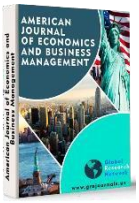

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Article

Practical Aspects of the Effectiveness of Construction Schedule Management

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Abstract: Currently, advanced construction management methods offer the prospect of direct control over project construction schedules. The use of these opportunities is linked to the improvement of scheduling systems in construction organizations. Empirical studies show that the deadlines specified in tender documentation differ significantly from the construction deadlines determined by current construction schedules and project management methods. The reason for this can be explained, first of all, by the failure to comply with the recognized approach to calculating construction deadlines. This article uses the example of the construction company Comfort House Invest LLC to demonstrate the possibilities of managing project construction deadlines.

Keywords: Construction Period, Schedule, Project Management, Reduction Of Deadlines.

1. Introduction

In the Strategy for Action to Ensure the Sustainable Development of Uzbekistan's Economy and Improve the Welfare of Its Population, the importance of the construction industry is growing. In his Address to the Supreme Assembly and the people of Uzbekistan, our country's President Sh. Mirziyoyev set the task of constructing 140,000 apartments in multi-story buildings by 2026. Overall, the task of increasing construction volume by 11 percent in 2026, bringing it to $30 billion, demonstrates the serious attention paid to the sector [1].

Increasing the volume of construction work in enterprises and organizations requires not only boosting production capacity but also effectively addressing the challenges of organizing construction. One of these issues concerns regulating construction schedules at sites, since shortening the construction period expands opportunities to carry out additional work in the future. In turn, influencing the construction schedule of facilities also accelerates the overall investment and construction process and spurs the rapid development of the construction industry. In this regard, popularizing modern approaches and methods in construction production is a requirement of our time. A noteworthy aspect of this issue is that the construction period at a site is a complex indicator that demands scientific and methodological justification.

Literature review. A number of foreign and domestic scholars have devoted scientific research to the concept of project management in construction projects and to issues of construction duration, which is one of the main criteria for achieving economic

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efficiency in project management, notably Kim Heldman, Richard Newton, Clifford Gray, Erik Larson, Leena Fisher, Gerd Diethelm, A.S. Tovb, G.L. Sipes, H. Kerzner, Liu Yugen, E. Goldtant, D.A. Novikov, A.O. Lisisyn, Ye.Yu. Marinevich, I.I.Mazur, V.D.Shapiro, N.T.Muxamedov, Z.M.Isaqova, I.A.Usmanov, X.T.Buriyev, Sh.M.Mirzoyev [1],[2],[3],[4],[5],[6],[7],[8],[9],[10],[11],[12],[13],[14],[15],[16].

Overall, in investment and construction complex enterprises, the development of modern approaches and methods for project management should be regarded not only as a strategic objective but also as a driver of regional development [17][18].

2. Methodology

A pilot study of construction schedule management effectiveness: Methodology of this study is founded on thorough empirical and analytical research on construction schedule management effectiveness, in the case of Comfort House Invest LLC, and the aim of this study is to explain some of the principles of one of the most important processes in project management, which is managing once project scheduling. This study employs a mixed methodological approach comprising elements of normative analysis, quantitative calculations, factor analysis, targeted observation, and expert survey. At first, the method for calculation of a construction timeframe for a contract was analyzed based on both a national regulatory documentation and international project management standards. The empirical data were obtained from three 16-story residential complexes in Samarkand, which were built between 2021 and 2023. The primary documents included work logs, material supply, acceptance certificates, cost estimates and contractual documentation. Assistant Professor This was performed by comparing the construction duration specified as per the tender with the one completed at the site, then identifying the deviations and their economic effects. Structured economic models were then applied to decompose total losses into excess operational expenses, prolonged labor and financial liabilities, and opportunity costs associated with unrealized volumes of construction. A second calendar was created based on the consensus of experts from company managers, construction professionals, and academic researchers. The cost coefficients and recalculated intensity of labor were used in estimating the possible economic effects of schedule optimization. Working days, Efficiency in terms of resource utilization, and expected Profitability to the company were the basis to evaluate the proposed revised schedule. This comprehensive methodological framework allows both direct and indirect economic impacts of shortened construction time to be evaluated and thus facilitates an evidence-based case for better management of construction schedules.

3. Results and Discussion

One of the key directions for increasing the competitiveness of the construction sector in the Republic of Uzbekistan is the effective use of all resources in construction production and the elimination of their losses. According to high-caliber experts in the construction industry, one of the factors hindering cost savings is the issue of construction time. This problem is related to the fact that a single methodological approach for determining construction periods has not been developed. For example, it is observed that the construction period specified in the tender contract is being interpreted differently because it is not based on clear standards. The construction contractor also sets the construction period in its internal documents based on its own management concept.

As a result, the timely completion of an object's construction, as well as its extension or shortening, is tied to different criteria for different types of projects. Research on facilities completed in Samarkand Province between 2021 and 2023 revealed that failure to adhere to construction deadlines (extension and reduction) is considered a common practice in construction (Table 1).

Table 1. Classification of the studied construction sites by work completion time.

№	Designation	Number of objects	2022	2023	2024
1	Total number of objects studied	**102**	**48**	**28**	**28**
2	Number of objects completed on time	48	34	8	6
3	Number of objects completed ahead of schedule	34	8	14	12
4	Number of objects with unchanged deadlines	20	6	6	8

In our view, to resolve this issue, a detailed study of the construction of the specific object, a reanalysis based on national and international building codes and standards, and, on that basis, reaching a single consensus on the construction schedule is possible.

It should be noted that the reforms being implemented in the sector are leading to many positive changes in the investment and construction chain, In particular, in the city of Samarkand, the construction of multi-story residential buildings is being carried out not on a social order basis, but rather based on market demand and supply for real estate. As a result, new economic relations are emerging in the construction sector. In our case, "COMFORT HOUSE INVEST" LLC has combined the roles of project initiator, construction client, and general contractor in a partnership-based investment project for the construction of the facilities. Under these conditions, LLC "COMFORT HOUSE INVEST" is guaranteed financial, economic, and production independence.

As the research object, we selected three 16-story residential complexes built by the construction company of "COMFORT HOUSE INVEST" LLC in the Qorasuv district of the "Obod maskan" neighborhood in Samarkand city, Samarkand province. The initial data for the calculations to be performed are as follows:

The total estimated cost of the construction is 95.0 billion soms; the total labor costs according to the estimate are 80,344.1 man-days; The contractually specified term was set at 2 years, the construction start time was November 2021, and its actual completion was in December 2023. Thus, the total duration of the actual construction was 25.0 months, meaning the project was completed one month late. The design organization is Univer Pro Stayl, and the general contractor and client organization is Komfort xaus invest LLC. Several subcontractors or auxiliary construction organizations also participated in the construction process, namely: LLC "Shafran Umarbek Servis" (internal and external electrical installation work), "Billur-dizayn" LLC (window frames), and the companies 'Vamprofil' and "Sam Greenwood" LLC (doors).

Based on the available documents for this complex of objects (work log, construction material supply documents, acceptance certificates for works and structures, etc.), we have concluded that, The calendar planning process and its enforcement at this organization were not adequately organized. Although the tender commission had set the construction period at 24 months, in practice the complex was completed in 25 months. This, of course, led to financial losses, namely:

$$Y_{um} = Y_1 + Y_2 + Y_3$$

Here, Y1 is the losses due to an increase in other expenses at the object;

Y2 – additional accrual of wages, social contributions, bank interest, taxes, and other expenses over the extended period;

Y3 – losses from the volume of construction work that could have been completed.

According to our calculations, a one-month delay in the complex's handover will amount to 4.294 billion soums (176,121-171,827) for LLC “COMFORT HOUSE INVEST”.

To analyze the organization of construction work at this site, we analyzed the construction standards, Based on Komfort Haus Invest LLC's material and financial resources and the engagement of expert specialists, we carried out the task of revising the calendar plan for this facility. The proposed specialists included the management and lead experts of “COMFORT HOUSE INVEST” LLC, scientists conducting research in the construction field, and the region's leading specialists.

During the process of creating the calendar plan and assessing its feasibility, the mistakes and shortcomings made during the 2021-2023 construction period were objectively studied. The calculations revealed that this complex can be completed in 457 working days, i.e., 22 months. The total estimated economic benefit compared to the construction period specified in the tender documents is determined using the following formula:

$$\mathbf{IS_{um} = IS_1 + IS_2 + IS_3}$$

- Economic benefit calculated for the investor by shortening the construction period:

$$\mathbf{IS_1 = C(1+i)^t - C(1+i)^{t'}} \qquad \mathbf{(1)}$$

Here S is the contract price of the object;

i - is the rate of return on investment;

t - is the planned construction period;

t′ - is the actual construction period.

IS1 = 171,827 – 163,552 = 8,275 billion soums

In other words, the investor receives their funds two months in advance, allowing them to reinvest them-that is, to generate income from the building. As for the residential building, handing over the apartments to their owners two months early theoretically allows for rent payments to be received two months in advance.

- The economic benefit for the construction company from reducing the notional fixed portion of other costs for building the project.

$$\mathbf{IS_2 = 0,6kC\left(\frac{t-t'}{t}\right)} \qquad \mathbf{(1)}$$

Here, 0.6 - is the share of the conventional constant part of other expenses;

k - is the coefficient for other expenses in the object's estimated cost.

As is known, as a component of the estimated cost, miscellaneous expenses are divided into conventional fixed and variable components, and the conventionally determined expenses are estimated as 60 percent of the miscellaneous expenses. The notional fixed portion of other costs is distributed evenly over the construction period, so a reduction in the construction schedule leads to savings in proportion to the cost reduction. If the average level of miscellaneous expenses is taken as 17% of the value of construction and installation work, in our example, their contingent constant part will be equal to 7.75 billion soums. (76.0*0.17*0.6=7.75). The excess of other costs can then be determined as follows:

IS2 = 7.75*(24-22)/24 = 0.646 bln. soums.

In addition to the direct economic benefit, reducing construction time also yields indirect benefits, such as the construction company performing additional work and consequently earning extra profit.

- Economic effect in the form of additional profit for the construction organization from performing additional work volumes. Accelerating the construction period leads to additional volumes of construction and installation work, i.e., to obtaining additional profit. The actual intensity of the work is assumed to remain the same. Then,

$$\mathbf{IS_3 = Q_g k_2 = I_h (t - t^i) k_2} \qquad \mathbf{(3)}$$

Here, Qg is the additional work volume;

I_h - is the actual intensity of work;

k_2 - is the normative profit coefficient in the project's cost estimates.

The release of construction capacities creates opportunities for the organization to perform work on other projects. Therefore, while maintaining the current intensity of work, the additional volume of construction and installation work will be as follows:

V_{qmi} = (76.0/22) * 2 = 6.909 billion soum.

The additional profit for the 6% of the work volume completed will be as follows:

IS_3 = 6,909 * 0.06 = 0.414 billion soums

Thus, the total economic effect of shortening the construction period will be as follows:

$$\mathbf{IS_{um} = IS_1 + IS_2 + IS_3 = 8{,}275 + 0{,}646 + 0{,}414 = 9{,}335 \text{ billion soums}}$$

Or the economic efficiency is equal to 9.36 percent of the estimated cost.

Conclusion. The practical research conducted indicates that project management methods are highly effective in planning and organizing construction production. We offer several recommendations for actively managing construction schedules at sites. In particular, we propose justifying the contractual construction deadlines for sites through calendar scheduling and advanced technological methods, involving the engagement of highly qualified experts in calendar planning, enhancing the professional qualifications of construction managers and specialists, and strengthening the economic rationale of project construction schedules.

Forming a dedicated team to manage various projects within the investment and construction complex and subjecting all calendar plans to expert review can also positively impact the execution discipline in construction.

4. Conclusion

This study substantiates its findings through the example of Comfort House Invest LLC, and reveals that the presence of weak calendar planning combined with the lack of a consistent methodological framework of the methods for estimating the durations of construction processes leads to substantial economic losses of construction projects. The contractual deadline for the construction of the contract was 24 months but the actual duration of construction was 25 months resulting in quantifiable economic loss found by the empirical analysis; but an updated scientifically constructed calendar schedule showed that no more than 22 months could be reasonably spent on the construction of the same complex. Using the Economic Benefit Analysis, and using a theoretical project cost, the re-

verification schedule shows total potential economic benefits of about 9.36% of project cost, as the earlier capital turnover, elimination of fixed costs, and increased profits from additional construction capacity. The results underscore that advanced project management approaches, economic justification of timelines of construction, backed by proven methods of program-based optimization, can materially improve returns to both investors and profitability to contractors. These studies suggest that standardized calendar planning procedures, enhancement of professional skills in schedule management, and inclusion of economic evaluation instruments in project planning processes are necessary to increase competitiveness of the construction sector. Future research should broaden the empirical evidence by examining additional construction companies in other regions, incorporate optimally project management technologies like BIM and integrated schedule software, and create a unified methodological schema for economically optimal construction durations in different market and regulatory environments.

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