73÷75
Automotive industry						
Plant for the production of trucks with capacity up to 4 tons	Production capacity of 100 thousand cars per year. The total area of all industrial buildings is 620 thousand m2, height of 12.8 m, equipped with overhead cranes with lifting capacity of 20 tons Without the production of engines and transmissions	21	16	75	8	109÷112
Building materials industry						
Cement plant	Production power of 3450 thousand t per year comprising: three technological lines with ovens of 6.4/7m in diameter, 95 m in length and auxiliary buildings, constructions and communications	22	14	50	8	94÷96

4 Conclusion

It is important to note that in the construction of industrial buildings, special attention is paid to environmental monitoring and industrial safety management of construction waste. However, the implementation of industrial environmental control and ecological monitoring requires leveraging additional financial resources. Industrial construction is one of the most complex areas of construction activity in the whole [14, 15].

Studies show that at present, there has been an increase in all the major stages of construction investment projects. At the same time, in the context of work with commercial orders, special attention is paid to ensuring the quality of construction products and the equitable distribution of financial flows. That is, in particular, because in most cases, large holdings investing is provided from their own funds for further use of constructed objects to

fit their needs. In addition, the payment is usually made in fact of fulfilled works and financing of such services is usually continuous.

Ordering of the main stages of the client's activity helps to determine the duration of the implementation of investment projects in some sectors of construction, that provides investors with the opportunity to plan the output of enterprises in the start-up power, the payback period of capital investments

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