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Factors Affecting Cost and Time Overruns for Construction Projects in Developing countries – A Review

Madhur Singh[1], Sakshi Gupta[2], R.K. Malik[3]

[1]*Department of Civil Engineering, KC College of Engineering and Information Technology, KC Group of Institutions, Nawanshahr, Punjab,*
[2]*Department of Civil Engineering, Amity School of Engineering & technology, Amity University Haryana,*
[3]*Department of Civil Engineering, Amity School of Engineering & technology, Amity University Haryana,*

Abstract— Construction projects experience time and cost overrun in their completion due to various reasons in India. It has been revealed from the technical and commercial point of view that the projects on completion have an exceeding estimated time and cost which is a major performance indicator. This study aims to make an in-depth evaluation for the causes of time and cost overrun in various projects. A thorough literature appraisal of developing countries was done and a list of factors related to time & cost was revealed. It has been seen from the extant literature survey that Client; Material, Manpower & equipment; and external related factors were the key reasons for the time and cost overrun. The projects can be completed successfully with minimum or no time and cost overrun if the projects are handed over to the professional planners, management and executers having professional experience in their field.

Keywords— Cost overrun, Factors, Performance, High rise construction projects, Time overrun.

I. INTRODUCTION

Indian construction industry is one of the eldest and largest industry. By the independence, the study of construction activity was for building of houses, religious places like mosques and temples etc. at distinct and municipal level, with the use of old methods, which are constantly being used in unindustrialized nations like India. The history of planned or ordered construction method in India can be dated back to around 1847 AD when Lord Dalhousie recognized the Public Works Department (PWD) for the construction of civil engineering buildings such as road, small dams, canals etc. The outline of Indian economy of last 50 years indicates that construction work of development investment is around 40%, close to 16% of Indian population which is working primarily be subject to construction for their living. The growing participation of the private division in infrastructure development through public private partnership (PPP) and Build Own Transfer (BOT) can be mentioned as the chief reason for a rise in GDP. Nevertheless, there is continuous possibility for more vigorous contribution from private sector in this way through investment. There are around 200 corms from corporate division who are presently working in construction industry in India. The quantity of listed class A contractors is around 1,20,000 who are working for local development authority, state departments and central government bodies such as CPWD. The number of minor and petty contractors working as sub-contractors for principal contractors are massive in this industry. So, there is plenty opportunity for development of construction industry at micro and macro level of infrastructure advancement.

II. LITERATURE REVIEW

One of the utmost significant difficulties the construction industry is facing at present is time and cost overruns. Time and cost overruns varies substantially from project to project and therefore, it is vital to state the authentic causes of time and cost overruns to minimalize and evade the delays and growing cost in any construction project. This work evaluates various literatures regarding the main problems of time and cost overruns to identify the correlated data regarding those problems.

Jape and Saharkar (2017) analysed the important reasons and effect of delay on construction projects. The aim of the research was to know the parameters affecting time and cost overrun. A questionnaire based survey was conducted targeting 24 construction project in Pune, 45 parameters were considered for study and analysis was carried out. The prominent 10 parameters causing project delay were: changes in design, problems in financing the project & accounts payable, complexity of project, performance concerns of supplier, blame game between project parties, problems gaps in documentation of agreement, unrealistic projects timeline, low skill manpower, price rise, risk & uncertainty related to projects (Table 1 and 2).

Table 1. Parameter wise RII & Ranking for Cost Overrun Parameters (Jape and Saharkar, 2017)

parameters	Relative Importance	Ranking on RII
Change in Design	0.91	1
Complexity of Project	0.89	2
Risk and uncertainty related with projects	0.88	3
Low skilled manpower	0.86	4
Inaccurate evaluation of projects timeline	0.85	5
Incorrect financial & payment methods	0.84	6
Discrepancies in contract documentation	0.83	7
Conflict between project parties	0.82	8
Inflation	0.8	9
Non-performance of subcontractors and selected suppliers	0.78	10
Lack of training and experience of project manager	0.79	11
Delay in Design	0.75	12
Increases in scope of work	0.74	13
Shortage of labour	0.73	14
Difficulties in obtaining permits	0.71	15
Poor site management & supervision	0.7	16
Inaccurate cost estimation	0.69	17
Cash flow problems	0.68	18
Delay in progress payment	0.67	19
Inappropriate methods for constructions	0.66	20
Rework due to errors during construction	0.65	21
Delay in approving drawings	0.64	22
Flaws in design documents	0.63	23
Difficulties in project financing	0.62	24
Speed of owner decision making progress	0.61	25
Strike	0.59	26
Insufficient experience of consultant	0.58	27
Quality control process	0.57	28
Fluctuation in labours, materials availability	0.55	29
Force majeure	0.57	30
Unforeseen condition on ground	0.53	31
Insufficient contractor experience	0.52	32
Extra items in work order	0.5	33
Equipment breakdown	0.48	34
Change in order by owner	0.47	35
Unpredictable weather conditions	0.45	36
Lowest bid win	0.44	37
Wastage of materials	0.43	38
Restricted access	0.42	39
Liquidity of the organization	0.41	40
Late deliveries	0.4	41
Government policies change	0.38	42
Quality of equipment & raw materials	0.37	43
Insurance & accidents	0.34	44
Natural calamities	0.33	45

Table 2. Below are parameter wise RII & Ranking for Time Overrun Parameters (Jape and Saharkar, 2017)

Parameters	Relative Importance	Ranking on RII
Change in Design	0.91	1
Incorrect financial & payment methods	0.89	2
Complexity of Project	0.88	3
Non-performance of subcontractors and selected suppliers	0.86	4
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Inaccurate evaluation of projects timeline	0.83	7
Low skilled manpower	0.82	8
Inflation	0.8	9
Risk and uncertainty related with projects	0.78	10
Lack of training and experience of Project manager	0.77	11
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Prajapati et al. (2016) analysed the factors influencing cost overrun during construction. They also analysed the effects of those factors on construction projects in state of Madhya Pradesh, India (all cities and town). Questionnaire study along with the desk study was utilized to gather information on cost and time overrun. The questionnaire and the data pertaining to them were analysed by utilizing descriptive as well as inferential statistics. After analysing the results, it was revealed that 15 of 34 public building construction projects were suffering due to cost and time overrun. The rate of cost overrun fluctuated between 0% and 120 % of the contract amount for different projects. The researcher also revealed that the rate of cost overrun diminishes with the rise in contract amount while it increases with the increase in duration of the project.

Al-Hazim et al. (2016) investigated the factors influencing overrun of the strategic cost, assigned resources and planned time of infrastructure engineering projects in Jordan. Samples of 40 public infrastructure projects were collected and analysed (Table 3). The analysis revealed that there were 20 factors affecting delay and cost overrun of infrastructure projects. The researcher found that topography and climate conditions are the most important aspects that causes time and cost overrun in infrastructure projects in Jordan.

Table 3. Factors being ranked and arranged according to their importance value (Al-Hazim et al., 2016)

S.No	Factors according to their ranks	Importance (in percentage)
1	Terrain conditions	22.20
2	Weather conditions	15.30
3	Variation orders	10.20
4	Availability of labour	7.70
5	Design mistakes	6.10
6	Planned cost for project construction	5.90
7	Material price fluctuations	5.90
8	Planned time for project construction	4.60
9	Market conditions (availability of resources)	4.30
10	Emergency works	3.20
11	Quality of equipment and raw materials	2.80
12	Delays in payment	2.20
13	Cost of variation orders	1. 9
14	Government requirements	1.40
15	Rework from poor materials quality	1.30
16	Delay in decision	1.00
17	Management – labour relationship	1.00
18	Sequencing of work according to schedule	0.80
19	Poor project management	0.50
20	Delay in decision making	0.10

Hisham and Yahya (2016) in their study stated that the construction industry in the recent times is continuously facing the delay in project and found the reasons and effects of the delays. A questionnaire-based survey was carried out among the various contractors and consultants firm in Skudai, Johor. Their study recognized that utmost favored causes of delay in construction industry are subcontractors and contractor's poor site managements. The investigation turned out with the most favoured impacts of construction delay which is time and cost overruns.

Shah (2016) performed a questionnaire based survey for his research work. The results from the survey emphasized on the utmost critical factors leading to delay and cost overrun. The obtained factors were ranked from the maximum to minimum significant factors using RII method. Further, it was revealed that some delay factors have additional criticality than others with respect to the topographical factors and political influences from the government to the local and international contractors, consultants and clients. The work concluded that it is imperative to assess the critical delay factors and take required actions at initial stage of the project and prior to the preparation of the accomplishment plan so that the time and the cost overrun could be minimized in future construction projects.

Shete and Kothawade (2016) conducted a study to examine the cost overrun in building construction projects from consultants' viewpoint utilizing a questionnaire-based study analysis. The study revealed that the cost overrun in construction projects was severe issue indicating that the average cost overrun faced by their company was between 10% and 30% of the project's estimated cost. Consultants related top 5 factors influencing the cost overrun in were: political

condition, variation of amounts and prices of materials, level of competition, exchange of currency, and financial instability. Based on the results, few points were recommended to reduce and regulate the cost and time overruns in building construction projects:

- Paying a lot of consideration to project planning
- Continuous updation of material prices and labour rates.
- Adequate time for preparing feasibility studies, planning, design, info documentation and tender submission.
- Evading or reducing late changes.
- Try to keep within the originally planned scope of work.
- Track and quantify the development constantly
- Resources to be preferably accessible to site.
- Suitable technical and economic management.

Senouci et al. (2016) investigated the causes of cost overruns and delays in Qatari public construction projects. A set of data from 122 Qatari public construction projects obtained was analysed using ANOVA for data analysis. The results revealed that the construction project cost overruns for the project finished between the years 2007-2013 are lesser than those finished between the years 2000-2007. To establish the associations between the contract prices of the project and cost overruns, regression analysis was carried out and subsequently to find the prediction models for assessing the cost overruns. Two linear regression models were established for forecasting cost overruns for building and drainage public projects, each. It was also revealed that cost overruns for building projects improved with contract prices while the cost overruns for drainage projects reduced with the increase in contract prices.

Patil and Bhangale (2016) studied a total of 70 samples which were found to be valid and then were analysed. 5 most significant factors were revealed from the study that causes cost overruns in high-rise constructions. They are high transportation cost, variation in material specification, increase in material price, recurrent failure of construction plants and equipment's, and rework.

Bhangale (2016) through his study found that owner and materials related factors were most influencing factors causing cost overruns. He found that implementation of systematic projects planning, scheduling and controlling throughout the life cycle of projects is very important. Effective utilization equipment management is essential for reducing the construction cost overruns as well as innovation of standards employed throughout the project, therefore, quality will be maintained throughout the project. The study revealed that there is a potential to permit the project owners and contract principals to make a better guess of project time, to support contractors to make improved approximations, diminish clashes resulting from time and cost overrun, and delivery of the project as a result of weather conditions.

Kadiri (2015) had found from his study owner and materials related factors are most influencial factors leading to cost overruns on high rise construction projects. It was suggested from the study that the contractors, engineers and owners should take appropriate choices in time to avoid any overruns. Owner should not ever underestimate the project duration. Contractors were directed to procure right and adequate quantity and quality of construction materials at the precise time. The implementation of construction methods, material and equipment requirements should be decided in a flawless means. Suitable planning must be carried out and implemented to avoid deficiencies or excess of materials and change orders in the construction work.

Subramani et al. (2014) found that time-consuming decision making, weak time management and planning, rise in material, machine and equipment costs, inadequate contract management, weak and inappropriate design, providing of the designs late, rework due to erroneous work, difficulties in land procurement, incorrect valuation and estimation methods, and lengthy time between design and time of bidding or even tendering are the main causes of cost overrun.

Doloi (2013) performed an in-depth investigation of the tasks and responsibilities of the significant stakeholders. Based on appropriate industry participations, 73 attributes related to cost performance were recognized for the study. From the results, it was revealed that planning and scheduling insufficiencies have the maximum influence on cost performance from clients, consultants, and contractors" perspective. Confirmatory factor analysis on the collective responses across all three groups suggested that vigorous control measures and suitable programming, along with effective design and efficient site management, are the utmost critical factors. These factors are largely connected with the responsibilities of contractors and consultants for dealing cost overruns in projects.

Azis et al. (2013) found through their study that inadequate cost performance in construction project is a usual issue throughout the world which results in substantial amount of cost overrun especially in Malaysia. Author presented qualitative research methodology using semi-structured interview with qualified personnel's in the construction projects. 21 respondents from consultant and contractor establishments were interviewed and subsequently evaluated the eight groups of cost overrun factors found out through literature survey. The results revealed that contractor's site management category is the most important factor contributing towards cost overrun; followed by information and communication category while the minimum severity was related to financial management category.

Alhomidan (2013) took 41 factors influencing cost overrun in road construction projects demarcated using an exhaustive literature survey which were further classified into 6 groups with respect to the origin of delay: project, managerial,

consultant, external, construction items, and financial. Occurrence and severity of each factor was defined by the zones (color coding as yellow, green and red). The survey revealed that the utmost vital factors influencing cost overrun were: internal administrative issues, delay in payments, communication gap between construction parties, and decision-making delays.

Similar study was taken up by Mahamid (2013) to identify the common causes influencing the time overrun in construction projects in the West Bank in Palestine from contractors' perspectives. 45 factors that causing delays in road construction projects were demarcated through a comprehensive literature survey. A questionnaire survey was carried out to rank the measured factors with respect to severity and occurrence. The results revealed the top risks influencing time overrun are: contractors' financial status, payment delays from owner's side, political condition and segmentation of the West Bank, communication gap between construction parties, efficiency of equipment being low and bottle-neck competition in bids.

Patil et al. (2011) found a few factors vital in decreasing the cost and delay of project and also gave the remedies for the overruns. Key factors affecting the time-delays were: number of change orders, financial restraints and owners' lack of knowledge and skills in construction. The three major factors that causes cost overruns revealed from the study were problems related to contractor, material and owner's financial constraints to reduce time and cost overruns to ensure quality.

Ameh and Osegbo (2011) found out the connection between time overrun and productivity on construction sites in Nigeria. The study recognized 18 factors that causes time overrun and 14 causes that lead to low productivity. The study revealed that insufficient funding of projects, insufficient planning prior to take-off and scarce tools and equipment and delayed materials delivery at site were the main factors that influence the project delay in Nigeria.

Haseeb et al. (2011) studied the causes and effects of delays in large construction projects of Pakistan. Analysis of the 100 copies of questionnaire retrieved out of the 150 administered established 16 important causes of delays. These were delay in interim payments, inaccurate time estimation, poor site management, obsolete technology, natural disaster and unforeseen site conditions. Others were change in design, material shortages, change orders and inaccurate cost estimates, amongst others.

Alaghbari et al. (2007) studied the major factors causing the delay in construction projects in Malaysia. The results of the study revealed that a total of 31 variables were inspected which were further categorized into 4 categories. The main factors causing delay in construction projects were due to the contractor, followed by the consultant, owner, and finally the external factors. The findings of the study conducted by the researchers revealed that economic factors cause the most delays in construction projects in Malaysia, followed by coordination problems and materials problems.

Ahmed et al. (2003) investigated delays in Florida construction industry. The study which was mainly contractor-based identified 50 causes of construction delay and retrieved 35 out of the 380 copies of questionnaire distributed. The study concluded that the most critical causes of delay in Florida were building permits approval, variations (change orders and changes in drawings), in complete documents and shop drawings approval.

Odeyinka and Yusif (1997) considered the causes of delay in Nigerian construction projects and classified into different categories related to contractor, client and external factors. Using the random sampling technique, 100 copied were analyzed carefully. The study revealed that changes in orders, time-consuming decision-making and issues related to cash-flow were the main causes of delay in construction projects in Nigeria, followed by natural disaster, climate/weather conditions, financial difficulties and poor site supervision.

III. CONCLUSIONS AND DISCUSSIONS

From the various literatures studied for high rise construction projects it can be conclude that the major factors contributing to cost overruns are:

- Type, size and length of the project.
- Change in design
- Complexity of the project
- Risk and uncertainty involved in the project
- Low skilled manpower
- Incorrect methods of payment
- Discrepancy in the contractual documentations.
- Conflict between project parties
- Inflation
- Inaccurate planning and scheduling of projects

While the major factors contributing toward time overruns are as follow:

- Design changes and delays
- Rework due to errors during construction

- Non-performance of subcontractors and selected suppliers
- Incorrect financial & payment methods
- Lack of training and experience of the project manager.
- Inaccurate evaluation of projects timeline
- Increases in scope of work
- Rework due to errors during construction
- Extra items in work order
- Wastage of material and Equipment breakdown

Therefore, the time and cost overruns in the construction projects can be reduced to a great extent if proper management takes place. The suggestions are - Paying a lot of attention to project planning, constantly and continuously updating the material prices and labour rates, taking sufficient time for planning and scheduling of the project, avoiding late changes, track and measure the progress of the various tasks in the project continuously, making available the required resources at site in time, providing adequate technical and financial management, etc.

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