


Cost Overrun Factors In Construction Industry of Pakistan

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Cost Overrun Factors In Construction Industry of Pakistan

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Abstract

Cost is among the major considerations throughout the project management life cycle and can be regarded as one of the most important parameters of a project and the driving force of project success. Despite its proven importance it is not uncommon to see a construction project failing to achieve its objectives within the specified cost. Cost overrun is a very frequent phenomenon and is almost associated with nearly all projects in the construction industry. This trend is more severe in developing countries where these overruns sometimes exceed 100% of the anticipated cost of the project.

In Pakistan, construction sector is an important sector although not working to its fullest potential but still of prime significance to the country. Growth in this sector is critical for growth in national income as it is among the largest sectors that generates employment within the country as well as a key driver for economic development of Pakistan. Like many other developing countries, Pakistan is also facing critical project management related issues among which cost overrun is quite prominent. There are several factors that are responsible for these cost overruns.

This paper attempts to identify the major cost overrun factors in the construction sector of Pakistan, which can serve as the way forward for future work in coping with these overruns. A thorough literature review was done and also expert opinions from developing countries were taken, through which a number of cost overrun causes were identified in global construction industry scenario. In total forty two (42) factors were short-listed to be made part of the survey questionnaire and the survey was conducted with representatives from local general contracting firms.

Results indicated that the majority of cost overrun factors (88%) lie in medium severity impact zone (with a rating between 5 to 7.5 out of 10), signifying that major attention needs to be given to these factors as they collectively cause considerable cost overrun. It is evident from the findings that both internal and external aspects of business setting are present as the prime contributors to cost overruns. The top ten cost overrun factors found were: fluctuation in prices of raw materials, unstable cost of manufactured materials, high cost of machineries, lowest bidding procurement procedures, poor project (site)

management/ poor cost control, delays between design and procurement phases, incorrect/ inappropriate methods of cost estimation, additional work, improper planning, and unsupportive government policies. An additional finding is that medium sized construction firms experience a greater percentage of cost overruns owing to their tendency to assume greater risk for the purpose of business development. Major recommendations include: stabilizing cost of materials, increasing supply of materials and machinery, more involved cost estimation processes, vigilant project planning, close observance and documentation of cost variation trends in the sector and the country, adoption of alternative procurement strategies such as design-build contracts, and best value procurement.

Keywords

Cost Overrun, Macro Economic Factors, Management Factors, Business and Regulatory Environment Factors, Pakistan.

1. Introduction

Cost has its proven importance as the prime factor for project success. Most of the significant factors affecting project costs are qualitative such as client priority on construction time, contractor's planning capability, procurement methods and market conditions including the level of construction activity (Elchaig et al, 2005). A project otherwise completed may not be regarded as a successful endeavor until and unless it satisfies the cost limitations applied to it.

In spite of its proven importance it is not uncommon to see a construction project failing to achieve its goal within the specified cost. Cost overrun is a very frequent phenomenon and is almost associated with all projects of construction industry. Cost overrun can be simply defined as when the final cost of the project exceeds the original estimates (Avots, 1983). According to one very comprehensive research made on cost overruns in global construction (Flyvbjerg, 2002), it was found that 9 out of 10 projects had overrun; overruns of 50 to 100 percent were common; overrun was found in each of the 20 nations and five continents covered by the study; and overrun had been constant for the 70 years for which data were available. It is believed that construction projects experience an increase in cost of about 33% on average (Hartley and Okamoto 1997).

Angelo and Reina (2002) state that the problem of cost overruns is critical and needs to be studied more to alleviate this issue in the future. They also point out that cost overruns are a major problem in both developing and developed countries (Angelo & Reina, 2002). The trend is more severe in developing countries where these overruns sometimes exceeds 100% of the anticipated cost of the project. Low quality materials cause higher construction cost than expected because of the loss of materials during construction. This results from a lack of standards for materials and management systems (Thunphanich, 1997). Lack of ability to prevent cost overruns or to control construction costs causes many Thai construction companies to fail (Sriprasert, 2000).

In Pakistan, construction sector is an important sector. Although not working to its fullest potential, it still is of prime interest to the country. Growth in this sector is critical for growth in national income as it is among the largest sectors that generates employment within the country as well as a key indicator of the economy of Pakistan. As many other developing country, Pakistan is facing also cost related issues among which cost overrun is quite prominent.

There are several factors that are responsible for these cost overruns. This paper attempts to identify the major factors of cost overrun in construction sector of Pakistan and can serve as the way forward for future work in coping with these overruns.

2. Research Scope and Objectives

The study has been conducted to identify the issues involved in cost overruns in construction projects in Pakistan. In this regard certain factors have been identified through the study and their importance and impacts have been discussed. The factors have been identified through a survey from construction firms. Furthermore, some recommendations and mitigation measures have been suggested to strategically cope up with these factors.

3. Research Methodology

The methodology of the study is follows:

1. A thorough literature review was done and also the expert opinions from industry experts were taken, through which a number of cost overrun causes were identified in the local construction industry scenario. In total forty two (42) factors were finalized to made part of the survey questionnaire.
2. Questionnaire consisting of two parts A and B was developed. In Part A personal Information of the respondent (for e.g. work experience, organization, annual volume of construction work) was asked. Part B was aimed to obtain information about causes of cost overrun in Pakistan construction industry, it was asked to rate those initially identified forty two (42) factors according to their severity level on the given scale, information regarding maximum, average and minimum cost overrun ranges experienced over large projects and average overruns over small projects were asked.
3. A survey was conducted through postal mail and personal interviews in which respondents were asked to rank and score these factors according to their experience. Thirty one (31) construction firms were approached for these surveys out of which twenty five (25) responses were received with the response rate of 80.64%.
4. Assessment of feedback from questionnaire survey was made. One response was cast off on the basis of insufficient information and analysis was made out of twenty four (24) responses to identify the major cost overrun contributing factors. Analysis is discussed in detail in the following section, on the basis of which recommendations to construction industry of Pakistan were made.

4. Analysis

The analysis of the survey conducted is made in two sections. In the first part, analysis of cost overrun factors is made on the basis of which major factors have been identified and their causes and impacts discussed. In the second section, the current trend of cost overrun for the local industry has been analyzed and discussed.

4.1. Respondent Organizations

The construction firms surveyed were involved with all types of construction work, with majority of respondents (67%) involved in heavy Engineering/ infrastructure construction, commercial building construction (54%) and industrial construction (50%).

Majority of respondents (71%) fall in medium range construction firms with their annual volume of works ranging from 100 M to 1000M rupees.

4.2. Cost Overrun Factor Analysis

Before providing the list of factors, respondents were asked to enumerate the five major cost overrun factors according to their perspective. It was found that the consequently identified factors were already in the list and were not providing any additional input to the comprehensive list.

In conjunction to this a list of 42 factors was given to the respondents to rank and score them according to the severity on the scale of 1 to 10 and were instructed to rate score 1 to the factors which they find least contributing towards the cost overrun and a score of 10 to those factors they regard as most significant towards generating project cost overruns and rating of in between to mark the severity of factor ranging from low, medium to high. Impact of each factor was then calculated by simple calculation

$$\text{Impact} = \frac{\sum(f_i * i)}{n}$$

where: i is the severity score from 1 to 10

f_i is the frequency of factor getting score i

n = number of responses

Figure 1 gives the resultant impact ranking of the cost overrun factors as depicted by the survey analysis, impact ranges were divided into three regions, range of 0 to 2.5 (on severity impact axis) is neglected from the analysis due its insignificance and ranges are developed for severity impact as low, medium and high. Low severity range (with impact score of 2.5 to 5), medium severity range (impact score of 5 to 7.5) and high severity range (ranges from 7.5 to 10). Results represents that very few (3) factors were rated as low severe, majority of the scores lies in the high medium severity range and two (2) factors were highlighted as having high severity impact on the cost overruns.

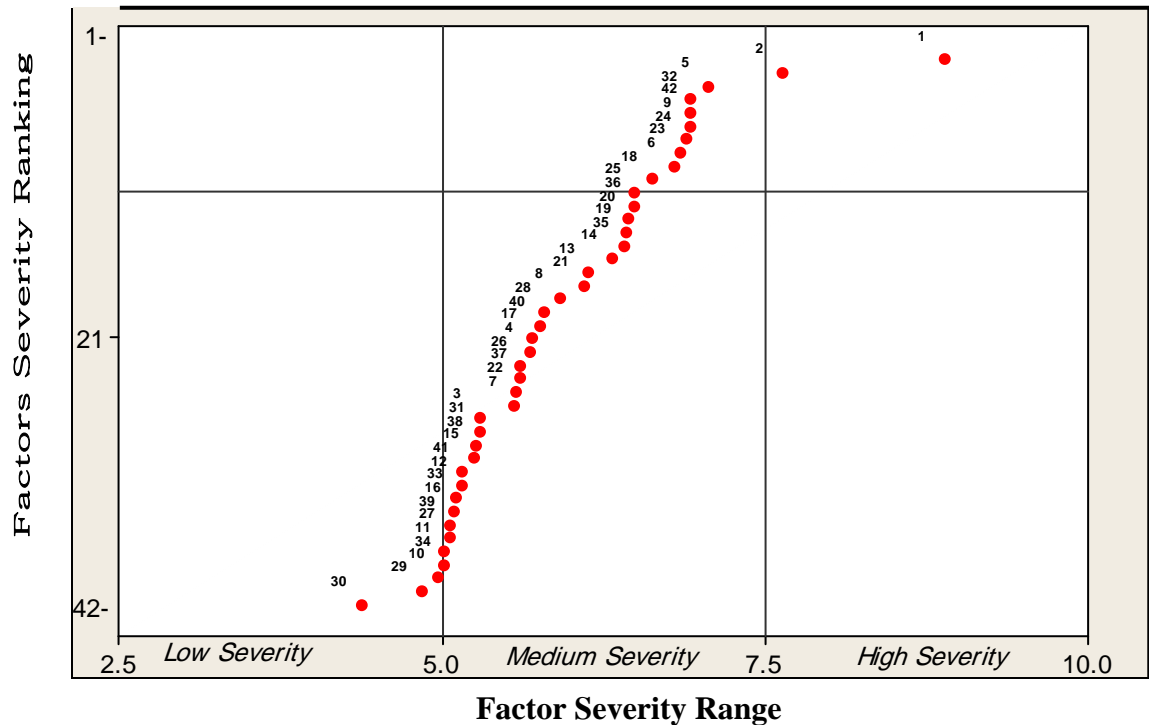
From the initial analysis top ten factors of cost overrun, on the basis of severity impact scoring received, were selected for the further in depth analysis. Table 1 presents the resultant top ten factors. It is evident that both internal and external aspects of business setting are present as the prime contributors to cost overruns. Chan and Park (2005) state that cost is affected by a large numbers of factors because of the fact that construction is a multidisciplinary industry and its work involve many parties such as the owner and various professionals, contractors and suppliers. For the purpose of analysis the identified top ten cost Overrun factors have been arranged into three (3) broad categories viz.;

1. Macro Economic Factors
2. Management Factors
3. Business and Regulatory Environment

This is useful towards assessing the treatment measures that can be applied to improve the scenario.

4.2.1 Macro Economic Factors

The cost of construction is basically the cost of money, the cost of material, the cost of labor and the cost of management. Top three factors identified by the survey results i.e. Fluctuation in prices of raw materials, Unstable cost of manufactured materials, High cost of machineries are markets related problems. Unlike a manufactured commodity, construction industry is mainly market driven. Prices can, and sometimes do, changes on an almost daily basis. These rapid changes in many cases cause problems for vendors to commit to one fix price.



(• Factor ID)

Factor IDs and Description

- | | |
|--|---|
| 1. Fluctuation in prices of raw materials | 21. Absence of construction cost data |
| 2. Unstable cost of manufactured materials | 22. Inappropriate contractual procedure |
| 3. Fraudulent practices, kickbacks, corruption | 23. Additional work |
| 4. Mode of financing and payment for completed work | 24. Wrong method of cost estimation |
| 5. High cost of machineries | 25. Inaccurate cost estimation |
| 6. Improper planning | 26. Poor relationship between management and labor |
| 7. High interest rates charged by bankers on loans received by contractors | 27. Stealing and waste on site |
| 8. Frequent design changes | 28. Inadequate labor/ skill availability |
| 9. Long period between design and time of bidding/ tendering | 29. Disputes on site |
| 10. Lack of coordination between design team and general contractor | 30. Adverse effect of weather |
| 11. Lack of coordination between general contractor and subcontractors | 31. Bureaucracy in bidding/ tendering method |
| 12. High machineries maintenance costs | 32. Lowest bidding procurement method |
| 13. High cost of skilled labor | 33. Litigation |
| 14. High transportation costs | 34. Numerous construction activities going on at the same time |
| 15. Domination of construction industry by foreign firms and aids | 35. Scope changes occasioned by inadequate pre-contract study |
| 16. Contract management | 36. Scope changes arising from redesign and extensive variation occasioned by change in brief |
| 17. Inadequate duration of contract period | 37. Inadequate site investigation |
| 18. Inappropriate government policies | 38. Inadequate preconstruction study |
| 19. Inadequate production of raw materials in the country | 39. Work suspensions owing to conflicts |
| 20. Poor financial control on site | 40. Inadequate quality/ Ambiguity of contract documents |
| | 41. Inappropriate contractor policies |
| | 42. Poor project (site) management/ Poor cost contro |

Figure 1: Severity Ranking of Cost Overrun Factors

Table 1: Top Ten Cost Overrun Factors

Rank	Factor ID	Factor Description	Impact	Category
1	1	Fluctuation in prices of raw materials	8.9	Macro Economic Factors
2	2	Unstable cost of manufactured materials	7.6	Macro Economic Factors
3	5	High cost of machineries	7.0	Macro Economic Factors
4	32	Lowest bidding procurement method	6.9	Business and Regulatory Environment
5	42	Poor project (site) management/ Poor cost control	6.9	Management Factors
6	9	Long period between design and time of bidding/ tendering	6.9	Business and Regulatory Environment
7	24	Wrong method of cost estimation	6.9	Business and Regulatory Environment
8	23	Additional work	6.8	Management Factors
9	6	Improper planning	6.8	Management Factors
10	18	Inappropriate government policies	6.6	Business and Regulatory Environment

Some of the factors which contribute to dramatic price fluctuations include:

- World commodity prices for basic materials
- the current state of the local economy
- the quality of materials and workmanship required
- simple supply and demand

The basic reason of cost overruns is that most contractors quote prices based on their projected estimates unfortunately, the prices change so quickly that the initial budget figures becomes completely unrealistic. Costs related to the construction industry have been volatile in recent years. Some of the volatility may be related to higher energy prices. Prices for iron and steel, cement, and concrete, commodities used heavily in the construction projects rose sharply within in last few years, and shortages have been reported. Need is there to calculate that how such price fluctuations may affect the cost or pace of new development in the construction industry with more certainty.

4.2.2 Management Factors

Some cost overruns are unavoidable because they cannot be reasonably prevented, such as those due to unanticipated events, however overruns due to design plan or project management problems are avoidable because they could have reasonably been foreseen and prevented. The project control procedure can help management identify its current position related to a future position (Wilson, 1983).

Sriprasert (2000) points out that cost overrun problems are caused by ineffective construction management and poorly established cost control systems Factors that are dependent upon individual organizations discrete can be regarded as in-house factors, as indicated in the survey reasons such as Poor

project (site) management/ Poor cost control, Additional work and improper planning are the mere negligence by the constructors and project managers and can be controlled considerably with little attention Management needs to modify the project schedule and estimates because of changes or discrepancies that may occur during the construction period (Civil and Environmental Engineering, 2004).

Gould (2002) states that the schedule is the primary control tool. Efficient management is essential to managing a productive and cost efficient site. Scope changes are due largely to inadequate planning and feasibility studies. If importance is paid at the right time scope changes and additional works can be considerably reduced. Another cause is poor scheduling i.e. not having the right materials, the right tools, the right information, the right training, and the right people all at the right place at the right time. Such improper planning is the major cause of time delays as well as cost overruns. . In order to control the project effectively, the project manager must monitor the schedule to avoid construction delays and additional costs because the building cannot be occupied as planned (Civil and Environmental Engineering, 2004). All of these responsibilities are those of management, and within the ruling factors of cost overruns these in-house factors, being internal factors, are in greater control of the individual organizations as compared to Macro Economic Factors and Business and Regulatory environment

4.2.3 Business and Regulatory Environment

Majority of constructors are small players who have weak financial positions, out-dated labour-intensive technology and poor organizational structures and vision for growth and development. They are highly vulnerable to government policies and changes in government policies

Leading factor of cost overrun related to Business and Regulatory environment, which encourages corner cutting and unsound construction methods is the prevailing practice of the government to implement its lowest bid price method, which has various inbuilt problems and cannot produce the best value. The lowest bid price is often less than 50% of the estimated total cost. The major shortcoming of the low-bid method, frequently used for competitive bidding, is the likelihood of awarding a construction contract to a contractor that submits, either unintentionally or on purpose, an unrealistically low bid price. Often, such an occurrence works to the owner's and contractor's harm by creating disputes, cost overruns, and schedule delays

Methods used for cost estimation during the project cost scheduling are not adequate enough to cover all aspects of cost of projects in result various cost items necessary for the project remain unidentified at the estimation stage and appears as cost overruns later. Extensive experience and decision are needed to develop a reasonable approximate estimate for the project cost, since the estimator has to modify the unit costs for quantities of materials, labor, location, and construction contingencies (Roachanakanan, 2005).Cost estimation techniques utilized locally don't carry out the in depth analysis, assumptions and forecasting on cost rates are done on experience without incorporating price index.

Most popular method of cost estimation is based on the bill of quantities which cumulates the anticipated cost estimate quite lesser than the scheduled cost in result imparts cost overruns to the project. One major problem that forces contractors to stick to this method is that if estimated otherwise they might end up having cost estimates more than others in competition and they may not remain competent to win contracts especially when lowest bidding method is adopted for bidding.

4.3. Existing Cost Overrun Scenario

To judge the existing cost overrun scenario in the local industry respondents were asked in the questionnaire about the minimum, average and maximum ranges of cost overrun, as percentage of the initial estimated cost, experienced by the organizations on large scale projects. Firms with relatively smaller Annual volume of work are observed to attain higher overruns as compared to large firms. This

trend supports the hypothesis that small firms having low management skills have weak cost and budget control mechanism in their projects. Figure 2 between annual volume and percentage cost overrun is reflecting the current trend of cost overruns for the respondents depending upon the size of organization.

Top most trend line in Figure 2 is representing the fashion of maximum cost overruns experienced by the contractors in their project trend. Even the large firms experience nearly about 40 % overruns which is the least among the volume ranges, this percentage increases up to overruns nearly about 60 % for the medium size firms (on the basis of annual volume of work). In comparison to the trend line for average and minimum percentage cost overruns ranges for maximum cost overruns are quite high.

Mid trend line is indicating the drift of average cost overrun against the annual volume of work ranges; pattern adopted by the trend line is such that for the medium size firms (on the basis of annual volume of work) the cost overrun range increases as compared to small size firms and then there is a declination in cost overruns as it moves towards large firms. The reason for which might be that in attempt to get more business these firms falls for projects and situations more prone to cost overruns.

Last trend line in Figure 2 is symbolizing the trend for minimum cost overrun within the local set up, it is evident that even the minimum range of cost overrun experienced is near around the 10 % of the total cost of the project. Again it is to be noted that medium size firms experiences somewhat greater percentage of cost overruns due to their tendency to take greater risk.

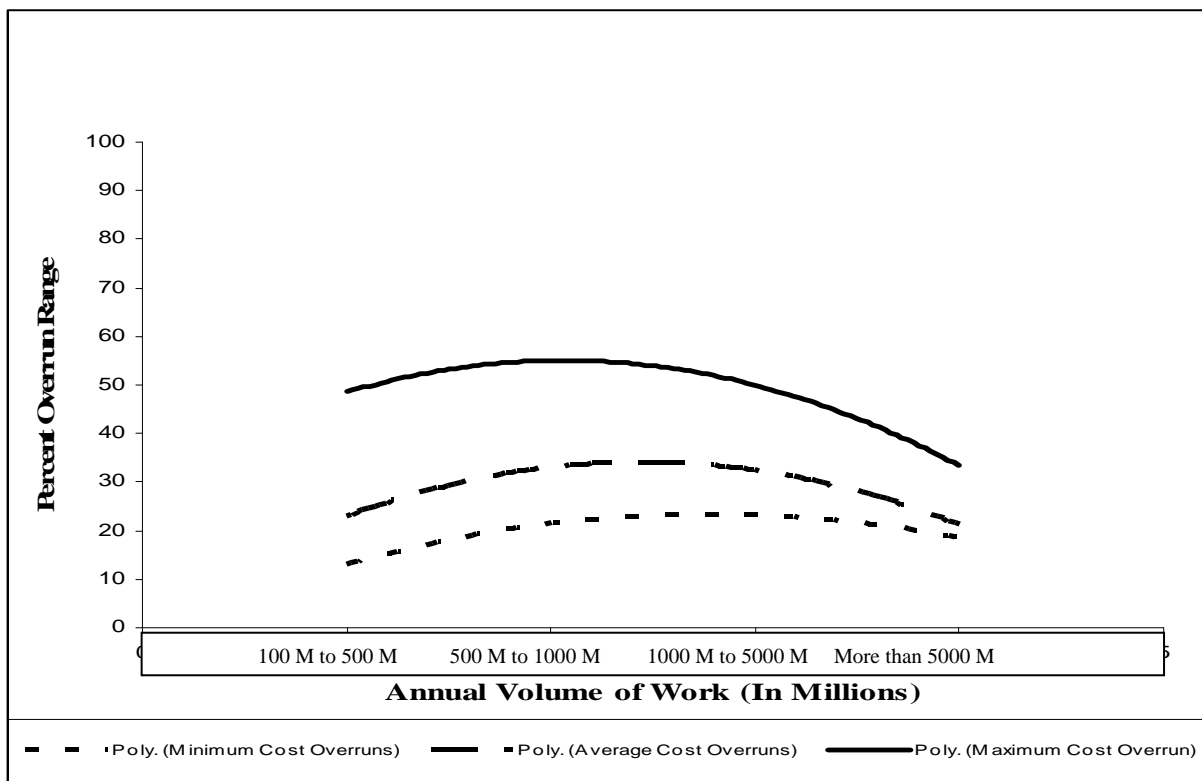


Figure 2: Current Cost Overrun Trends

5. Conclusions

The following major conclusions have been derived:

1. The survey results indicated that the majority of cost overrun factors (88%) lie in medium severity impact range. Attention should be paid to these factors as they cause considerable increase in the cost of the project initially estimated.
2. Findings reveal that both internal and external aspects of business setting contribute to cost overruns.
3. Macro economical factors affect the cost of the construction project most severely.
4. Among all factors leading to cost overruns, management related factors are those which can be controlled and prevented most easily as they are the in-house factors.
5. Business and regulatory environment is dysfunctional and need drastic changes, more scientifically proven methods, tools and techniques may be adopted instead of the orthodox practices
6. Almost every project in the local industry faces cost overruns when executed. Minimum range of cost overrun in percentage of the estimated cost is at least 10 %.
7. Medium sized firms are more prone to cost overruns in comparison with small and large firms, main reason for which being that they are in the transitional phase where they need to take more risk to get more business and establish them.

6. Recommendations

On the basis of the analysis few recommendations can be made to the local industry for improving its current situation. These recommendations are grouped for improvements under the same three classifications identified earlier in the paper.

6.1. Macro Economic Factors

Fluctuation in prices of raw materials and cost of manufactured materials are severe when these elements are in short supply, to stabilize the cost of materials, increase of supply of materials can be useful to break the monopoly of few suppliers controlling the supply chain of the market.

6.2. Management Factors

Thorough estimation process for project costs calculations, with vigilant planning, keeping in view trends of inflation and depreciation factors, cost variations trends in sector and country with lead to smoother implementation and achievement of desired cost control.

6.3. Business and Regulatory Environment Factors

The government should think of adopting, not just the conventional contracts but also the design-build contracts, direct negotiation contracts and other types of contracts. Alternative procurement strategies such as best value procurement should also be adopted in the projects undertaken by government, semi-government bodies and agencies.

One type of competitive bid can be the average-bid method, in which the winner is the contractor whose bid satisfies a certain relationship with the average of all bid prices. The basic advantage of the average-bid method, from an owner's perspective, is that it safeguards against signing a construction contract for an unrealistically low bid price that almost certainly will lead to adversarial relationships during construction (Grogan 1992). On the other hand also safeguard contractors to fall for their mistaken low amount bids.

7. Future Research

Current research has highlighted many factors that are responsible for creating cost overruns but their frequency of occurrence is not known to us. An exercise can be conducted to find out the impact of these factors in relation to their occurrence pattern and their severity impact.

Remedial measures can also be researched to cope up with these factors and to bring them down to some acceptable limits if they cannot be eradicated completely.

Current study has focused on contractors. Other stakeholders especially construction managers can also be surveyed for their perspective as to these cost overrun factors and their patterns. Their input can be useful to have a holistic picture of cost overrun on construction projects in Pakistan.

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