



Cost overruns as significant factors affecting the sustainable management of building projects in Iran(The Causes of Cost Overruns)

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ABSTRACT: The building industry is a large part of Iran's economy. A considerable amount of national resources, including energy and materials, are consumed in this sector. Therefore, the efficiency of this industry has an essential role in the sustainable development of the country. Cost overruns of construction projects or deviating from the budget is one of the most influential factors in reducing the efficiency of this industry and the occurrence of numerous problems in it. Therefore, identification of the causes of costs overruns is a significant factor in managing the cost of building projects. In this paper, a review of similar research was conducted and a long list of reasons for cost overruns was prepared. Then, the list was modified, completed and categorized based on the ecology of Iran's building industry. The list has been distributed as a questionnaire among 230 experts, and the severity and frequency of each factor were asked. Based on the obtained data, statistical analyzes such as ANOVA were performed. According to the results, inflation, project delay, bureaucracy, weak resource planning, and low efficiency and rework due to incorrect or non-integrated design in various fields are among the most critical factors causing cost overruns.

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1- Introduction

Global population growth is leading to increased demand for materials and energy. Due to the limited resources of materials and energy in the world, the concern of sustainable development as the optimal use of resources has been raised [1]. The construction industry in the world has always been one of the largest consumers of materials and energy and has a unique role in global economic growth [2]. Therefore, any factor that affects the building construction efficiency, can be considered as a sustainable development factor [3, 4]. According to the United Nations, until 2050 worldwide, the need to build buildings in urban areas is about 1.5 times higher than what humans have built from the beginning [5, 6].

One of the key performance indexes about the success of the project is the cost performance index. Increasing the cost of the project or deviating from the planned budget leads to effect on the sustainable development of the region [7, 8, 2]. This paper, by focusing on building construction, tried to identify the factors which increase costs and also ranked them in terms of frequency, severity and importance. Based on the results of this study, it will be possible to take effective effort to remove barriers and achieve sustainable development in the building and housing sector by reducing costs and improving productivity [3, 4].

In 2020, Tshidavhu et al. studied the reasons of cost and schedule overruns in South Africa's energy megaprojects. The results revealed that slow client decision-making, shortages of skilled labor, inaccurate material estimating, unforeseen ground conditions, poor material planning, changes in the scope of work on-site, contractual claims, variation orders and poor site management were the major causes of schedule and cost overruns [9]. In the same year, Sohu et al. studied the factors of cost overruns in Pakistani construction projects and found the five main factors as follows: financial crisis faced by the client; mistakes in making proper estimation; faults in drawing; delay in getting approval from the client and poor planning by the client [10]. In 2020, Chinda studied factors affecting construction costs in Thailand through a structural equation modeling approach. Lack of coordination, design management, and unclear client requirements are the three main factors in the pre-construction period and site management, resources, labor capability and contract-related are the four main factors in the construction period [11]. In the study by Khan et al. In 2019, major factors that are highly responsible for affecting construction cost and time in Indian government projects were searched. Inflation, fluctuation in the price of raw materials, increase in material prices, and transportation cost has been introduced as the main factors of cost increase [12]. Al-Hazim et al.'s research in 2017, showed

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that Terrain and Weather conditions are the top factors causing completion delay and cost overrun in infrastructure projects in Jordan.

In this study, by focusing on building projects in Iran, which are completely different in ecology from even other construction projects in Iran and the world, the main factors causing cost overruns will be identified.

2- Methodology

The goal of this study was to uncover the concept behind the reality of the phenomenon of construction cost overruns. Data gathering in an objective manner is essential for such studies. Generally, methodologies can be distinguished by two criteria: the purpose of the study and the data-gathering practice. This study was practical in purpose and used an analytical-descriptive data gathering approach. The data was gathered with the use of a carefully designed and structured questionnaire, the reliability and validity of which were confirmed by Cronbach's alpha ($\alpha = 0.938$) and expert opinion, respectively.

This study was cross-sectional, meaning that each respondent filled out the questionnaire only once. This questionnaire was implemented in Google Form Platform and distributed among the relevant experts by contacting them in person or remotely through email and LinkedIn. The data was compiled in Microsoft Excel and preprocessed and prepared for statistical analysis using SPSS statistical tool kits.

The questionnaire was composed of an introductory note, demographic questions, and research-specific questions. The respondents were asked to evaluate each factor affecting delays using a severity index (SI) and frequency index (FI) on a discrete four-step scale (rarely = 1; sometimes = 2; often = 3; always = 4, or low = 1; moderate = 2; high = 3; extreme = 4). These measures were used to evaluate the significance of each factor separately and convolutionally through the importance index (IMPI).

The normality of data was confirmed using the Kolmogorov-Smirnov test. One-way ANOVA was used for normal variables and the Kruskal-Wallis test was used for non-normal variables. The results of each factor were compared in terms of frequency, severity, and importance. These results were then compared between the client, contractor, and consultant groups.

3- Results and Discussion

According to this study, inflation is the most important factor cause to cost overruns. After inflation, delay in the project due to mismanagement, bureaucracy, weak resource planning and low productivity, rework due to incorrect and non-integrated design, are the next most important factors in increasing costs. By looking at the factors raised, it is clear that the first and third factors have a governmental origin and outside the project environment. But the other three factors, which play an important role in increasing construction costs and also originate from different origins, can be directly managed and controlled by the project team.

According to the respondents, the reasons with

governmental or regulation origins are the most important area in cost overruns. From the various stakeholder's point of view, among the five important factors in cost overruns, the top three factors are the same. Inflation, delay and bureaucracy are these three factors.

Based on the comparison of the results of this study with other similar studies worldwide, poor planning is always one of the main factors in cost overruns and the most frequent. Project delay and mismanagement are the second most common factors in various studies. Inflation, low-skilled labor, design problems, and unforeseen events, are next. In this comparison, if only research done in the field of the building is considered, inflation in the second place is repeated and is consistent with the present studies.

This study shows that the problem of bureaucracy in Iran compared to other countries is clearly serious and problematic.

4- Conclusions

In this research, 230 questionnaires have been completed by contractors, consultants and employers. Based on the evaluation and ANOVA analysis, the reasons with governmental or regulation origins, such as inflation, are of paramount importance. Then there are the reasons with the origin of the client, consultant and contractor and finally, field items. In order to reduce the effects of factors of governmental origin, appropriate policies are needed. However, about other factors, strong planning and project management are needed. In general, the results of this research are in good agreement with other researches done worldwide.

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