International Journal of Advance Research and Innovation
Vol. 7(2), Apr-Jun 2019, pp. 43-49
Doi: 10.51976/ijari.721906

Article Info
Received: 29 May 2019 | Revised Submission: 05 Jun 2019 | Accepted: 10 Jun 2019 | Available Online: 15 Jun 2019

Effect of Pre-Planning in High Rise Building for Time Management

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ABSTRACT

In India the Construction industry is one the most integral industry and it also forms a vital role in contributing to the economy growth of the country. People of wide range ranging from skilled, unskilled to semi-skilled are provided employment by this industry as this industry is very labor intensive .Despite this there has been many reported accidents, ill health problems and damage cause to the Environment during the execution phases of the construction works. Knowledge however for the management plan for the health, safety. And the Environment Management Plan is limited in the Industry. The aim of the study is therefore aimed at finding the plans to be followed in real life at the sites, to find and analyze the deficiencies and also to suggest ways to mitigate them in the context of the Indian Industry. While meeting the objective of the study for my case study two metro projects were studied one the Delhi metro project and the other one being the Mumbai Metro project. Both the projects were studied for their environment management plans which is being followed and the mitigation methods adapted by the authorities. The study aims at going through the literature reviews and to understand and see that whether the facts mentioned are being followed at the site and what are the things which is being lacked.

Keywords: *High Rise Building; Public Private Partnership; Construction Industry.*

1.0 Introduction

Studies have shown that planning have an important role in both initial phase of construction project & during execution phase also. All construction projects are unique in nature so we have to plan for uncertainties that are part of construction projects.

Pre-planning have become very crucial as construction projects have become more complex in nature and the sector have become more dynamic [1-5]. The growth in research and development have given architects, structural consultants the freedom to come with very unique and astonishing and marvelous construction models that catch the eyes of every individual. The architects and consultants have transformed their canvassed ideas into real time feasible construction models converging into lifestyle habitat for people.

Common pattern that is observed in all high rise building projects is cost overrun, time overrun, delayed clearance of running account bills, failure to meet deadlines and milestones. Many researches claim to address solving of these problems by having a proper and detailed planning of construction projects prior to beginning with execution of construction work. Many projects have failed to see the light that they have been crafted by the stakeholders since they failed to look at the pre-planning aspect before starting of project work.

Globally various types of public-private partnerships (PPPs) have been practiced in infrastructure development in order to achieve the best results. The private funding in the BOT arrangement not only reduces the strain on the government/public pocket but also facilitates more innovations by harnessing the skills, technologies, and operational efficiency of the private sector.

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This arrangement also reduces the risks and responsibilities of the public sector as most of these are transferred to the private sector. Many projects in a broad range of sectors have been successfully developed through BOT with significantly increased value to the outputs. These include roads, bridges, ports, airports, and railways; power, water supply, and waste disposal systems; telecommunication networks and other services of information technology; schools, hotels, hospitals, prisons, and even military facilities. Though the BOT model for financing of the infrastructure has been a boom for the construction industry and the developing countries lacking funds, various problems have been encountered in worldwide infrastructure development through BOT. One major problem that has been encountered is the slow progress in the execution of BOT. There are other serious problems like legal, political, environmental, etc. that have even led to failures of BOT projects worldwide.

2.0 Causes and Effects of Delays

20 causes of delays categorized into 2 different groups were found in order to make a questionnaire survey with the respective participants (contractors, owners, consultants and others) of Indian construction industry and also 8 effects of delays were observed. The number of causes and effects are as-

2.1 Group-A owner contributed factors

1. Delay in progress payments
2. Delay to furnish and deliver the site
3. Change orders (plan/design) & extra orders by owner during construction
4. Late in revising and approving design documents
5. Delay in approving shop drawings and sample materials
6. Slowness in decision-making process
7. Conflicts between joint-ownership of the project
8. Suspension of work by owner
9. Owners lack of experience and involvement
10. Bureaucracy in client's organization
11. Unavailability of professional construction management (i.e. consultant)

2.2 Group-B contractor contributed factors

12. Difficulties in financing project/insolvency
13. Conflicts in sub-contractor's schedule during execution
14. Rework due to errors during construction
15. Conflicts between contractor and other participants
16. Ineffective & inadequate early planning and scheduling of project
17. Implementing improper & obsolete construction methods
18. Fraudulent practices and kickbacks
19. Negotiations and obtaining of contracts
20. Inadequate contractor's work & experience & also poor risk management and ignorance.

2.3 Effects of delay

1. Time overrun
2. Much reduction in profit for the contractor due to cost overrun
3. Non-productivity loss for the owner due to extended stay of construction phase
4. Distrust with contractor and damage for the company's reputation
5. Distrust insists the owner to delay the progress payment which leads to contractor's cash-flow
6. Problem
7. Dispute, Arbitration or Litigation b/w the participants of the project
8. Abandonment of project
9. Difficult in improving the market value of the contractor's company.

2.4 Objective

The purpose of the study is to describe importance of pre-planning for high rise buildings & to identify parameters that require major focus for successful completion of Project.

To identify possible remedial solution for the most influencing factor and the major factors for time overrun.

2.5. Literature review

Planning for a construction project is very unique, complex and challenging process that requires a detailed considerations of all the parameters that are part and parcel of a project lifecycle. Meaning of planning as per different stakeholders is different and correct.

For example; material flow plan, logistics plan, weekly meeting planning, resources planning, communication flow plan and others [1, 6-10]. However planning for a project can be referred to as process of identifying all the processes and activities

that are required to be performed correctly in a certain pattern or sequential manner to meet the end desired result [3-15]. The client and contractor in their own approach first of all visualize what the end product or project delivery would look like, consisting of different features and uses and facilities, leading to a chalk out plan to identify all activities and tasks that would be performed or followed in sequential fashion to reach the final outcome, the desired end project or goal. It also includes working out the time requirement for activities along with their resource estimates for same [2, 11-13].

3.0 Methodology

Initially literature review and live project case study helped to find out factors causing delay of construction projects (pre planning). This study helped in preparation of questionnaire survey with the help of experts and other industry guides. The category of people approached for the survey were Project managers, Senior Engineers, Project Engineers, Planning engineers, General managers, owners and contractors with good work experience. Relative importance of these identified causes with respect to Indian construction scenario was found out.

4.0 Data Collection

4.1 Case study 1

Name of Project: City of Joy (COJ)

Project Description: 16 Towers of 36 story each with high end amenities.

Cost of Project: 1250 crore

Name of Client: A JV between Neptune, Nirmal & Lifestyle Group

Name of Contractor: ABC

Consultants: Hafeez Contractor, Sterling, Buro Happold

Start Date of Project: March 1998

Current Status: work is halted (Construction of 2 towers Triumph & Thrill with Built up Area of 3.2 lac sqft with Mivan Formwork began in 2008, reached 28th floor till date)

4.1.1 Causes of delay

a) Financial problems of the Client.
b) Delay in statutory approvals.
c) Frequent changes in design.
d) Delay and Error in issuing of drawings.
e) Faulty drawings documentation.
f) Termination of main contractor and its due litigation.
g) Logistics error (7 wastage's occurring).
h) Modification in shutter design.
i) Delay due to non-compliance of Govt. Norms.
j) Shortage of labor.
k) Shortage of Equipment's and Machineries.
l) Shortage of Material.
m) Rework due to design changes.

4.2 Case study 2

Name of Project: US Open Apartments

Project Description: 5 Towers of 40 story each with high end amenities.

Cost of Project: 450 Cr.

Name of Client: XYZ Group

Name of Contractor: ABC

Consultants: Hafeez Contractor, J+W Constultant, Buro Happold and others

Start Date of Project: Feburary 2011

Current Status: Towers yet to be completed (work for 2 in progress and 3 yet to start).

4.2.1 Causes of delay

a) Financial problems of the Client.
b) Delay in statutory approvals.
c) Slow decision making.
d) Frequent changes in design.
e) Error in drawings.
f) Delay in design and delivery of shuttering formwork.
g) Theft of shuttering material.
h) Incompatible client team.
i) Failure of QC system (delay in closure of NCRs)
j) Logistics error (7 wastage's occurring)
k) Modification in shutter design.
l) Delay due to non-compliance of Govt. Norms.
m) Shortage of labor.
n) Inefficient use of tower crane.
o) Shortage of equipment's and machineries.
p) Shortage of material.
q) Rework due to design changes.

4.3 Case study 3

Name of Project: ABC Future X.

Project Description: 3 Tower of 60 (2 basement +3 podium) story each

Cost of Project: 500 crore

Name of Client: MACE Developers

Name of Contractor: XYZ

Consultants: Naik & Associates, Rahimtulla Constultant, Arup, Kapadia Architects.

Start Date of Project: January 2010

Current Status: Current status work is halted (reached 45th Floor).

4.3.1 Causes of delay

a) Frequent changes in Scope.
b) Financial problems of the contractor.
c) Delay in statutory approvals (delay in CC, Tree Authority).
d) Delay in approvals of GFC Drawings.
e) Poorly maintained Project Schedule.
f) Slow decision making (Approvals of formwork design, RFIs).
g) Frequent changes in design (swimming pool being introduced @ 8th Floor).
h) Error in drawings (in complete detailing).
i) Incompatible contractor team.
j) Modification in shutter design.
k) Delay due to non-compliance of Govt. Norms.
l) Shortage of labor.
m) Shortage of Equipment's and Machineries.
n) Shortage of Material (Reebol shuttering oil, MS nails, Hessian cloth and others).
o) Rework due to design changes.

Of the three cases studied, it was found that the financial condition of client and contractor, delay in issue of drawings, design changes, Frequent changes in scope of work, delay in statutory approvals, slow decision making process by client as well as contractor, poorly drafted project schedule, error in drawings, Modification of shutter scheme, changes in due non-compliance of Govt. Norms, shortage of material, equipment's and machines, weakly drafted Quality Assurance and Quality Control policy, inefficient use of tower crane, wrong estimate of cost of construction and time, improper site planning, weather conditions, other external influences, lack of experience of contractor, low bidding by contractor, irregular supply of water and electricity, equipment breakdown, rework due changes in design or bad quality work, inefficient client and contractor team, shortage of labor and others as major problems.

From the list of number of factors for delay, few were identified as reasons due failure of pre-planning as per discussions with industry experts and professionals. They were as follows:

4.4 Client related factors

a) Design changes (changing scope)
b) Site Handover
c) Type of Contract
d) Logistics and Traffic Mgmt.
e) Delay in issue of drawings
f) Risk Identification
g) Statutory approvals
h) Coordination with and between consultants
i) Inefficient resources planning
j) Cash flow of Client

4.5 Contractor related factors

a) Locating temporary facilities
b) Process of Supply chain and Material mgmt.
c) Inefficient resources planning
d) Cash flow of contractor
e) Ineffective use of Tower crane
f) QA/QC plan
g) Safety plan
h) Availability of raw material
i) Risk identification
j) Process of execution

4.6 Questionnaire survey

The survey carried out was divided into two sections. One being about respondent's demographic information, which consisted of name, experience and location. Second being responses for 20 questions that were classified into two major factors causing time overrun. The question were based on literature review and study of live projects. The common factors were included in the survey questionnaire. The various factors affecting the time for completion of construction projects were rated on scale of five points. Where 1 expressed Very Low Impact and 5 expressed Very High Impact. The likert scale is being used as it is easy to construct, makes collection of data easier to collect and interpret. The respondents were supposed to rate their score on this range. By random sampling statistical techniques, 50 questionnaires were sent to industry professionals through mail and other means. Only 36 number of respondents responded to the survey. Though the sample size is small, but the quality of responses is considered to be high due feedback from experienced

professionals with clear understandings of the survey questions.

4.6.1 Demographic Information

The demographic profile of respondents is as follow in table 1.

Table 1: Demographic Profile of Respondents

Position in organization	Number of sample received	Number of sample for this position	Percentage of sample for this position
General Manager	36	5	13.89 %
Project Manager	36	10	27.78 %
Planning Engineer	36	4	11.11 %
Project Engineer	36	7	19.44 %
Senior Engineer	36	4	11.11 %
Site Engineer	36	6	16.67 %

A total of 36 responses were received, that represented about 72 % as the response rate. According to survey the demographic characteristics showed about 13.89% (n=5) responses were received from General Manager, 27.78% (n=10) were PM, 11.11% (n=4) were Planning Engineer, 19.44% (n=7) were Project Engineer, 11.11% (n=4) were Senior Engineer, 16.67% (n=6) were Site Engineer.

5.0 Data Analysis

5.1.1 Reliability test

To calculate reliability for the five perspective of balanced questionnaire responses, we used the internal consistency method by Nunnally 1978. It is used to calculate cronbach alpha co-efficient. Cronbach's alpha is the most sort out measure to internal consistency that is reliability. It is widely used in questionnaire survey where likert scale is used and one needs to find whether the scale is reliable. Since the cronbach alpha value for the questionnaire survey done is 0.815.

5.1.2 Relative importance index (RII)

Using relative importance index to determine the relative importance of the various causes of delays. The RII method is used to determine in the responses which factors where used more frequently during formation of Project.

RII for various factors are calculated as per the standard formula:

RII= (∑ W) / (A*N)

Where RII = relative importance index

∑ W= weighting given to each factor by respondents (1-5 here)

A= highest weight (5 in this case)

N= Total number of respondents (36 in this case)

Table 2: Impact of Client on Timely Completion of Project

Impact of Client on Timely Completion of Project	RII	Rank
Delay in issuing of drawings	0.783	3
Site Handover	0.583	8
Type of Contract	0.444	10
Logistics and Traffic Mgmt.	0.711	6
Design changes	0.788	2
Risk Identification	0.561	9
Statutory approvals	0.778	4
Coordination with and between consultants	0.678	7
Inefficient resources planning	0.744	5

Table 3: Impact of Contractor on Timely Completion of Project

Impact of Contractor on Timely Completion of Project	RII	Rank
Availability of Raw Material and Labor	0.757	4
Locating Temporary Facilities	0.711	6
QA/QC Plan	0.65	7
Process of Supply Chain & Material Mgmt.	0.567	9
Safety Plan	0.512	10
Inefficient Resource Planning	0.750	5
Risk Identification	0.568	8
Cash Flow of Contractor	0.810	1
Process of Execution	0.785	3
Effective use of Tower Crane	0.794	2

6.0 Conclusions

This study tried to identify the impact of pre planning in high rise building for time management. A semi structured questionnaire survey was made with help of literature review.

The study tried to fill in gaps for critical pre planning factors that affect the timely completion of high rise building.

These factors would help the strategist to make policies and contracts which will help to curb the time overrun for projects, thereby improving the quality of construction business by improved performances.

For Client and Contractor related Impact factor are suggested and recommended.

1) Pre-Construction planning should be given due importance and proper time framework should be assigned to it in a project. It helps in covering all the uncertainties that the project could face and proper mitigation plan can be put in place. Depending on the scale of project, even industry experts or construction professional's guidance can be taken.
2) Procurement schedule of different consultants should be asked in advanced and timely follow up should be practiced religiously. Scope of project and required deliverables should finalized before execution starts. Lean practice of Integrated Project Delivery should be used in project.
3) Drawings should be issued on time as per procurement schedule. Documentation of such vital data should be kept in a central data processing unit. Data management system can be used as latest technology. It will help to keep track of all documentation process which include submittals, transmittals, RFI's and others.
4) Effective and efficient management of equipment should be there in system. Daily schedule of use of the lifting equipment's should be kept in place and to be followed and each personnel involved in project should know the schedule. Spare parts of important equipment should be ordered along with procurement of equipment. Even extra standby equipment along with operator should be on project site. The time which is wasted by keeping machine idle during lunch break, can be utilized fruitfully should be worked out keeping all stakeholders in confidence.
5) Proper logistics plan along with traffic management which includes its timely up gradation as project passes through different execution phase should be planned in advance. It is helpful in avoiding wastages onsite.
6) Main contractor should appoint efficient sub-contractor which is financially secured. He should be capable both technically and financially. Also government should facilitate affordable loan to client, contractor and others to give a boost to the construction sector.
7) Client should have a clear cut orientation with contractors, consultants so that changes in scope can be avoided. Design provided by consultants should be feasible as per site parameters. Scheduling of project progress should be such that all uncertainties and actual progress that will be achieved should be the basis of Scheduling for finalization of time duration.
8) Fortnightly meeting with all project coordinators should be conducted where all design related issues, RFI's, design submittals and design feasible issues to be discussed and decision to taken. It will help in increasing the speed of decision making thereby saving crucial project time which is wasted due idle resources. Last planner system should be used after agreement between stakeholders so that maximum output can be achieved with existing set of resources, avoiding conflict.
9) Flaws in drawings issued should tackled with high priority. Sketch drawings to be issued, so that time taken to revise and send the GFC drawings won't affect the project activities on site. Idle time would be avoided.
10) If the project has lot of complexity like unique design, then designing team to taken on board should be suitable for it. The design contracts should be awarded to experienced consultants who can make design independently.
11) On regular basis contractor should submit up-dated schedule of material supply and should be keep follow up with vendors to know correct status of delivery of material so that effective resource planning can be made.
12) Client and contractor should have a strong liaison team so that statutory approvals can be obtained on time.

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