

“Factors Influencing Time and Cost Overruns In Indian Construction Projects”

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ABSTRACT

The construction industry is an important industry at both the global level and national level. It provides huge employment to the people and plays very significant role in country economy. Delay is one of the most common problems in the construction industry. Time and cost overruns are a result of delays in project execution. Project overrun is a serious economic problem in the developing countries where the project implementation takes place in the face of many uncertainties. It wastes away financial resources, delays the development process and also makes construction costlier. With increasing globalization and technology driven economic growth all over the world, a scientific and systematic approach to project management becomes imperative to ensure that project objectives are attained within the constraints of time, capital and other resources. But with the increasing demand, the projects with time and cost overruns are also increasing. Time and cost are the two major elements in project management, apart from quality and scope. One of the biggest challenges in the management of construction project or to one of the project manager is to ensure that the project is completed on time and within estimated cost.

The present study deals with analysing the factors of time and cost overrun of Indian projects. The study is well supported by a case study and a questionnaire survey conducted for the Indian projects. According to the study conducted, various factors are taken into account and ranked as significant and more significant factors according to its impact on construction project. The factors which play a significant role are given more preference rather than the others according to the study. Hence, effective project planning, controlling and monitoring should be established to enhance project performance in order to minimize or avoid time overrun and cost overrun problems in India. The case study is judged using a project management scheduling chart and is well represented into differentiable charts.

KEY WORDS – *Time Overrun, Cost Overrun, Project Management, Construction Industry*

1. INTRODUCTION

1.1 Time and Cost Overruns In India

One of the main objectives and policies of any public or private sectors dealing with the execution of projects is to upgrade projects performance, through reduction of costs, completion of projects within their assigned budget and time constraints, and improve quality. Construction industry in India is suffering from many problems which affect time, cost and quality, these factors related to political situation and techniques used in India, these problems are summarized as following:

- Large number of workers in comparison to the number of projects (the large number of unemployed labour in India);
- Borders closure and shortage of materials in markets;
- Dependency on obtaining of equipment from other countries
- Continued increase in material prices;

- Dependency on donor countries to get the fund;
- Unstable economic situation;
- Unstable political situation.

These factors above and others contributed to large proportion in making many problems in construction industry which usually related to time and cost overruns.

Delay of project and cost overruns in India is one of most important problems at construction management field. Also study and study in this field are few compared to worthy expected results, despite the importance and the significance of the construction sector in India. It is noted that the parties of project (owner, consultant, and contractor) don't give the time and cost overruns the importance at the evaluation at the end of project.

This shortage of time and cost overruns control may be as a result of:-

- Lack of knowledge and awareness about project performance.
- The distribution of delay and cost overruns responsibilities between the three parties (contractors, consultants and owners).
- Political conditions also serve as one of the main factor.

The problem of projects delay and cost overruns can nearly be noticed in every project at India indicating that this problem didn't receive enough attention by both studies and responsible authorities.

1.2 Project aim

The aim of this project is to assess factors influencing time and cost overruns on construction projects in India.

1.3 Project objectives

1. To identify variables influencing construction time and cost overruns and to evaluate their relative importance.
2. Investigate the collective group perspectives on the relative significance of these factors from owner, consultant, and contractor point view.
3. To evaluate the magnitudes of the time delay, and cost increases.
4. To evaluate the degree of agreement /disagreement regarding the ranking of these factors.
5. To conduct practical case study on a building site.
6. To formulate recommendations for improving construction performance.

1.4 Project Approach

It involves the assessment of factors influencing time and cost overruns on construction projects in India. The objectives of the study were decided to be achieved through a two-staged approach.

First Stage

- Factors influencing time and cost overruns in construction projects in India will be first

examined and identified.

- This will be done through a relevant literature review and by conducting a pilot study that sought advice from experienced construction practitioners.
- We will also intend to develop a questionnaire/ survey to assess the perceptions of owners, consultants, and contractors.

Second Stage

- It is intended to carry out case study after carefully selecting and investigating them.
- These cases will give in-depth information regarding the causes of time and cost overruns at these sites and also check the procedures and actions taken by contractors, owners and consultants.
- Each case will be analysed separately.
- Hence we intend to illustrate the link between the data collected by questionnaire and data in case study and also recommendations will be documented for each

1.5 Limitations and Assumptions

This study included the following limitations:

- The study included the factors influencing time and cost overruns in India only.
- Literature on delay and cost overruns in India is very limited.

2. Causes of time and cost overruns

2.1 Causes of time overruns (delay)

Time overruns (delays) can be divided into three categories:

1. Those over which neither party to the contract has any control;
2. Those over which the owner (or his/her representative) has control;
3. Those over which the contractor (or any subcontractor) has control.

The predominant factors influencing time overruns/delays are design changes, poor labour productivity, inadequate planning and resource shortages.

2.2 Causes of cost overruns

Previous study has attempted discover reasons for the disparity between the tender sum and the final account. This section identifies the factors that influence cost overruns. Four factors were identified from the existing study findings

Morris et al (1990), Kaming et al (1997) and Chimwaso (2001). These are; design changes, inadequate planning, unpredictable weather conditions; and fluctuations in the cost of building materials.

The factors are divided into two groups of seven critical factors and nine other factors, which are usually ignored, but perceived to be of equal significance.

2.3 List of critical factors

1. Incomplete design at the time of tender.
2. Additional work at owner's request.
3. Changes in the owner's briefing
4. Lack of cost planning/monitoring during pre-and-post contract stages.
5. Site/poor soil conditions.
6. Adjustment of prime cost and provisional sums.
7. Re-measurement of provisional works.
8. Logistics due to site location.
9. Lack of cost reports during construction stage.

2.4 List of other factors, which are usually ignored

1. Delays in issuing information to the contractor during construction in delays.
2. Technical omissions at design stage.
3. Contractual claims, such as, extension of time with cost claims.
4. Improvements to standard drawings during construction stage.
5. Indecision by the supervising team in dealing with the contractor's queries in delays.
6. Delays in costing variations and additional works.
7. Omissions and errors in the bills of quantities.
8. Ignoring items with abnormal rates during tender evaluation, especially items with provisional quantities.
9. Some tendering manoeuvres by contractors, such as front-loading of rates.

Table 1 - Variables influencing time and cost control

(Chan et al (2002), Alwi et al (2002), Assaf (2006))

Variables of delays and cost controls
<ul style="list-style-type: none"> • Environment restriction • Experience of project location • Accurate prediction of equipment production rate <ul style="list-style-type: none"> • Equipment availability • Experience of local regulation <ul style="list-style-type: none"> • Weather conditions
Variables of time controls
<ul style="list-style-type: none"> • Build ability • Labour productivity • Level of planning • Material availability • Accuracy of materials estimate • Accurate prediction of craftsmen production rate <ul style="list-style-type: none"> • Skilled labour availability • Locational restriction of the project
Variables of cost controls
<ul style="list-style-type: none"> • Inflation of material cost • Accurate quantity take-off • Experience of project type

Table 2 Factors affecting time and cost overrun according to different designation

Category	Factor
Owner	Finance and payments of completed work.
	Owner interference.
	Slow decision-making by owners.
	Unrealistic imposed contract duration.
Contractor	Subcontractors.
	Site management.
	Construction methods.
	Improper planning.
	Mistakes during construction.
	Inadequate contractor experience.
Consultant	Contract management.
	Preparation and approval of drawings.
	Quality assurance/control.
	Waiting time for approval of tests and
Material	Quality of material.
	Shortage in material.
Labour and equipment	Labour supply.
	Labour productivity.
	Equipment availability and failure.
Contract	Change orders.
	Mistakes and discrepancies in contract
Contractual relationships	Major disputes and negotiations.
	Inappropriate overall organizational
	Lack of communication between the parties.
External factors	Weather condition
	Regulatory changes and building Code
	Problems with neighbours.
	Unforeseen ground conditions

3. STUDY METHODOLOGY

3.1 Questionnaire

A questionnaire was developed to assess the perceptions of owners, consultants, and contractors due to the importance index of causes and effects of delay in India construction industry. Factors influencing time and cost overruns in

construction projects in India were first examined and identified through a relevant literature review and by conducting a pilot study that sought advice from experienced construction practitioners.

3.2 Questionnaire design

It has been assembled around of (85) factors which affect the time and cost overruns in engineering projects in various countries around the world and at intervals of time, but not all of these factors are consistent with the conditions and circumstances surrounding the India from economic level, the type of projects, geographical region and occupation factors which experienced the India, so it has been selected factors commensurate with 52 the nature of construction projects and problems in the India. Modifications and new questions then added as a result of interview of experienced construction managers to suit the local construction industry in India.

Method adopted for stage 1:- Decision Matrix

3.3 Decision Matrix

Introduction

A **decision matrix** is a list of values in rows and columns that allow an analyst to systematically identify, analyze, and rate the performance of relationships between sets of values and information. Elements of a decision matrix show decisions based on certain decision criteria. The matrix is useful for looking at large masses of decision factors and assessing each factor's relative significance. Decision matrix is used to describe a multi-criteria decision analysis (MCDA) problem.

Description

A decision matrix is a chart that allows a team or individual to systematically identify, analyze, and rate the strength of relationships between sets of information. The matrix is especially useful for looking at large numbers of decision factors and assessing each factor's relative importance.

Uses

A decision matrix is frequently used during quality planning activities to select product/service features and goals and to develop process steps and weigh alternatives. For quality improvement activities, a decision matrix can be useful in selecting a project, in evaluating alternative solutions to problems, and in designing remedies.

3.4 Decision matrix/selection matrix approach for analysis-

Identify alternatives

Depending upon the team's needs, these can be product/service features, process steps, projects, or potential solutions. List these across the top of the matrix.

Identify decision/selection criteria

These key criteria may come from a previously prepared affinity diagram or from a brainstorming activity. Make sure that everyone has a clear and common understanding of what the criteria mean. Also ensure that the criteria are written so that a high score for each criterion represents a favourable result and a low score represents an unfavourable result. List the criteria down the left side of the matrix.

Assign weights

If some decision criteria are more important than others, review and agree on appropriate weights to be assigned.

Design scoring system

Before rating the alternatives, the team must agree on a scoring system. Determine the scoring range and ensure that all team members have a common understanding of what high, medium, and low scores represent.

Rate the alternatives

For each alternative, assign a consensus rating for each decision criterion. The team may average the scores from individual team members or may develop scores through a consensus-building activity.

Summation of scores

Multiply the score for each decision criterion by its weighting factor. Then total the scores for each alternative being considered and analyze the results.

4. CASE STUDY

4.1 Introduction

These cases discussed in-depth information regarding the causes of time and cost overruns at construction projects in India, also to check the procedures and actions taken by contractors, owners and consultants. Each case will be analysed separating of others, the case will illustrate the link between the data collected by questionnaire and data in case, recommendations will be documented for each case.

In the first stage we developed a questionnaire to assess the perceptions of owners, consultants, and contractors. Factors influencing time and cost overruns in construction projects in India were first examined and identified through a relevant literature review and by conducting a pilot study that sought advice from experienced construction practitioners.

In the second stage of the project we did a case study after carefully selecting and investigating it. This case study will give in-depth information regarding the causes of time and cost overruns at the sites and also check the procedures and actions taken by contractors, owners and consultants.

The case study will be supported with the project management chart and analysing papeded chart along with the actual executed work and reasons for the detail.

4.2 Site details

Description

Gujarat Urban Development Authority has undertaken an extensive program of **Construction of 2016 Dwelling Unit under SEWS housing scheme in various T.P. schemes in the jurisdiction of GUDA Area**. The Construction of involves the major activity of Civil Work, Water supply, Sanitary, Plumbing work & Electrical Works.

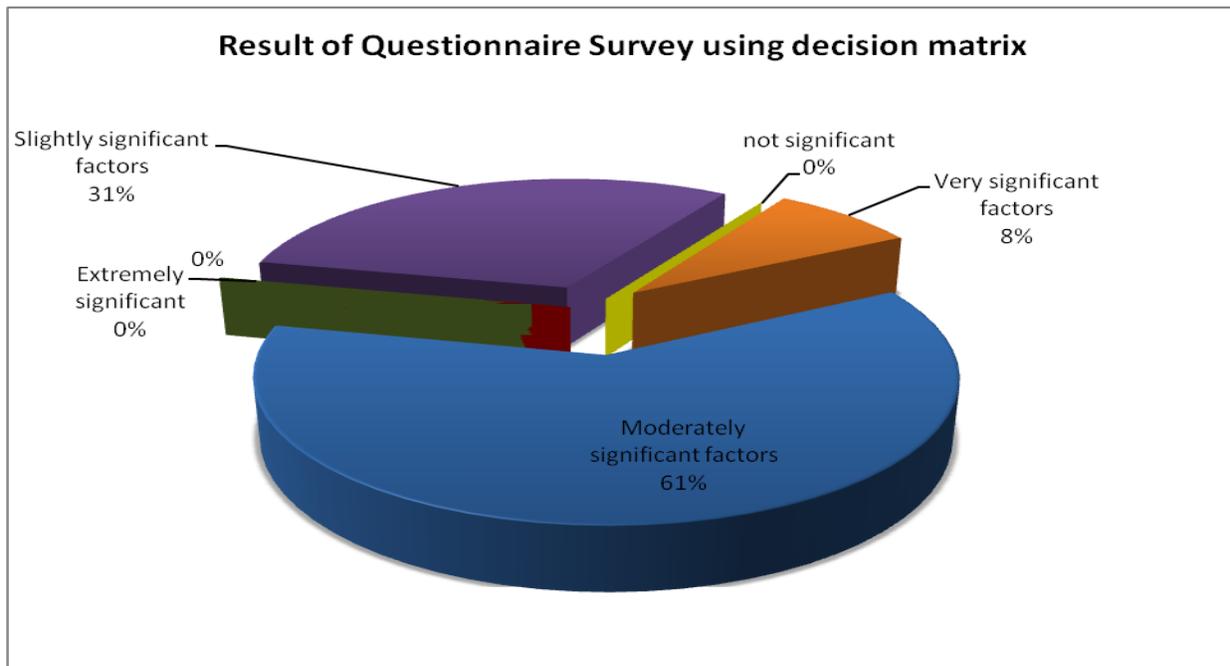
4.2.1 Site Information

- Construction of 2016 dwelling units under SEWS housing scheme.
- Under the observation of GUDA.
- Per flat Built up Area: - 36.75 sq. m.
- No of Units per Floor: - 8
- No of Floors: - G+3
- 7km from railway station.
- Height of building from ground floor to parapet:- 12.49m
- Length of building :- 28.5m
- Breadth of Building :- 15.30m
- Built up Area :- 386.05sq m
- Cost of the Project :- Rs 83,26,80,818/-
- Total no of blocks:- 63 blocks
- The project is divided into three phases - Phase 1, Phase 2, and Phase 3.
- Currently the work in phase 1 has started which is a site of 26.68cr. Sites of phase 2 and 3 are yet to be started.
- The work which is completed till date is of 9 blocks which includes complete sub-structure.

5. RESULT AND DISCUSSION

5.1 Result of Questionnaire Survey using decision matrix

- Using the decision matrix out of 85 factors the following factors were categorized among the moderately significant factors and very significant factors.



(Graph: 1)

Moderately Significant Factors (Greater than 50%)

1. Inappropriate type of contract used (E.g. traditional, design- and- build, etc.).
2. Slow information flow between project team members.
3. Insufficient number of staff (contractor).
4. Finding appropriate sub-contractors.
5. Low productivity and poor distribution of labour.
6. Lack of subcontractor's skills.
7. Poor site management.
8. Equipment and tool shortage on site.
9. Uncompromising attitude between parties.
10. Low harmony between technician team of contractor and consultant which may lead to controversies between both of them.
11. Unethical behaviours used by contractors to make high profit.
12. Dependence on an inexperienced engineer to bear the all responsibilities of the site.
13. Absence of consultant's site staff.
14. Lack of technical and managerial skills of staff which leads to delay in giving instruction.
15. Bad contract management by the consultant.
16. Lack of quality assurance / control.
17. Delays in payment and material approval.
18. Lack of problem discussions.
19. Market reputation of the consultant.
20. Contract modifications (replacement and addition of new work to the project and/or change in the specifications).
21. Owner – initiated variation and/or interference.
22. Unrealistic contract durations imposed by owner.
23. Lack of urgency/priority on part of the owner.
24. High quality of work required.
25. Owner delay in freeing the financial payments.
26. Poor provision of information to project participants.
27. Inadequate managerial skills for all parties.
28. Lack of follow up for the project schedule and absence of continuous tracking.
29. Poor judgment in estimating time and resources
30. Slow inspection and testing procedure used in project.
31. Unclear specifications.
32. Slow drawing revision and distribution.
33. Incomplete drawings.
34. Not using systematic procedures.
35. Delays in design work / lack of design information.
36. Shortage and Delay of material delivery to site.
37. Poor material handling on site.
38. Price escalation of materials and for manpower.
39. Shortage of site workers.
40. Inappropriate overall organizational structure linking- all parties to the project.
41. Mistakes and discrepancies in contract documents.
42. Inappropriate type of contract used.
43. Poor site conditions (location, ground, etc.).
44. Poor economic conditions (currency, inflation rate, etc.).

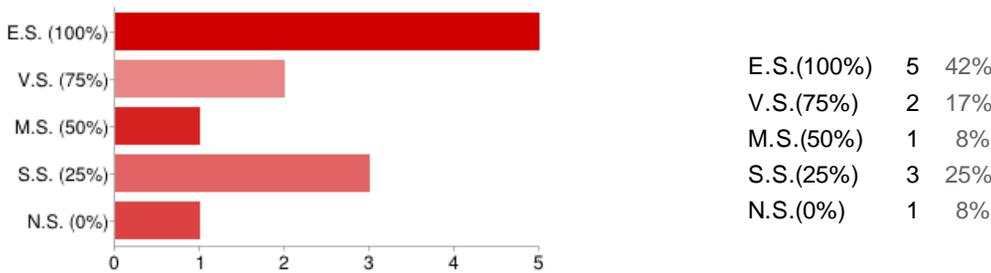
45. Design changes.
46. Lack of coordination at design phase.
47. Additional work at owner’s request.
48. Lack of cost planning/monitoring during pre and post-contract stages.
49. Improvements to standard drawings during construction stage.
50. Delay in construction, supply of raw materials and equipment by contractors.
51. Change in the scope of the project i.e. in government policies, etc.
52. Delay in preliminary handing over of project.

Very Significant Factors (Greater than 75 %)

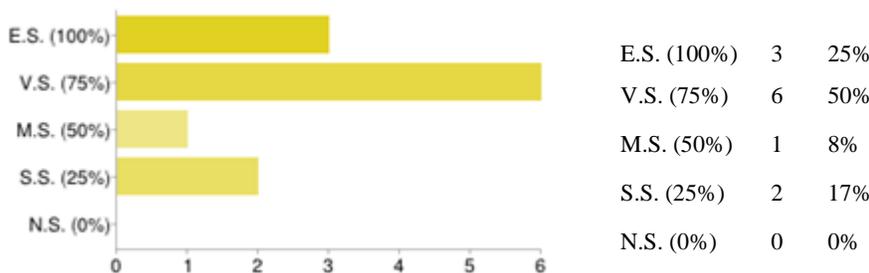
1. Paper work – Recording and Maintenance of data
2. Cash inflow and outflow
3. Inadequate construction planning and decision making
4. Skilled labour shortage
5. Building regulations
6. Bureaucracy in Government agencies
7. Attracting skilful technicians for work

The following graphs shows the very significant factors :- (Graph 2)

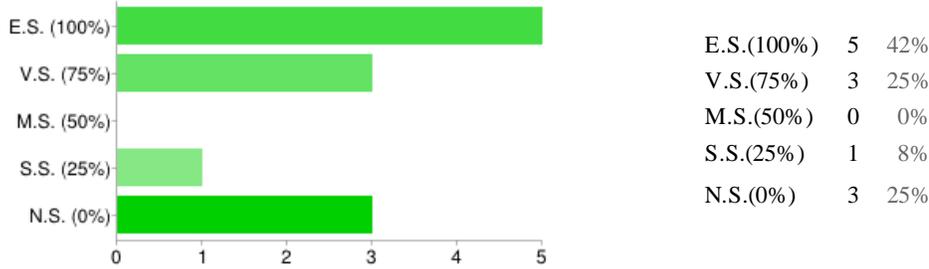
- Paper work – Recording and Maintenance of data



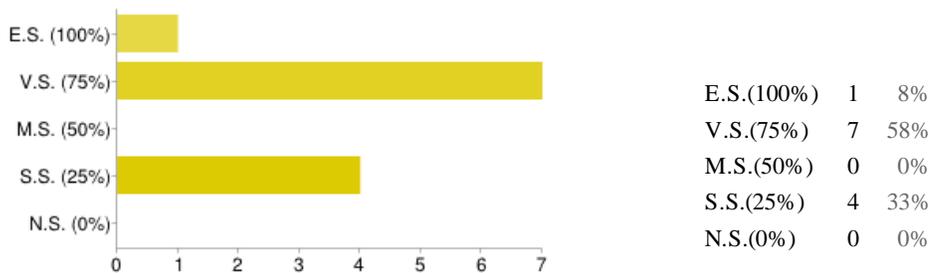
- Cash Inflow and Outflow



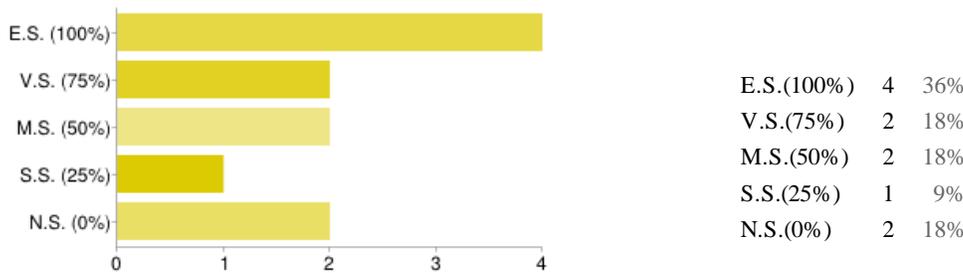
• Inadequate construction planning and decision making



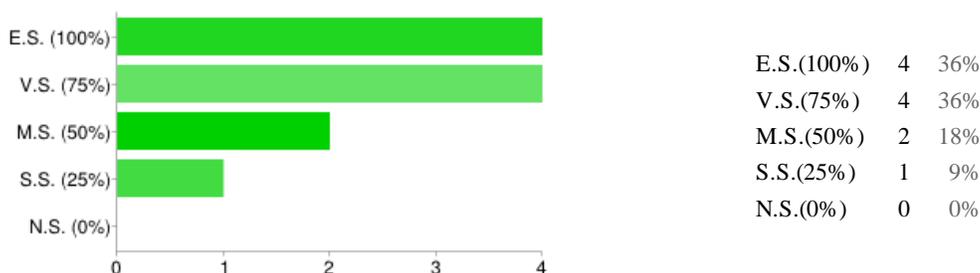
• Skilled labour shortage



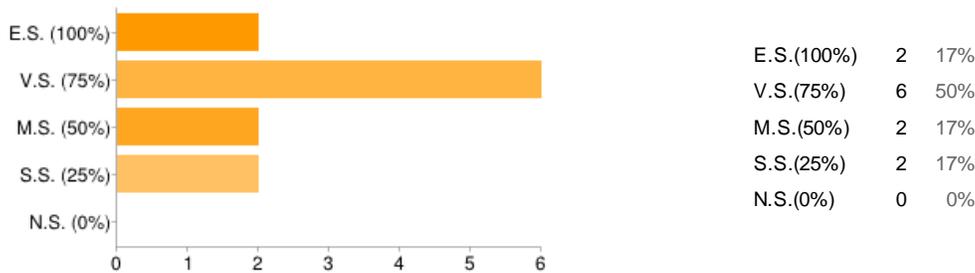
• Building regulations



• Bureaucracy in Government agencies



- Attracting skilful technicians for work



5.2 Cash Flow Analysis

- The complete project is for 18 months .
- The company started with 7% of cost of project as cash in hand for the site activities
- The security deposit for the complete project is 5% of the project cost.
- We have proposed a cash flow analysis data for the company project which would give 16% profit of the cost of project as the end of time limit for the project .

6. CONCLUSION

6.1 Conclusion and discussion

This chapter includes the conclusions and recommendations that would help in solving the problem of delay and cost overruns at construction projects in India. The first objective of this study was to identify variables influencing construction time and cost overruns. The second objective was to evaluate their relative importance. Investigate the collective group perspectives on the relative significance of these factor from owner, consultant, and contractor point view was the third objective. The fourth one was to evaluate the degree of agreement /disagreement regarding the ranking of these factors. The fifth objective was to evaluate the magnitudes of the time delay, and cost increases. The sixth objective was to conduct case study, and the last one was to formulate recommendations to improve construction performance.

According to the questionnaire prepared seven factors which were analyzed as very significant factors. The factors play and important role according to the owners, consultant and contractor point of view. These factors are considered to be the most important factors for any Indian construction project.

Very Significant Factors (Greater than 75 %)

1. Paper work – Recording and Maintenance of data

- This factor plays an important role while analyzing the project details and its characteristics.

2. Cash inflow and outflow

- The amount of money involved in the project is the key for any work to be executed.

3. Inadequate construction planning and decision making

- The steps to be followed while the work of construction and from the first step to the completion is to in the balanced manner between time and costing

4. Skilled labour shortage

- The type of labour determines the speed and accuracy in the work through which the work is appreciated and even the companies reputation is judged.

5. Building Regulation

- The construction work should be into the building regulations as per the government so that there is no problem in the future for the peoples using it.

6. Bureaucracy in Government agencies

7. Attracting skilful technicians for work

6.2 Recommendation

Using the factors which we have analyzed we have proposed the very significant and significant factors which are considerable for the Indian construction projects.

The case study which we have done is for a building construction project of (G+3) floors. The estimated time for the project is 18 months but currently due to some reasons the project has been delayed by 32 days. The reasons of the delays are due to two main reasons. Firstly the work order which was to be issued by the government was delayed by 20 days by them and secondly the mobilization of the skilled labour took 6 days more than the project.

- The number of skilled labour can be judged primarily and the mobilization work should be started early.
- The relationship between consultant ,client and owner should be conducive for the successful completion of project.
- The time duration set for a project should include the days wasted on account of natural calamities, health of labour, accidents or any unavoidable reasons which in turn can cause extension of project.
- The work executed should be upto the mark so that the bills through the government does not stop and the rotation of work continues.
- Delay in technical as well as administrative decisions by the HOD' s of the executing agency.
- Approval of plans/design by a non-technical person (in case the HOD of the project authority is a non technical person).
- Leaving site unattended by senior engineers.
- Off and on visits of Politicians to the sites.
- Day to day monitoring of the site.
- Details of drawing should be freezed before starting the actual work.
- External agencies should be fixed in advance.
- Brought out items should be ordered and finalized in the beginning of job.
- Possession of the complete site should be given to the external agency
- Man power and machinery to be planned properly.
- Raw materials should be well stocked before the incoming of the monsoon season.

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