

Time Overrun in Pre-Construction Planning Phase of Construction Projects

Hafiz Usama Imad, Muhammad Akram Akhund, Tauha Hussain Ali, Ali Raza Khoso, Fida Hussain Siddiqui

Abstract—Construction industry plays a significant role in fulfilling the major requirements of the human being. It is one of the major constituents of every developed country. Although the construction industry of both the developing and developed countries encompasses a major part of the economy, and millions of rupees are utilized every year on various kinds of construction projects. But, this industry is facing numerous hurdles in terms of its budget and timely completion. Construction projects generally consist of several phases like planning, designing, execution, and finishing. This research study aims to determine the significant factors of time overrun in pre-construction planning (PCP) phase of construction projects in Pakistan. Questionnaires were distributed by various means and responses of respondents were compiled and collected data were then analyzed through a statistical technique using SPSS version 24. Major causes of time overrun in pre-construction planning phase; which is an extremely important phase of construction projects, were revealed. The research conclusion will provide a pathway for stakeholders to pay attention to the mentioned causes to overcome the major issue of time overrun.

Keywords—Construction industry, Pakistan, pre-construction planning phase, time overrun.

I. INTRODUCTION

CONSTRUCTION is a large dynamic sector that plays a significant role in developing the economic profile of a country. Its behavior sometimes is uneven and very sensitive to the economic cycles due to many reasons such as the political environment and has a significantly high rate of business failure [1]. The problem of time overrun in construction projects is a global issue. Time overrun issues are normal in construction projects and can be categorized as simple or complex. When a project is not completed within the estimated time and budgeted cost as mentioned in the project contract, it is regarded as time overrun and cost overrun, respectively [2]. Various studies indicate that construction projects throughout the world face time overrun in the completion of projects [3].

Literature review depicts that there are several phases in the life cycle of a construction project. It is stated that there are four project phases in construction projects, i.e. conception phase, planning phase, execution phase and transfer phase [4]. In the planning phase, the expected cost and time of the project are estimated. The time and cost overruns generally

occur in the planning phase [5]. These overrun problems continue to show up from the planning phase to final design stages [6]. The role of time overrun in PCP has been found and discussed by numerous researchers. Formerly, a study related to PCP was conducted by [7], in the Singaporean construction industry. The findings of this research claim that 10 out of 12 construction projects handled by 15% of Singaporean construction firms were completed on time or less than the originally planned project duration. Remaining 85% of construction companies' projects were delayed during PCP. Similarly, 92 % of projects in Malaysia are susceptible to time overrun. [8]. Therefore, the goal of this research study is to determine the most significant factors of time overrun in the construction project of Pakistan during PCP phase. In this research, time overrun factors are detected with the support of construction projects' main stakeholders.

A. Causes of Time Overrun in PCP Phase

The construction project mainly varies by nature, size, location, type of contract, and expertise of group members. These attributes can generally disturb the construction projects and turn up the things in difficult situations like time overrun, if not taken care of properly. The results findings of research carried out by [9] conclude that there are many time overrun factors which are affecting construction project performance. The usual factors are weather condition, poor safety management, poor area and site investigation. But, the most significant factors which affect construction projects performance are the inadequate scope of the project during PCP. Besides that [10] found that the significant factors of delay in buildings project during the planning stage are lack of PCP professionals and lack of experienced and expert personnel at an early stage of the project. Furthermore, causes of time overrun in construction projects of Ghana through a case study were found by [11]. These significant causes of time overrun are preparation and approval of drawing samples, late in decision making by the owner, waiting for the approval, shortage of technical and experienced staff, lack of database in estimating activity duration and resources, poor geological conditions of the site, low bidding filled, working estimation, licenses and accessing facilities, delays in site inspections for approval of drawings by site inspectors. Similarly, in India, [12] conducted a research to identify crucial factors responsible for time overrun in Indian construction industry. The study highlighted 66 causes, where respondents were asked to rate on Likert's scale between 1 to 5. Delays by subcontractors, financial constraints, delays in payments, variation in the scope of project, design change, labor deficiency, landscaping, design revision and delays in design

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approval are the topmost identified factors responsible for time overrun.

TABLE I
FACTORS CAUSING TIME OVERRUN

| NO. | TIME OVERRUN FACTORS | REFERENCES |
|---------|--|------------------------|
| PCPF-1 | Late decision making by owner | [11], [14]-[16] |
| PCPF-2 | Poor organizational structure | [11], [18] |
| PCPF-3 | Incompetent project team | [18] |
| PCPF-4 | Poor scope decision | [17] |
| PCPF-5 | Incompetent planning staff | [15]-[16], [18] |
| PCPF-6 | The difficulty of coordination between various parties [contractor, subcontractor, owner, consultant] working on the project | [18] |
| PCPF-7 | Insufficient or ill-integrated basic project data and survey | [17] |
| PCPF-8 | Unreasonable project time frame | [18], [19] |
| PCPF-9 | Inaccurate site investigation | [15] |
| PCPF-10 | Ineffective communication among owner, designer and constructors | [18] |
| PCPF-11 | Delays in drawing approval | [11] |
| PCPF-12 | Conflicts between drawing and specification | [16], [17], [19] |
| PCPF-13 | Change in drawings & specifications | [13] |
| PCPF-14 | Inadequate integration on project interfaces [involvement] | [18] |
| PCPF-15 | Delay of design submittal from consultant | [16] |
| PCPF-16 | Uncooperative owners | [11], [18] |
| PCPF-17 | Improper project feasibility study | [11] |
| PCPF-18 | The complexity of project design | [17], [19] |
| PCPF-19 | Insufficient support, management and training staff to model the operations. | [15], [18] |
| PCPF-20 | Design details unclear & inadequate | [16], [19] |
| PCPF-21 | Licenses and accessing issues | [11], [15], [16]-[18] |
| PCPF-22 | Delay in approving major changes in the scope of work by consultant | [16], [19] |
| PCPF-23 | Incapable inspectors [Delays in site inspections for approval of drawings] | [11], [15] |
| PCPF-24 | Judgment and experience of the involved people in estimating time and resources | [14], [17], [18] |
| PCPF-25 | Global financial crisis | [14] |
| PCPF-26 | Changes in clients' requirements | [15], [19] |
| PCPF-27 | Lack of database in estimating activity duration and resources | [11], [15], [17], [18] |
| PCPF-28 | Mistakes and delays in producing design documents | [11] |
| PCPF-29 | Slow information delivery between designers | [18], [19] |
| PCPF-30 | Excessive bureaucracy in project owned operation | [11], [17] |
| PCPF-31 | delay land expropriation due to occupants | [17] |
| PCPF-32 | Un-specified sequence of completion | [17] |
| PCPF-33 | Poor conflict resolution mechanism | [15], [17] |
| PCPF-34 | Unclear specification & conflicting interpretation by parties | [17], [18] |
| PCPF-35 | Waiting for sample material approval | [11] |
| PCPF-36 | Changes in laws and regulations | [11], [18] |
| PCPF-37 | Environmental concerns and restrictions during planning surveys | [14] |
| PCPF-38 | Rigidity of consultant | [11] |
| PCPF-39 | Application of un-matching specifications | [11] |
| PCPF-40 | Lack of use of advanced engineering design software | [16] |
| PCPF-41 | Consultant or architect's reluctance for change | [17] |
| PCPF-42 | Fraudulent practices | [16] |
| PCPF-43 | Conflicts between consultant and design engineer | [17], [18] |
| PCPF-44 | Complicated administration process of client | [17] |
| PCPF-45 | Slow response of designer | [18] |
| PCPF-46 | Political situation | [13], [17] |
| PCPF-47 | Monopoly | [16] |

In Saudi Arabia, a research study was carried out for identifying the significant causes of time overrun in large construction projects from the perspective of constructor, client, and consults. The results of this study revealed more than 70 factors of time overrun, but most crucial factors are related to the PCP stage. These factors are a change in

drawings and specifications, contract modification and change order of contract [13]. A study is conducted by [14] for achieving project success and its profitability through PCP. The main causes of achieving any construction project successfully were related to some attributes which can cause time overrun in the planning stage. The most common causes

of time overrun are found as, incomplete project team, shortage of technical personnel, lack of resources to estimate time duration of the project, unclear contract conditions, unreasonable project time frame, slow information delivery between designers, slow response of designer, lack of training mechanism and training staff, wrong estimation, conflicts between consultant and design engineer, incompetent contractor, judgment and experience of the involved people in estimating time and resources, difficulty of coordination between various parties (contractor, subcontractor, owner, consultant) working on the project, poor organization of the contractor or consultant/inappropriate overall organizational structure linking to the project and insufficient communication between the owner and designer or other parties in design phases.

The findings of an exclusive literature review and pilot study are 47 common factors of time overrun in the planning phase of construction projects, as shown in Table I.

II. METHODOLOGY

The methodology of this research is divided into two parts. In the 1st part, an extensive review of the literature was done to determine the common significant factors of time overrun in construction projects during PCP phase. This led to the determination of 74 factors of time overrun. The experts of the field were contacted for validation of causes specifically for construction industry of Pakistan, and finally 47 causative factors were shortlisted. The factors of time overrun in PCP phase were organized on a 5-point Likert scale in the questionnaire for the survey; where “5” describes extremely significant and “1” describes not significant. The first section of the questionnaire was related to respondents’ personal information, while the second part includes the causative factors of time overrun during PCP stage. The respondents of this research study comprise of clients, constructors, and consultants of Pakistan’s construction industry. A random sample of well experienced Chief Executive Officers (CEOs), superintendent engineer, executive engineer, director, resident engineer, construction project manager, and planning engineer were selected to fill out the questionnaire. One hundred ten respondents were distributed among which only 83 questionnaires were received and validated for data analysis. The importance of these causative factors was evaluated, and the ranking is assessed with the help of SPSS analysis software version 24 by using relative importance index (RII) formula [20], [21].

Fig. 1 describes the position of respondents in their construction firms. Among these experienced personnel, 7.22% were CEOs, 8.43% were Superintendent Engineer, 7.22% were Executive Engineer, 4.88% were Directors, 18.07% were Resident Engineers, 28.91% were Construction Project Managers and 25.31% were planning engineer from the clients, consultants and constructors in construction sectors.

III. RESULTS AND DISCUSSION

The analyzed data are presented in the forms of bar graphs individually according to their RII value as shown in succeeding portions. The graphs are grouped into three main categories. Fig. 2 presents the factors possessing a mean value of more than 4. Fig. 3 shows such factors carrying importance level between 3 and 4 in terms of RI values. While the last category, i.e. represented in Fig. 4, shows time overrun factors having RII value less than 3.

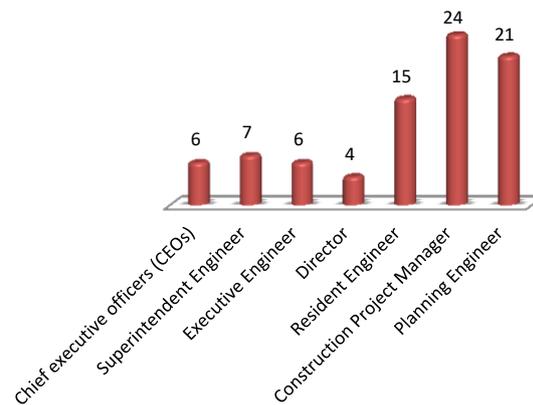


Fig. 1 Position of respondents in their construction companies

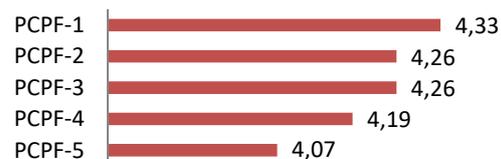


Fig. 2 Extremely significant factors of time overrun in PCP stage

Late decision making by the owner even during the initial planning of any project results in time delays at a later stage, that is why was ranked as an extremely significant factor. Factors at second place with a mean value of 4.26 archived were “Poor organization of the contractor or consultant/inappropriate overall organizational structure linking to the project” and “Incompetent project team”. Individually, the project team members and the overall organization if improper, and lacks intellectual interaction and coordination, will surely result in delays. Thereafter, with 4.19 mean value ‘Poor scope decision’ is the 4th extreme significant factor. PCP stage surely considers the scope of the project. If it is not properly decided, and alterations occur at a later stage; the project will be delayed during the execution phase.

Various times environmental restrictions considered during planning surveys might end up in an inappropriate planning strategy. This could affect the project’s progress as due to such considerations a lot of environmental aspects are affected for which work must be stopped. Changes in laws and regulations occur within the planning and execution phase of the project, ultimately affecting the progress of the project. This factor has a mean value of 3.93. Next factor “Waiting for sample

material approval” with an average index value of 3.9 is ranked amongst ‘very significant factors of time overrun’. Investigations in terms of tests of different materials also delay the decision of usage of various materials on site. Several problems occur during the life cycle of the project such as ‘ambiguity in specifications & conflicting interpretation by various parties’ and ‘contractual disputes’ for which poor government judicial system is available are possessing the mean values as 3.85 and 3.78, respectively.

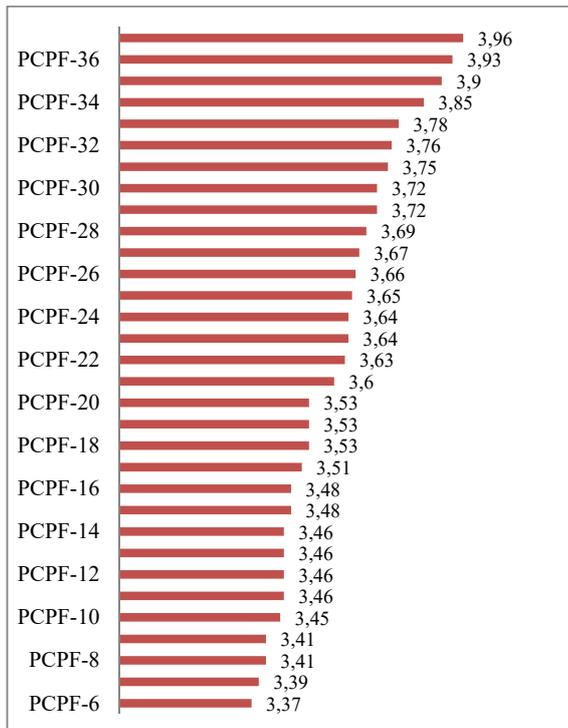


Fig. 3 Very significant factors of time overrun in PCP stage

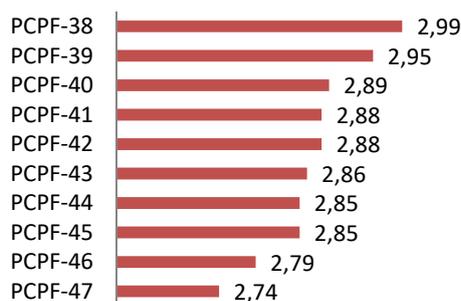


Fig. 4 Moderately significant factors of time overrun in PCP stage

Majority of factors fall under this category. Few other factors during planning stage which result in time overrun of projects are unreasonable planned project time, ill-integrated basic project data and difficulty of coordination between various parties (contractor, subcontractor, owner, consultant) working on the project. Miscommunication or lack of coordination always results in rework, leading to cost and time

overruns.

The third category of factors is ‘moderately significant factors’. Political situation does affect and monopolies occurring in developing countries like Pakistan can affect the real progressing of the project. No doubt these two are least ranked but are still considered in a survey by stakeholders.

IV. CONCLUSIONS AND SUGGESTIONS

The study started with an investigation of parameters aiming to affect the total project duration. Very next step after conception part is the planning phase in the project’s lifecycle. Complications either arise or vanish; depending on how the project is planned at this stage. Assessment of such factors leading to time overruns is crucial for the success of the project. Valuation of the planning phase of construction revealed numerous factors as already listed above. Categorization was done in extremely significant, very significant and moderately significant factors. Identified factors will surely help concerned individual/organizations to prevent and control such issues before it severely hits the project duration. Proper teams are built, which must incorporate effective communication amongst all stakeholders. It signifies proper relationships and attitudes, which resists change orders, reworks and delays and hence leading towards the successful ending.

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REFERENCES

- [1] F. Nega, Causes and Effects of Cost Overrun on Public Building Construction Projects in Ethiopia, Master thesis, Addis Ababa University, Ethiopia, 2008.
- [2] K. J. Shah, M. R. Apte, “Causes of Delay in Construction of Bridge Girders”, *Journal of Mechanical and Civil Engineering*, 12(1), pp. 08-12, 2015.
- [3] Y. Rashid, S. Haq, M. S. Aslam, “Effects of delay in construction projects of Punjab-Pakistan: an empirical study”, *Journal of Basic and Applied Scientific Research*, 3(10), pp. 87-96, 2015.
- [4] G. P. Prabhakar, “Projects and their management: A literature review”, *International Journal of Business and Management*, 3(8), pp.1-9, 2009.
- [5] O. Torp, A. M. Belay, C. Thodesen, O. J. Klakegg, “Cost Development Over-time at Construction Planning Phase: Empirical Evidence from Norwegian Construction Projects”, *Procedia Engineering*, 145, pp.1177-1184, 2016.
- [6] H. Lind, F. Brunes, “Explaining cost overruns in infrastructure projects: a new framework with applications to Sweden”, *Construction Management and Economics*, 33(7), pp.554-568, 2015.
- [7] B. G. Hwang, L. K. Low, “Construction project change management in Singapore: Status, importance, and impact”, *International Journal of Project Management*, 30(7), pp.817-826, 2012.
- [8] Y. R. Wang, G. E. Gibson, “A study of pre-project planning and project success using ANNs and regression models”, *Automation in Construction*, 19(3), pp.341-346, 2010.
- [9] S. Mollaoglu-Korkmaz, L. Swarup, D. Riley, “Delivering sustainable, high-performance buildings: Influence of project delivery methods on integration and project outcomes”, *Journal of Management in Engineering*, 29(1), pp.71-78, 2011.
- [10] Y. Frimpong, J. Oluwoye, L. Crawford, “Causes of delay and cost overruns in the construction of groundwater projects in a developing country; Ghana as a case study”, *International Journal of project management*, 21(5), pp.321-326, 2003.

- [11] S. A. Assaf, S. Al-Hejji, "Causes of delay in large construction projects", *International journal of project management*, 24(4), pp.349-357, 2006.
- [12] P. A. Koushki, K. Al-Rashid, and N. Kartam, "Delays and cost increases in the construction of private residential projects in Kuwait", *Construction Management and Economics*, 23(3), pp.285-294, 2005.
- [13] H. A. Odeyinka, A. Yusuf, "The causes and effects of construction Delays on the cost of a housing project in Nigeria", *Journal of Financial Management and Property and Construction*. Vol.2, pp. 31-41, 1997.
- [14] G. S. A. Elawi, M. Algahtany, D. Kashiwagi, "Owners' Perspective of Factors Contributing to Project Delay: Case Studies of Road and Bridge Projects in Saudi Arabia", *Procedia Engineering*, 145, pp.1402-1409, 2015.
- [15] S. D. Anderson, K. R. Molenaar, C. J. Schexnayder, "Final Report for NCHRP Report 574: Guidance for Cost Estimation and Management for Highway Projects During Planning, Programming, and Preconstruction", *National Cooperative Highway Research Program, Transportation Research Board*, 2006.
- [16] A. Abbas, Z. U. Din, R. Farooqui, "Achieving Greater Project Success & Profitability through Pre-construction Planning: A Case-based Study", *Procedia Engineering*, 145, pp.804-811, 2016.
- [17] M. A. Akhund, A. R. Khoso, U. Memon, S. H. Khahro, "Time Overrun in Construction Projects of Developing Countries", *Imperial Journal of Interdisciplinary Research (IJIR)*, 3 (5), pp. 127-129, 2017.
- [18] G. E. Gibson, Y. R. Wang, C. S. Cho, M. P. Pappas, "What is pre-project planning, anyway?", *Journal of Management in Engineering*, 22(1), pp.35-42, 2006.
- [19] K. Ullah, A. H. Abdullah, S. Nagapan, S. Suhoo, M. S. Khan, "Theoretical framework of the causes of construction time and cost overruns". In *IOP Conference Series: Materials Science and Engineering*, 271(1), p. 012032, 2017. <http://iopscience.iop.org/article/10.1088/1757-899X/271/1/012032/pdf>.
- [20] K. V. Prasad, V. Vasugi, R. Venkatesan, N. S. Bhat, "Critical causes of time overrun in Indian construction projects and mitigation measures", *International Journal of Construction Education and Research*, 1-23, 2018, <https://doi.org/10.1080/15578771.2018.1499569>
- [21] A. R. Khoso, A. H. Memon, A. A. Pathan, M. A. Akhund, "Solid Waste Management Issues in Hyderabad City", *Mehran University Research Journal of Engineering and Technology*, 37(3), pp.653-662, 2018.