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Causative Factors of Cost Overrun in Building Projects of Pakistan

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Abstract: Cost overrun occurs when the final cost of the project exceeds the approved cost at the time of tender. Cost overrun or budget overrun is one of the many problems facing by construction industry stakeholders in the construction of building projects in Sindh Province of Pakistan. To attain the main objective of the research, deep literature review was carried out whereby the total of 64 causative factors of cost overrun were identified in construction industry. A questionnaire was developed and distributed among 28 well experienced experts having more than 20 years of experience in handling building projects. Collected data was analyzed by average index method. The results revealed that significant causative factors of cost overrun in building construction projects include financial difficulties faced by client, slow information between parties, change in price of material, delay of design, poor site management, cash and payment problem faced by contractor, and delay in decision making. The findings from this research can help practitioners of building projects to find measures to mitigate or overcome these causative factors of cost overrun way before they can lead to damaging impact on project's cost performance.

Keywords: Cost Overrun, Causative Factors, Building Projects, Sindh Province, Pakistan

1. Introduction

Among all other industrial sectors, construction industry is known to play an important and vital role in the growth of economy of any country in the world. It also contributes in improvement of Gross Domestic Product (GDP) as well as in employment of labour forces [1, 2]. Construction industry has improved life standard by delivering infrastructures like hospitals, buildings, schools and other facilities. Hence, it is quite difficult to complete project within approved cost, time and standard quality. Of these, cost performance issue related to cost overrun in building and infrastructure projects is found to be the major issue as it affects economy of any country such as Pakistan [3, 4]. According to Endut et al. [5], out of 308 public sector's construction projects and from the total of 51 private sector's investigated construction, it was found that more than 50% of them have faced cost overruns problems. Cost overrun creates the issue of litigation, cash flow issues, mistrust and arbitration in construction projects [6]. Moreover, Devi and Ananthanarayanan [7] also stressed that most construction projects are seriously affected from cost overrun whereby 9 out of 10 projects that they investigated have faced cost overrun.

The current literature review presents the importance of cost overrun issue and its impact on the cost performance of construction projects. Many studies have been carried out to find out factors instigating cost overrun in construction projects but there is still a lack of study to identify factors that would to cost overrun in building projects of Pakistan. Hence, the primary aim of this study is to identify the causative factors of cost overrun in building projects of Sindh Province.

2. Literature Review

A study has been carried out by Zafar et al. [8] to find out major factors of cost overrun by quantitative approach covering stakeholders of construction projects of Pakistan. Their findings revealed that major factors of cost overrun are shortage of experienced contractors, project site location, security problems, low productivity, and mistakes in estimation of cost for project. Another study was conducted by Abusafiya and Suliman [9] regarding causative factors cost overrun in Bahrain construction projects. A questionnaire was designed and dispersed among experts and engineers to find out overrun causative cost factors. Results of study unveiled that causative cost overrun factors include frequently design changes, mistakes during construction, schedule delay, inadequate supervision and site management, mistakes in time and cost estimates, delay in making and approval of different design and drawings, and poor design. According to Jadhav et al. [10], critical factors of cost overrun consist of sudden changes made by client in specification of materials, design changes during

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construction, delay progress in payment by client, variation in cost of materials, and rework at site due to mistakes. Similarly, in another study carried out by Le-Hoai et al. [11] has determined that the significant factors causing cost overrun in Vietnam construction projects comprise poor site management at site, poor supervision, financial issues faced by client, many changes in design, and financial problems faced by contractor. While Ameh et al. [12] identified top seven critical cost overrun factors in telecommunication projects which include inexperienced contractor, material cost, variation in cost of materials, high interest rate from banks, mode of financing, fraudulent practice, and design changes. In Pakistan, a study has been conducted by Ejaz et al. [13] to determine major influencing factors of cost overrun in construction projects of Pakistan through quantitative approach. Their findings revealed that the influencing factors of cost overrun comprise changes of material price, inadequate control procedure at site, shortage of technical staff, delays in approval of work, and shortage of materials at site.

The extensive literature review has helped to identify 64 common causative factors of cost overrun worldwide. These 64 common factors of cost overrun were further investigated to determine the significant causative factors of cost overrun in building projects of Sindh Province.

3. Methods

A questionnaire was designed based on the identified 64 common causative factors of cost overrun and questionnaire survey was carried out in person. Twenty-eight highly experienced respondents were randomly selected among construction practitioners namely client, consultant, and contractor. The selected respondents were requested to select the appropriate level of significance for each of the factors contributing to cost overrun. A 5-point Likert Scale having five points ranging from 1 to 5 was used to measure the degree of significance of each factor, where 1=NS (Not significant), 2=SS (Slightly significant), 3=MS (Moderately significant), 4=VS (Very significant), and 5=ES (Extremely significant). The gathered data was then analyzed using Average Index (AI) formula as expressed in Equation (1):

$$AI = \{\Sigma(1x_1+2x_2+x_3+4x_4+5x_5)\}/\{\Sigma(x_1+x_2+x_3+x_4+x_5)\} \quad (1)$$

where;

x_1 is no. of respondents for 'Not significant'
x_2 is no. of respondents for 'Slightly significant'
x_3 is no. of respondents for 'Moderately significant'
x_4 is no. of respondents for 'Very significant'
x_5 is no. of respondents for 'Extremely significant'

The significance level for each factor was evaluated based on the ranges suggested by Ghani [14] as follows:

4.50 < AI < 5.00 for 'Extremely significant'
3.50 < AI < 4.50 for 'Very significant'
2.50 < AI < 3.50 for 'Moderately significant'
1.50 < AI < 2.50 for 'Slightly significant'
1.00 < AI < 1.50 for 'Not significant'.

Reliability test was also calculated employing statistical analysis software SPSS Version 22. According to Xin and Rong [15], the Cronbach's alpha value of greater than 0.7 is considered acceptable, while the Cronbach's alpha value of less than 0.3 is considered unacceptable. After finished analyzing the gathered data, it was found that the value of Cronbach's alpha is 0.841, which is acceptable.

4. Results and Discussion

The selected respondents for questionnaire survey should have been handling building projects in Sindh Province for many years. Figure 1 highlights the working experience of the selected respondents, and it can be clearly seen that all of them have had working experience of more than 20 years in the construction of building projects. Whereas, Table 1 presents the significant causative factors of cost overrun in building construction projects in Sindh Province.

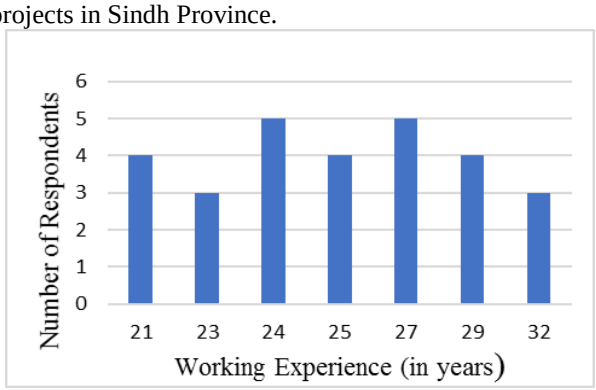

Fig. 1 Years of respondents' working experience

Table 1 Significant causative factors of cost overrun

Factor	Scale / No. of Respond					AI value	Rank
	1 NS	2 SS	3 MS	4 VS	5 ES		
Financial issue faced by client	0	1	5	10	12	4.18	1
Slow information between parties	1	3	3	6	15	4.11	2
Change in material price	0	3	3	11	11	4.07	3
Delay in design	0	2	6	10	10	4.00	4
Poor site management	1	2	5	9	11	3.96	5
Payment problem faced by contractor	2	1	5	9	11	3.93	6
Delay in decision making	1	1	8	8	10	3.89	7
Natural disaster	0	2	9	8	9	3.86	8

From the gathered data analysis, the factors with Average Index (AI) values of more than 3.6 were considered as significant causative factors of cost overrun [16], as presented and ranked top down accordingly in Table 1. The results show that only 8 out of 64 common causative factors of cost overrun are considered as significant causative factors of cost overrun in building construction projects of Sindh Province. Among them include financial difficulties faced by client, slow information between parties, change in price of material, delay of design, poor site management, payment problem faced by contractor, delay in decision making and natural disaster, which were based on their obtained Average Index values of 4.18, 4.11, 4.07, 4.00, 3.96, 3.93, 3.89 and 3.86 respectively.

4.1 Financial Issues Faced by Client

Financial issues faced by client was found as the most significant causative cost overrun factor with AI value of 4.18. Normally, client could face financial issues due to shortage of funds from government. Construction activities on site would remain suspended unnecessarily if client delays the payment process to contractor for a long period of time, which may subsequently lead to project's cost overrun [17].

4.2 Slow Information between Parties

A smooth and clear communication between parties involved in any construction project is necessary in ensuring the successful completion of the project. Unfortunately, it has been observed that slow information between parties is a common problem occurring at construction project's site. This issue would result in the delay of construction work activities, and if not handle properly would eventually lead to cost overrun [10].

4.3 Change in Price of Material

Change in price of materials is one of the common causative cost overrun factor in construction of building projects. Prices of different materials and items are fixed at the time of tender of each project, and due to the demand and supply, the market prices of materials varies from the start to the completion of project. This changes in price of construction materials can generally lead to project's cost overrun [18].

4.4 Delay in Design

Appointment of unexperienced staff in a consultant firm who is unable to finalize the design of a project on time may not only delay the designs' submission to relevant authorities but defer the agreed starting date of construction. Apparently, the delay in design may result in many construction activities being suspended, and finally causing cost overrun [19].

4.5 Poor Site Management

Poor site management normally arises when daily construction activities on site are not properly managed by staff, site engineers, and site manager. This problem generally implies the incompetency of contractor's low level staff as well as the management staff in terms of playing their roles on site [11].

4.6 Payment Problem Faced by Contractor

Payment problem faced by contractor is also one of causative cost overrun factor in construction of building projects. It is true that contractor contributes important role in the construction of project from the starting date right to the completion date of the project. Construction activities remain suspended for a long period of time due to financial difficulties faced by contractor and the construction workers do not want to proceed with their work as they are not able to be paid. This issue would commonly lead to project's cost overrun [20].

4.7 Delay in Decision Making

The three stakeholders namely client, consultant, and contractors are known as decision makers in any construction project. If any problem arises and proper decisions are not made quickly or within a reasonable timeframe, it may slow down the construction project activities which ultimately creates the project's cost overrun problem [21]. Delay in decision making with regards to approval of materials, approval of drawings and approval of specification of different items may result in the problem of cost overrun in construction of building projects.

4.8 Natural Disaster

Natural disasters (i.e. heavy flood, heavy rains, earthquake, tsunami, etc.) are unpredictable problems that may cause cost overrun due to the delay in the construction of building projects. Floods and rains affect the performance of projects to be completed within the approved cost of project. Thus, natural disaster is undoubtedly one of major factors which contributes to cost overrun [22].

4.9 Results of Current vs. Previous Studies

The significant causative cost overrun factors found through the questionnaire survey among the selected respondents involved in building projects of Sindh are compared with those identified factors from previous studies. Table 2 shows the top eight significant causative factors ranked top down comparing the findings from the current study with those of the previous studies.

The findings obtained from current study as compared with those of previous studies can be considered as moderately similar. It can be seen from Table 2 that delay in design and design changes are the most similar causative factors of cost overrun. Furthermore, natural disaster found in the current study is

also another causative factor which is somewhat similar to weather effect found in previous studies. It is a fact that natural disaster or weather effect (i.e. heavy rains, floods, and earthquake) affects the construction activities at site [23]. Likewise, change or fluctuation in price of material is also another causative factor of cost overrun found in both the current study and previous studies. However, the other causative factors of cost overrun such as poor planning, shortage of material at site, shortage of labour, and late delivery of equipment were found in previous studies.

Table 2 Comparison of results

Current Study		**Previous Studies**	**Rank**
Financial issues faced by client		Weather effect	1
Slow information between parties		Poor planning	2
Change in material price		Shortage of material at site	3
Delay in design	**versus**	Shortage of labour	4
Poor site management		Delay in decision making	5
Payment problem faced by contractor		Late delivery of equipment	6
Delay in decision making		Fluctuation in material price	7
Natural disaster		Design changes	8

5. Conclusion

Successful project can be defined as the project that is completed within its approved cost at the time of tender. However, problem of construction project cost overrun is still being faced by construction industry worldwide. Extensive literature review was carried out which helped to identify the 64 common factors of cost overrun in construction industry. A questionnaire survey was designed based on the identified common factors causing cost overrun from literature, and questionnaire survey form was distributed to 28 well experienced respondents among the three construction stakeholders (namely client, consultant and contractors) who have directly involved in building projects in order to determine the significant causative cost overrun factors in building projects of Sindh Province. The collected data was analyzed using Average Index value to determine their significance level as well as their top down ranking. The current study has revealed that financial issues faced by client, slow information between parties, change in material price, poor site management, payment problem faced by contractor, delay in decision making and natural disaster are the eight significant causative cost overrun factors in building projects of Sindh Province.

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