

Common Factors of Cost Escalation in Construction Industry of Pakistan

Salman Ahmed

Department of Civil Engineering,
Quaid-e-Awam University of
Engineering, Sciences & Technology,
Nawabshah, Pakistan
enr.salamahmed@gmail.com

Aftab Hameed Memon

Department of Civil Engineering,
Quaid-e-Awam University of
Engineering, Sciences & Technology,
Nawabshah, Pakistan
aftabm78@gmail.com

Noor Ahmed Memon

Department of Civil Engineering,
Quaid-e-Awam University of
Engineering, Sciences & Technology,
Nawabshah, Pakistan
nahmedmemon@gmail.com

Abdul Nasir Laghari

Department of Chemical Engineering,
Quaid-e-Awam University of
Engineering, Sciences & Technology,
Nawabshah, Pakistan
laghari@hotmail.com

Muhammad Akram Akhund

Department of Civil Engineering,
Mehran University of Engineering and
Technology,
Jamshoro, Pakistan
akhund42@gmail.com

Hafiz Usama Imad

Department of Civil Engineering,
Mehran University of Engineering and
Technology,
Jamshoro, Pakistan
usamaimad@yahoo.com

Abstract—Cost escalation is a ubiquitous problem, especially in Government organizations. Though bigger projects encompass escalation cost, in smaller projects, it is generally ignored. Several internal and external factors are responsible for the undesirably increased cost of a project. Among them some are tangible, and some are intangible. The scope of this study is to highlight most common remittable and non-remittable factors responsible for cost escalations. Thirty most common factors responsible were listed. A survey was done in order to have the stakeholder's opinion on identifying the most common factors. Out of 102 generally identified escalating factors, 30 factors were shortlisted based on literature and initial study. Participants responded on a 1 to 5 Likert's scale. Out of 200 distributed questionnaires, 52 reliable set of questionnaires were selected for data analysis. Clients, consultants, and constructors were selected from different projects like roads, structure, public amenities etc. Minimum threshold to participate in the survey was that a respondent must had at least a Diploma or Bachelor's degree in the field of civil engineering. Results highlighted that financial problems, slow payments, and inflation are the top-ranked identified factors responsible for cost escalation in the construction industry of Pakistan. The weighted average of all factors ranges between 0.355 and 0.688, having 0.668, 0.629 and 0.625 for the top three factors.

Keywords—cost escalation; stakeholders; construction industry; Pakistan

I. INTRODUCTION

Cost escalation is referred as the change in the price of a given commodity or services for a given period of time in a given economy. In Pakistan, cost escalation is a ubiquitous problem, especially in Government organizations. Cost escalation is the adjustment or settlement of unit price of

contract component which includes labor, construction materials and equipment to contract the value during bid and is almost inevitable in large construction projects [1]. Cost escalation often offsets the industry's contribution to the economy. Escalation and contingency expenses include unnecessary costs caused by the underestimation of the actual cost that exceeds the budget amount [2]. Cost escalation problem has various causes, therefore it is necessary to study the common factors responsible for cost escalation in construction industry of Pakistan.

Results of a research regarding Zambian road construction projects indicate that bad weather and flooding were major main reasons for cost increase. Another major reason was the payment delays from client to the contractors. Researchers suggest that there is no simple solution to control the cost increase and schedule delay. However, it can be controlled through good project management [3]. Cost escalation reasons occurring in projects of Nigeria's construction industry are unstable material prices and changes [4]. In Pakistani industry the main reason for rising costs is customer behavior [5]. Another survey of Pakistani construction works among key stakeholders indicated escalation of material prices and discontinuity of funds. Researchers suggested that there is immense need of proper planning at the earlier stage of estimation. Proper provision for contingencies should be kept to cover the escalation of material prices [6]. The Office of Government Accountability indicated that 77% of road projects in the United States failed in achieving completion within estimated cost. On the other hand, authors in [7] concluded that 9 out of every 10 construction projects experienced cost escalation. In Jordan, road projects were reported as overran due to terrain and weather conditions [8]. Analysis of cost issues in construction projects of India showed that changes in

designs by the clients, fluctuations in material prices, delay in payments, changes in material types and specifications during construction, and reworks caused by errors during construction are considered seriously [9]. During the construction phase of Vietnam highway projects, land acquisition, capital and contract constraint, infrastructure construction investment management system, survey and design scheme, construction unit fiscal and management ability as threats for project cost were indicated in [10]. Poor planning, labor and material shortfall are considered as key reasons that affect project cost in India [11] while poor site management, lack of coordination, contractor’s lack of experience and fraudulent practices were reported as major issues in Nigerian construction projects [12]. Road construction projects of Palestine showed fluctuation in prices, incomplete drawings, short time to prepare cost estimation, contract size and lack of experience as key factors affecting project cost [13]. Similarly, a survey investigation on road works of Saudi Arabia revealed administrative problems, delay payments, delay in decision making and poor communications between parties as most affecting factors [14]. Authors in [15] highlighted as major reason of cost escalation the inadequate project preparation. After a comprehensive review of the above mentioned studies, 30 top common factors were identified and considered for further investigation with respect to local construction industry. The factors are listed in Table I.

TABLE I. TOP COST ESCALATION FACTORS

	Factors	References
1	Fluctuation in material prices	[4, 8-10, 13, 17-18]
2	Weather conditions	[2-4, 8, 14]
3	Frequent design changes	[8-10, 12, 14]
4	Cash flow and financial difficulties faced by contractors	[4, 10, 11, 17]
5	Slow payments of completed works	[9-11, 14]
6	Lack of coordination on site	[2, 4, 12, 14, 17]
7	Poor site and project management	[2, 12, 14, 17]
8	Inflation	[2, 3, 7, 9, 14]
9	Poor contract management	[2, 7, 10, 11]
10	Labour productivity	[8, 10, 17]
11	Local government pressures	[2, 3, 8, 10]
12	Poor technical performance	[2, 8, 10, 11]
13	Incorrect planning and scheduling	[12, 16, 18]
14	Shortage of materials	[9, 15, 17]
15	Low speed of decision making	[4, 8, 11, 14]
16	Government policies and political instability	[4, 8, 12, 14]
17	Increasing of loan interest rates	[10, 12, 14, 16]
18	Project location	[2, 10, 19]
19	Insufficient/incomplete drawings	[4, 13, 19]
20	Ground conditions	[8, 12, 19]
21	Inaccurate estimate	[2, 4, 17, 19]
22	Unrealistic schedule	[4, 12, 19]
23	Number of change/extra work orders	[2, 6, 9, 17, 19]
24	Timeliness of subcontractors and suppliers	[2, 7, 9]
25	Delay in land acquisition	[2, 6, 10, 18]
26	Inadequate contractor experience	[3, 5, 12, 13]
27	Strikes	[3, 7, 11, 18]
28	Absence of construction cost data	[4, 8, 12]
29	Unavailability of competent staff	[6, 17, 18]
30	Reworks due to the errors	[2, 8, 9, 11]

II. AIM OF STUDY

The main aim of this research is to find the common factors of cost escalation in construction projects of Pakistan. The main objectives set under this scope were to explore cost escalation factors in construction projects throughout the world and to identify the common factors influencing cost escalation in construction projects of Pakistan.

III. RESEARCH METHODOLOGY

This study is based on a questionnaire survey, in which identified factors are presented to respondents from different contractor organizations working in Pakistan’s construction industry. The respondents are requested to rate each specific factor on a five point Likert scale. To keep the reliability of the collected data, only respondents having minimum diploma or bachelor’s degree in the field of civil engineering are selected. Statistical analysis of the collected data is done by Statistical software package (SPSS) Version 20 and Microsoft Excel. The questionnaire was designed according to the 30 factors of Table I from the total 102 cost escalation factors identified from the mentioned literature review and with the help of a pilot study. The questionnaire is divided into two parts, the first one focuses the respondent’s demography, while the second one identified the probability of occurrence (POC) of factors causing cost escalation expressed in Likert scale from 1 to 5, with 1 meaning not occurrence and 5 meaning that the considered factor is very often occurring.

IV. DATA COLLECTION AND ANALYSIS

In this quantitative and qualitative research the designed questionnaire was distributed among 200 construction practitioners involved in construction industry. Fifty two fully filled and valid questionnaires were received. Reliability test was conducted using Cronbach’s Alpha, and its value was found to be 0.88, which indicates well reliable data [20]. All successfully validated and reliable questionnaires from construction practitioners were analyzed by using weighted average (WA). Figure 1 illustrates the ratio of respondents involved in construction industry. The threshold value to rank the factor as common factor is 0.35 [3]. Figure 2, presents the ratio of data collection on the nature of project.

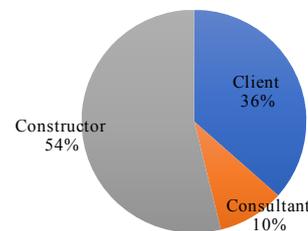


Fig. 1. Ratio of respondents from different organizations

The respondents were asked to rank the probability of occurrence level of each cost escalation factor in construction

industry projects of Pakistan. The responses were analyzed with SPSS v 20 for determining frequency level. Weighted average (WA) was calculated with Microsoft Excel. The results regarding the probability of occurrence for all 30 factors are presented in Table II.

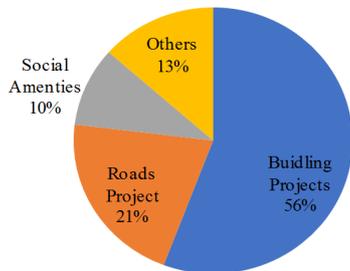


Fig. 2. Nature of construction projects

TABLE II. OVERALL FACTOR OCCURRENCE LEVEL AND RANKING

Factor	Frequency						WA	Rank
	1	2	3	4	5	Total		
Cash flow and financial difficulties	1	7	23	12	7	50	0.668	1
Slow payments	5	9	15	14	6	49	0.629	2
Inflation	1	17	15	5	10	48	0.625	3
Fluctuation in material prices	1	16	15	14	5	51	0.624	4
Number of change/extra work orders	5	22	12	8	5	52	0.546	5
Frequent design changes	3	26	15	3	5	52	0.527	6
Shortage of materials	3	29	7	9	1	49	0.502	7
Incorrect planning and scheduling	8	23	11	7	3	52	0.500	8
Poor contract management	7	25	10	9	1	52	0.492	9
Government policies and political instability	7	27	10	4	4	52	0.488	10
Lack of decision making timely	13	14	15	8	1	51	0.482	11
Weather conditions	5	25	14	4	1	49	0.482	11
Poor site and project management	7	28	9	3	4	51	0.478	12
Delay in land acquisition	8	25	9	6	2	50	0.476	13
Timeliness of sub-contractors and suppliers	13	17	15	3	3	51	0.467	14
Influence of local government	10	24	9	2	4	49	0.461	15
Insufficient/incomplete drawings	13	20	10	5	2	50	0.452	16
Inaccurate estimate	9	27	10	4	1	51	0.447	17
Unrealistic schedule	17	17	8	6	3	51	0.447	17
Lack of coordination on site	8	32	8	1	3	52	0.442	18
Rework due to errors	16	16	16	4	0	52	0.431	19
Inadequate contractor experience	20	15	10	5	2	52	0.423	20
Unavailability of competent staff	17	19	13	1	2	52	0.415	21
Strikes	23	14	8	3	4	52	0.412	22
Ground conditions	14	24	8	4	0	50	0.408	23
Labour productivity	20	17	9	5	1	52	0.408	23
Poor technical skills	19	18	7	5	1	50	0.404	24
Absence of contract cost data	18	23	4	2	2	49	0.384	25
Project location	19	21	8	1	1	50	0.376	26
Increasing of loan interest rates	19	23	6	1	0	49	0.355	27

1=Not occurring, 2=Slightly, 3=Moderately, 4=Often, 5=Very often

From Table II we can define the top factors of cost escalation in construction projects in Pakistan. Results indicate that cash flow and financial difficulties is the most commonly occurring factor in the construction projects of Pakistan. The factor slow payments is ranked second, inflation is third,

fluctuation in material prices is ranked fourth, and the number of change/extra work orders is placed fifth. These results are in accordance with [16]. Finance ability is the key driving force for each project, so normally cash flow and financial difficulties are identified as the top cost escalation factor. It is necessary to have a smooth transition and money flow among clients, consultants and constructors which are the prime stakeholders of any construction project. Slow payment flow is an important cause of cost escalation in the construction projects of any country. Cost inflation of material, labor and equipment is one of the most uncertain and uncontrolled factors, causing delay and cost escalation in the project. It is highlighted as third most common factor of cost escalation by this study. This factor of cost escalation is common in developing countries.

V. CONCLUSION

Pakistan construction industry is vulnerable to several threats. Two of the most important are cost escalation and time overrun. Through a review of previous research works, carried out globally, in cost escalation area of study, a total of 30 factors were considered. These factors were used in a survey form to collect the perception of the respondents regarding factors of cost escalation in construction projects of Pakistan. Data analysis revealed that cash flow and financial difficulties, slow payments, inflation, fluctuation in material prices, and number of change/extra work orders were reported as the most common occurring cost escalation factors in a construction project.

VI. RECOMMENDATIONS

For overcoming the issues mentioned above, all stakeholders have to play their role for removing barriers, specially clients, consultants and contractors, who are mostly directly or indirectly involved in causing escalations. Following are some recommendations that should be thought upon in mitigating and minimizing cost escalations and time overrun.

- Clients should ensure adequate funds, land possession, feasibility study, proper designing, accurate estimation, uninterrupted allocation of requisite budget and timely decisions before or during execution.
- Clients play the most important role in reducing the impact of financial problems.
- Non-availability of construction materials issue can be avoided by a pre-planned purchase strategy.
- The project needs to be completed on time and if delay is caused by slow work progress by the contractor, financial damages may be imposed.

REFERENCES

[1] Y. S. W. Broto, T. J. W. Adi, E. Suryani, J. W. Soetjipto, "Project Cost Escalation Prediction Models Based on System Dynamic Approach", Third International Conference on Civil Engineering Research, Surabaya, Indonesia, August 1-2, 2017

[2] M. Muya, C. Kaliba, B. Sichombo, W. Shakantu, "Cost Escalation, Schedule Overruns and Quality Shortfalls on Construction Projects: The

- Case of Zambia”, *International Journal of Construction Management*, Vol. 13, No. 1, pp. 53-68, 2013
- [3] C. Kaliba, M. Muya, K. Mumba, “Cost Escalation and Schedule Delays in Road Construction Projects in Zambia”, *International Journal of Project Management*, Vol. 27, No. 5, pp. 522-531, 2009
- [4] N. Z. Muhammad, A. Keyvanfar, M. Z. A. Majid, A. Shafaghat, A. M. Magana, S. Balubaid, “Assessment of Cost Escalation factors for Building and Civil Engineering Projects in Nigerian Construction Industry: a Multiple Regression Approach”, *Jurnal Teknologi*, Vol. 74, No. 4, pp. 85-91, 2015
- [5] M. Abas, S. B. Khattak, R. Akhtar, I. Ahmad, M. Ullah, I. U. Haq, “Identification of Factors Affecting Cost Performance of Construction Projects”, *Technical Journal, University of Engineering and Technology (UET) Taxila Pakistan*, Vol. 21, No. 1, pp. 72-78, 2016
- [6] N. Ejaz, I. Ali, M. F. Tahir, “Assesment of Delays and Cost Overruns during Construction Projects in Pakistan”, available at: <http://dl.lib.mrt.ac.lk/handle/123/9431>, 2013
- [7] B. Flyvbjerg, M. K. S. Holm, S. L. Buhl, “What Causes Cost Overrun in Transport Infrastructure Projects?”, *Transport Reviews*, Vol. 24, No. 1, pp. 3-18, 2004
- [8] N. Al-Hazim, Z. A. Salem, “Delay and Cost Overrun in Road Construction Projects in Jordan”, *International Journal of Engineering and Technology*, Vol. 4, No. 2, pp. 288-293, 2015
- [9] P. Jadhav, D. Desai, A. Gupta, “Analysis of Construction Cost Overrun Causes by Contractor’s View”, *Imperial Journal of Interdisciplinary Research*, Vol. 2, No. 8, pp. 908-910, 2016
- [10] H. A. Vu, J. Wang, L. Min, S. H. Mai, “Research on Cost Overrun Risk of Construction Phase of Vietnam Highway International Contracting Project”, *Scientific Research Publishing*, Vol. 8, pp. 86-98, 2016
- [11] D. Bhatia, E. M. R. Apte, “Schedule Overrun and Cost Overrun in the Construction of Private Residential Construction Project: Case Study of Pune India”, *International Journal of Technical Research and Applications*, Vol. 4, No. 2, pp. 174-177, 2016
- [12] A. Haruna, S. U. Kunya, M. Mohammad, “Factors Affecting the Contractor’s Cost Overrun of Building Project in Kano State, Nigeria”, *Journal of Multidisciplinary Engineering Science and Technology*, Vol. 3, No. 1, pp. 3648-3652, 2016
- [13] I. Mahamid, A. Bruland, “Cost Overrun Causes in Road Construction Projects: Consultants Perspective”, 2nd International Conference on Construction and Project Management, Singapore, September 16-18, 2011
- [14] A. Alhomidan, “Factors Affecting Cost Overrun in Road Construction Projects in Saudi Arabia”, *International Journal of Civil and Environmental Engineering*, Vol. 13, No. 3, pp. 1-4, 2013
- [15] A. Ebrahim, A. Y. Akal, “Modeling Schedule Overrun and Cost Escalation Percentages of Highway using Fuzzy Approach”, *Engineering, Construction and Architectural Management*, Vol. 24, No. 5, pp. 809-827, 2017
- [16] M. A. Akhund, T. H. Ali, N. A. Memon, S. H. Khahro, “Causal Attributes of Cost Overrun In Construction Projects of Pakistan”, *International Journal of Civil Engineering and Technology*, Vol. 8, No. 6, pp. 477-483, 2017
- [17] D. S. Tejale, S. D. Khandekar, J. R. Patil, “Analysis of construction project cost overrun by statistical method”, *International Journal of Advanced Research in Computer Science and Management Studies*, Vol. 3, No. 5, pp. 349-355, 2015
- [18] S. Durdyev, S. Ismail, N. A. Bakar, “Factors causing cost overruns in construction of residential projects: case study of Turkey”, *International Journal of Science and Management*, Vol. 1, No. 1, pp. 3-12, 2012
- [19] K. Knight, A. R. Fayek, “A preliminary study of the factors affecting the cost escalation of construction projects”, *Canadian journal of Civil Engineering*, Vol. 27, No. 1, pp. 73-83, 2000
- [20] M. A. Akhund, A. R. Khoso, A. A. Pathan, H. U. Imad, F. Siddiqui, “Risk Attributes, Influencing the Time and Cost Overrun in Joint Venture Construction Projects of Pakistan”, *Engineering, Technology & Applied Science Research*, Vol. 8, No. 4, pp. 3260-3264, 2018