

Analysis on Causes of Delay in Construction Industry in Pune City

Leena Mali¹, Abhijit Warudkar²

P.G. Student, Department of Civil Engineering, JSPM's Imperial College of Engineering and Research, Pune, India¹

Assistant Professor, Department of Civil Engineering, JSPM's Imperial College of Engineering and Research, Pune, India²

ABSTRACT: Construction delay is a time exceeds either after the contract date or after the date that the components involved have agreed upon for the delivery of the project. In both cases, a delay is usually a costly situation or the period of amount of time during which something is delayed. There is various types of definition of delay are made in construction industry such as to wait until later to do something or to take longer than expected or planned or the amount of time that you must wait for something that is late. Delay are the major source of claim and disputes in construction industry in India. Various delayed analysis methods have been developed, there is a lot of debate was arranged on national and international level for how to minimize delays. This paper has intended to identify the causes of delays, the effects of delays and methods of minimizing construction delays. This paper study has carried out based on literature review and a questionnaire survey. The eighty-three questionnaire has been made on the basis of pilot study, which has been distributed on various construction site. Interview has been taken on each construction sites, also take photos of any ongoing activity on that site. Then ranked on their importance index by the data collection in Pune city. For major factor analysis has used to reduce all factors divided into nine groups: project, clients, consultants, contractors, designer, equipment, labour, external and material.

Recommendation has been made for improve project management, improve cash flow by client so as to reduce payment delays and also more some suggestions are made by top ten major factors, which has been included on report. The result of this paper should help construction practitioners, policy makers and researchers in construction field.

KEYWORDS: construction; delay factors; residential and commercial building; ranking; Pune

I. INTRODUCTION

When project delays are unexpected, they are hardly manageable and have rather negative impacts on the project activities and outcomes. An unexpected delay will extends the overall duration of project activities and entails an increase in project costs. It produces time-associated cost effects that will increase the resource consumption and will require extra time upon reaching project success.

Delays in construction projects risen the displeasure to all the parties involved and the main role of the project manager is to make sure that the projects are completed within the budgeted time and cost. The main purpose of this study is to identify the factors of delays and their effect on project completion. This study takes an integrated approach and attempts to analyze the effect of specific causes on specific effects.

Prevention can be adopting by teamwork which helps in planning and analysing the requirements, which will allow the resources and identifying the risks. The delay is study researched through case studies. These case studies have been taken from live projects in the Pune region. The methodology for these studies takes the all the factors from pilot case studies and make them questionnaires for each project. The analysis and of the data provided for the project is analysed further for each case study. The recommendations for project is given as to what could have been done to recover the delays. Conclusions are based on the project analysed by major causes, which helps to allow better knowledge management in future. The benefit of using methods has already in use in previous studies and use them frequently. Denote of this research has to depicted a common thread in analysis. This study attempted common thread currently use, which assist in delay analysis criteria.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

II. OBJECTIVE

1. To identify the causes of delays in construction industry in Pune region
2. To identify significant factors that causes delays.
3. To analyze collected data which are collected from the previous studies.
4. To give suggestion for minimum of effects of delays for construction projects.
5. To study the differences in ideas of three main stakeholders including clients, contractors and consultants (Focuses on top ten causes).

III. LITERATURE REVIEW

A) Aibinu, A. A. and Jagboro, G. O., "The effects of Construction Delays on Project Delivery in Nigerian Construction Industry", International Journal of Project Management, Elsevier, Vol. 20, pp. 593-599, 2002.

Aibinu and Jagboro (2002) studied the effects of construction delays on project delivery in Nigerian construction industry. The six effects of delay that were identified includes: time overrun, cost overrun, dispute, arbitration, total abandonment and litigation. The major effect on construction delay on project execution, completion cost and time. The main conclusion of this study was model relating delay and actual project duration provide a benchmark for future research work and also facilitate comparison with other countries. This paper studies adopted a scale 0-4 for ranking exercise.

B) Frimpong Y, Oluwoye J, Crawford L, "Causes of delay and cost over runs in construction of groundwater projects in a developing countries; Ghana as a case study". International Journal of Project Management; Vol. 21, pp. 321-326, 2003.

Frimpong conducted a survey to identify and evaluate the relative importance of significant factors contributing to delay and cost overruns in Ghana groundwater construction projects.

A questionnaire with 26 factors was carefully designed from preliminary investigations conducted in groundwater drilling projects between 1970 and 1999 in Ghana.

The questionnaire was directed towards three groups in both public and private organizations: owners of the groundwater projects, consulting offices, and contractors working in the groundwater works.

The questionnaire was distributed to a random sample of 55 owners, 40 contractors and 30 consultants.

The result of the study revealed the main causes of delay and cost overruns in construction of groundwater projects: monthly payment difficulties from agencies; poor contractor management; material procurement; poor technical performance; and escalation of material prices.

C) Koushki.P.A, Al-Rashid.K and Kartam.N. "Delays and Cost increase in the Construction of Private Residential Projects in Kuwait", Journal of Construction Management and Economics, Vol 23, Issue 3, pp. 285-294, 2005.

Regarding cost overrun Koushki (2005) identified three main causes that were contractor related problems, material-related problems, and owners, financial constraints, whereas Wiguna and Scott (2005) identified the most critical factors included as High inflation/increased material price, Design change by client; defective design, Weather conditions, Delayed payment on contracts, Defective construction work. This paper was represents 450 person-interview in survey which include private residential project in Kuwait.

Koushki *et al* states that minimization of time delays and cost overruns in private residential projects would require availability of adequate funds, allocation of sufficient time and money at the design phase, and selection of a computer consultant and reliable contractor to carry out work.

D) MuraliSambasivan, and Yau Wen Soon, "Causes and Effects of Delay in Malaysian Construction Industry", International Journal of Project Management, Vol. 25, pp. 517-526, 2007.

MuraliSambasivan, *et al* studied the delay factors and their impact on project completion in Malaysian construction industry. The study identified ten most important causes of delay from a list of 28 different causes. Ten most important causes of delay were Contractor's improper planning, Contractor's poor site management, Inadequate contractor experience, Inadequate client's finance and payments for completed work, Problems with subcontractors, Shortage in material, Labour supply, Equipment availability and failure, Lack of communication between parties, Mistakes

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

during the construction stage. This paper included 150 respondents participated in survey and identified 10 most important causes of delay from a list of 28 different causes and 6 different effects of delay.

E) *Saleh, H. T., Abdelnaser, O., and Abdul H. P.*, "Causes of delay in construction industry in Libya". The International Conference on Administration and Business, 2009.

According to *Saleh, Abdelnaser and Abdul (2009)*, construction delay is a critical function in construction project and also one of the biggest problems construction firms face in Libya. In this study, the items of contractor's factors that cause delay and gave ranking based on the mean value criteria. And in further analysis they identified the impact of delay in construction projects i.e. loss of interest by stakeholder, blacklist by authorities, waste of money and time and declination of reputation.

F) *Mohamad, M. R. (2010)*. "The factors and effect of delay in government construction project (case study in Kuantan)".

Mohamad M. R. (2010) studies the factors and effects of delay in government construction project. Research indicates that, the most important causes of delay from 45 different causes and 5 different effects of delays. They were cost overrun, rescheduling and rearrangement, litigation, disputes and arbitration.

G) *N.Hamzah, M. A. Khoiry, I. Arshad, W. H. W. Badaruzzaman, and N. M. Tawil* "Identification of the causes of construction delay in Malaysia". International journal of civil, environmental, structural, construction and architectural engineering, Vol. 6, No. 12, 2012.

N. Hamzah et al. was identified 34 causes of construction delay have been determined and 24 have been selected using rasch model analysis. He was identify causes of delay in Malaysian construction industries based on previous research also to illuminate unwanted factors on the basis of rasch model method. He was concluded that the improvement of delay factors is not only limited to technical factors, but also factors from the project management perspective. Both from the processes involved and influence of human attitudes, mentality, skills and behaviour.

H) *Desai Megha, Dr. Bhatt Rajiv*, Birla Vishwakarma Mahavidyalaya, Gujarat, India.

"A methodology for ranking of causes of delay for residential construction project in indian context". International journal of emerging technology and advanced engineering. Vol. 3, March 2013.

This paper was identify 59 causes under nine major groups. Different techniques: Relative importance index and Importance index based on degree of severity and degree of frequency was used. Spearman's rank correlation factor is going to be used to check the accuracy of collected data. Correlation is a relationship measure among different parties or factors and the strength and direction of the relationship. In this research it is used to show the degree of agreement between the different parties. The correlation coefficient varies between +1 and -1, where +1 implies a perfect positive relationship (agreement), while -1 results from a perfect negative relationship (disagreement). It might be said then that sample estimates of correlation close to unity in magnitude imply good correlation, while values near zero indicate little or no correlation. This paper was determined major causes of delay for residential construction projects in Indian context.

I) *Rahul Kolhe, Milind Darade*, "Detail analysis of delay in construction projects". International journal of innovative science, engineering & technology, Vol. 1, Issue 10, 2014.

Mr. Rahul was conducted interviews on various sites with help of questionnaire. The questionnaire divided mainly nine groups are project related delay, owner, contractors, consultants, design, material, equipment, labour, external related delays. He was analysed on survey based that time increases for doing work, increased with cost of project.

Cost overrun and time overrun are the two most frequent effects of delays, which significantly affects on construction projects like loss, expense claims and fluctuation claims.

IV. THEORETICAL CONTENT

According to pilot study of previous data, the type of delay can also have an impact on non-critical activities which need a more detailed analysis to determine whether additional time extension is warranted, or if the reduction of float time can be justified. There are four basic ways to categorize type of delays:

A. Critical or Non-Critical Delays

- i) The project itself
- ii) The contractor's plan and schedule (particularly the critical path)

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

- iii) The requirement of the contract for sequence and phasing
- iv) The physical constraint of the project, i.e. how to build the job from a practical perspective.

B. Excusable or non-excusable Delays

- a) Excusable Delay with Compensation (caused by the owner)
 - i) Delay to furnish and deliver the site to the contractor
 - ii) Change orders by owner during construction
 - iii) Late in revising and approving design documents by owner
 - iv) Delay in approving shop drawings and sample materials
 - v) Poor communication and coordination between parties
 - vi) Slowness in decision making process
 - vii) Unavailability of incentives for contractor for finishing ahead of schedule
 - viii) Suspension of work
 - ix) Conflicts between consultant and design engineer
 - x) Inadequate experience of consultant
 - xi) Lack of working knowledge
 - xii) Lack of consultant's experience
 - xiii) Lack of consultant's site staff experience
- b) Excusable Delay without Compensation (neither the contractor nor the owner fault)
 - i) Unexpected Fire
 - ii) Unexpected suspension
 - iii) Protest from the labour
 - iv) Unexpected whether
 - v) Unexpected of late delivery equipment
 - vi) Unexpected of late delivery material
- c) Non-Excusable Delay (caused by contractor or its subcontractor)
 - i) The usual weather and as expected whether
 - ii) Delay cause by subcontractor
 - iii) The inefficiency of contractor to manage the construction site.
 - iv) The financial of contractor.
 - v) The lack of labour.
 - vi) Failure to manage their work according to the contract schedule.
 - vii) Always make mistake or failure to fulfil of owner specification
 - viii) Lack of high technology
 - ix) Late procurement of material

C. Compensable or non-Compensable Delay

A compensable delay is a delay where the contractor is entitled to a time extension and to additional compensation. Non-compensable delays mean that although an excusable delay may have occurred, the contractor is not entitled to any added compensation resulting from the excusable delay.

D. Concurrent Delay

In analysed concurrent delays, each delay is assessed separately and its impact on other activities and the project duration is calculated. There are some guidelines for concurrent delays classification. Firstly, if excusable and non-excusable delays occur concurrently, only a time extension is granted to the contractor. Next, if excusable with compensation and excusable without compensation delays occur concurrently, the contractor is entitled to time extension, but not to damages.

Identification Of Factor And Group In Construction Delays

The literature review was done through books, conference proceedings, the internet, and engineering journals. The group are includes the contractor, client, consultant, material, labour, equipment, external and financial.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

Causes Of Delay

Total 83 causes of construction project delays were identified from literature or pilot study. Pune is the most industrialized city, thus most construction and consulting companies locate their administrative offices in this city. The survey is based on 16 well recognized construction sites, 60-65 causes are applicable for this region. Causes of delay to which participants were asked to indicate their level of importance of each cause. These causes were categorized into following 9 major groups.

1. Project related factors includes contract duration, legal disputes between various parties, type of project bidding, ineffective delay penalties.
2. Client related factors includes finance and payments of completed work, owner interference, slow decision making and unrealistic contract duration imposed by owners.
3. Contractor related factors includes site management, improper planning, contractor experience, mistakes during construction, and improper construction methods by subcontractors. Contractors are fully responsible for delays caused by subcontractor, because subcontractor included among contractor's factors.
4. Consultant related factors includes experience of consultant, inspection and testing.
5. Designer or consultant related factors includes preparation and approval of drawings, quality assurance or control.
6. Material factors include late procurement of material, shortage of material.
7. Equipment related factors includes equipment availability, shortage of equipment, low level equipment operators.
8. Labour related factors includes shortage, personal conflict, weak motivation, labour productivity.
9. External related factors includes natural disasters, effect of subsurface conditions, traffic control and restriction, provide service from utilities, market inflation.

V. RESEARCH AND METHODOLOGY

There are two methods involved in this process. The first method consisted of literature search for information on causes of delay in other countries. Second method is to identify critical attributes among all nine categories by taking interviews of several sites. To identify most critical factors on the basis of 'Average Index'.

The scope of research included large private residential as well as commercial buildings. Given this scope, questionnaire was distributed to randomly to 30 contractors representing different experience and specialization of contractors working on large project. In this method questionnaire has personally handed over to respondents. This communication method to return of 23 completed questionnaires of contractors.

This phase resulted in the identification of eighty-three (83) causes of delay. The second stage involved the development of questionnaire incorporating the 83 causes of delay identified and data collection. The questionnaire was organized in the form of an importance scale. Four point Likert scaling has used for ranking questions, which helps that have concluded agree levels as shown in Table I. Respondents, were asked to indicate by ticking a column the relative importance of each of the causes of construction delay in terms of 4 = 'Always', 3 = 'Often', 2 = 'sometimes important', 1 = 'Rarely'.

TABLE I. AVERAGE INDEX ANALYSIS

Average Index	Level Of Importance
0<1	Rarely
1<2	Sometimes
2<3	Often
3<4	Always

In data analysis frequent importance index is used for delays. This technique widely used in construction for measuring viewpoints with respect to surveyed variables. From the previous studies several researches used this technique in their analysis. This analysis has to establish relative importance of various factors identify, which is responsible for delays. The score of each factor has calculated by summing up scores given by respondents. Then calculated the ranking of different causes.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

Average Index (AI):

$$AI = \frac{\sum (1X_1 + 2X_2 + 3X_3 + 4X_4)}{4(X_1 + X_2 + X_3 + X_4)} \quad (1)$$

Where,

X_1 = Number of respondents for rarely

X_2 = Number of respondents for sometimes.

X_3 = Number of respondents for often.

X_4 = Number of respondents for always.

Questionnaire Design

It is related to general information for both the company and respondent. Both the contractors and consultants were further requested to answers of their experience in the construction industry. In this stage both contractors and consultants can take opinions about the project which have been already started and that they have experienced. It is related to the causes of construction delays. It is classified into owner, contractor, consultant, materials, and equipment, labour and external factors. Questionnaire design consists of effects of construction delays on project and for recovery to minimize these sever delays. Thirty questionnaire were distributed in survey, response rate has 76%.

VI. VISIONARY SCENARIO

The visionary scenario describes the same work effort addressed in the problem scenario, with modifications made, based on the identified target technologies. The followings is the visionary scenario that was developed in the Conceptualization Phase. Suitable modifications were made to the scenario during implementation or mitigation phases.

Scenario 1: Retrieve & Review

Situation: The surveyor, is sitting and preparing all the causes of construction delay from literature review. The surveyor is now looking at a summary of other country or other states construction companies, which includes information about sever causes of delays of that particular region. He can also retrieve last reports from this summary.

The surveyor checks from summary report to determine what he will need and which type of data required to use for this survey on site. He finds that he needs all factors are in questionnaire form to take interviews of this site.

Scenario 2: Prepare for surveying

Situation: Surveyor is taken with all questionnaire forms for each site. He is reminded that he needs after all questionnaires are filled project manager has to take information about project type and also share his experience also.

Scenario 3: Goes to construction site with questionnaire form, which divided into nine major groups. The data were collected from following companies as shown in Table no. II.

TABLE II. NAMES OF COMPANIES

Sr.No.	Name Of Company
1.	Goel Ganga Developments
2.	Millenium Engineers and Contractors Pvt. Ltd.
3.	Urbanfracon Augusta (Contractor)
4.	Landmark Construction Solution
5.	Sintex Industries Ltd.
6.	S. S. infra technologies Pvt. Ltd.
7.	Prime Builders and Developers (Contractor)
8.	Yashraj Properties (Contractor)
9.	Yashraj Infrastructure Nirman (Contractor)
10.	Yashrajinfrotech (Contractor)
11.	Maniratna Builders (Contractor)
12.	Sahayog Builders (Contractor)
13.	Verma Developers
14.	Sancheti Associates Pvt. Ltd.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

Scenario 4: At site office

Situation: For collecting data surveyor goes to construction site and takes interviews to project manager. If he has possible to take all nine groups interview for making accurate current condition such as contractor, client, designer, labour, consultant etc. He takes photos of construction sites.

He selects the commercial as well as residential sites. Surveyor has compared with last summary previous construction report of Pune region taking either from pilot study or from face to face interviews. He moves to the next site of construction. If he goes captured same thing for other construction sites that requires recommendation and suggestion will minimize delay. Table no III. Shows respondents details which includes name of site, respondents name and his experience.

TABLE III. RESPONDANTS DEALS

Sr. No.	Site Name	Respondant's Name	Experience(Yrs.)
1	Ganga Platino	Mr.SanjeevGaikwad	20
2	World Trade Center	Mr.NasirPathan	17
3	Augusta	Mr. Pankaj Zope	12
4	Industrial civil work	Mr. Shushrut Patil	20
5	Prefabricated structures	Mr. Shushrut Patil	20
6	Prefabricated structures	Mr. Shushrut Patil	20
7	Mount & Glory	Mr. JayprakashGawade	17
8	Fortune House	Mr. Dinesh Soni	20
9	YashrajBahar	Mr. Sameer Kumbhar	8
10	Yashraj properties	Mr. Sachin Bhalerao	10
11	Yashraj infrastructure	Mr. RushikeshUndre	7
12	Yashrajinfrotech	Mr. YogeshJagtap	7
13	Yashraj infrastructure	Mr. Sunil Botre	15
14	ManiratnaGagan	Mr. Rakesh Undre	8
15	Yashraj Green Castle	Mr. Sunil Wakure	9
16	Dream Valley	Mr. Sunil Wakure	9
17	Sahyog Builders	Mr. RushikeshUndre	7
18	Yashraj Height	Mr. Sameer Kumbhar	8
19	Yashraj Avenue	Mr. Rakesh Undre	8
20	Maniratna developers	Mr. Rakesh Undre	8
21	Polaris	Mr. DattaSurunge	5
22	Castle Royal	Mr. Bhandari	15
23	Marvel Landmark	Mr. Suresh Pisal	10

Scenario 5: Generate Report

Situation: Surveyor now done with data collection work from site. He apply methodology from pilot study. He makes formula which could be suitable for their data. He select top ten causes from their severity index. He has make recommendation based on ranking factors of Pune city. Surveyor also reviews the respondent comments which has considered at time of conclusion and recommendation. He has finally makes with final report.

Research findings and results -

Researcher taken interviews from 16 respondents, questionnaires has been collected.

Significant causes of delay -

Average index was employed to rank the significant causes of delay. All the parties contributed to rank the significant factors of delays. The result in Table IV Ranking of delay, shows that the top 10 major causes of construction delays in Pune, Maharashtra, India are shortage of labours rank of 0.793 followed by site mobilization, permits from municipality, poor qualification of contractor's technical staff, delay in manufacturing building materials, providing services from utilities (water and electricity etc.), damage of sorted materials.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

TABLE IV. RANKING OF DELAY

Sr. No.	Questions	Group	Average Index	Rank
1	Frequent change of sub-contractors	Contractor	0.761	4
2	Poor qualification of the contractor's technical staff	Contractor	0.772	3
3	Delay in site mobilization	Contractor	0.793	2
4	Late in reviewing and approving design documents by consultant	Consultant	0.707	10
5	Damage of sorted material while they are needed	Materials	0.717	8
6	Late procurement of materials	Materials	0.728	6
7	Lack of high-technology mechanical equipment	Equipment	0.717	7
8	Shortage of labours	Labour	0.793	1
9	Delay in providing services from utilities (such as water, electricity)	External	0.707	9
10	Market inflation	External	0.739	5

The result is shown in Figure 1 Average Index versus Causes of Delay as below. The highest rank is of shortage of labours whereas frequent change of subcontractor is on the lowest rank.

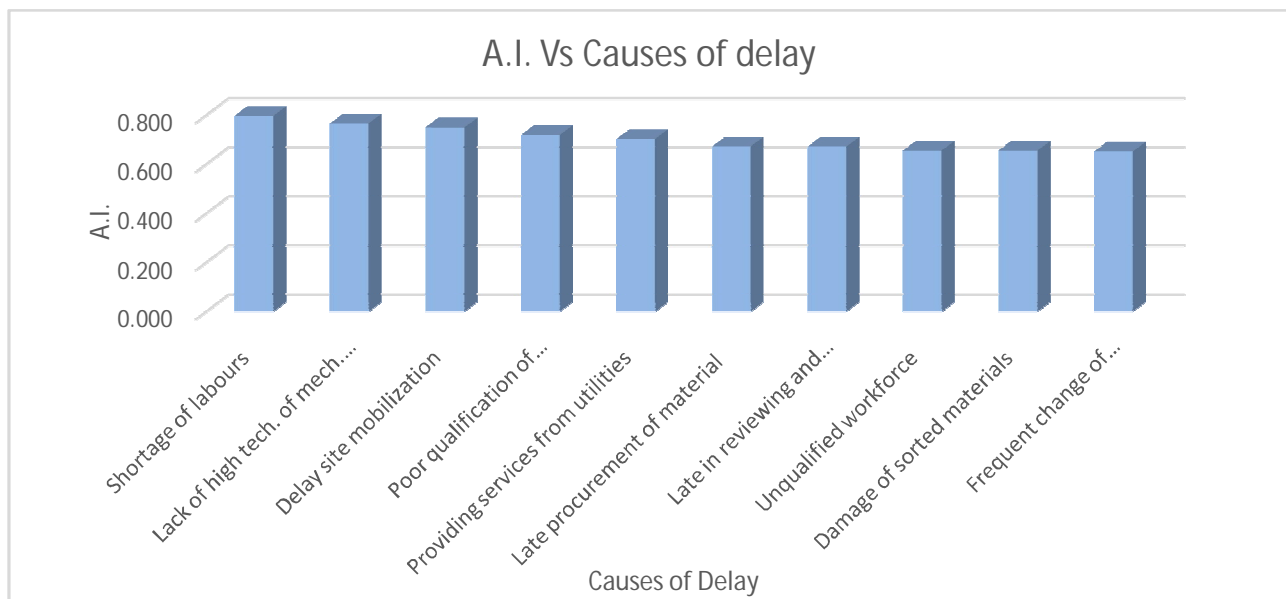


Fig. 1 Average Index (A.I.) vs Causes of Delay

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

VII. POSSIBILITIES AND LIMITATIONS

1. In construction site, busy scheduled of project manager should be take this type of interviews casually, which is directly affect on project performance or final result.
2. The study has been done on small scale and may not represent the entire universe.
3. It has some data based on the expressed opinion of the fellow employees obtained through questionnaires, which may be arbitrary.
4. The respondent's interest varies in answering the questionnaire, as it may be an interruption to their regular work.
5. The scope of study is restricted to residential and commercial construction projects only.

VIII. CONCLUSION AND RECOMMENDATION

Conclusion

The objectives has achieve through analysis of interview out comings. The survey results indicated that the majority of delay factors are relevant to contractor and material. Most factors related to consultant it is due to not understanding the client necessities, not having proper project information, absence of some detail in drawing etc. It is examine from survey due to contractor that mostly delay occur because of shortage of labours. In other factors due to which delay occurs are project conditions like site mobilization, complexity, complication in work due to weather. Delay also occurs due to external factor like change in government, regulation and location, unqualified of labours etc.

The all ranking indices explained earlier were used to rank delay causes from viewpoints of the nine groups. Total 23 respondents participated in this survey. Top 10 causes ranked by Relative Importance Index (RII) technique or Average Index. The average index, was computed for each cause to identify the most significant causes. The causes were ranked based on Average Index values. From the ranking assigned to each cause of delays.

Figure 2 shows result of Average Index verses major nine group. This figure shows result with respective to major nine group. The material bar having rank 0.697, which is higher than other groups. It means material related factors has more severe than other groups.

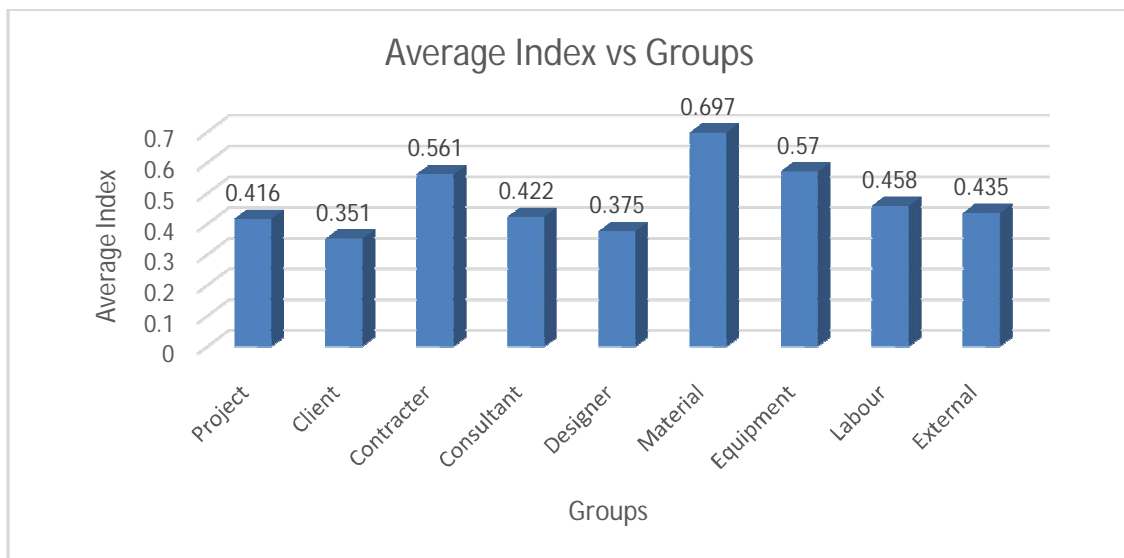


Fig. 2 Average Index vs Groups

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

Recommendation

In construction industry it is necessary to find weaknesses of particular task and to solve overcome them. To minimize and control delays in construction projects, the following issues can be recommended by all parties:

Shortage of labour- According to take interviews, shortage of labour due to late delivery of materials. If material reached at site late, work may start late, so the labour should take leave for day on that site and go to another site for work. This will affect on schedule also make lack of manpower. Another reason is that delay payments of subcontractors, if subcontractors payment is not regular then he should not make payment of labours. Also for small works they can use the small equipment to replace some manpower so that instead of doing work manually machine can do work faster. A financial incentive should be given to employee, should create competition among employees.

Lack of high technology equipment- For small project they used small equipment and lower quality machines, another reason is used unskilled labour may not manage new machines. Lack of knowledge of equipment influence construction delay.

2. Late procurement of material- Extra attention is required on quality of construction materials. Because using suitable materials reduces time taken to finish the work and wastage of materials. Construction materials has a positive effect on work and thus reduce shortage of labours can be achieved.

Damage of sorted material- lack of needful area for storage of material on construction site should affect on quality of material.

3. Improve the knowledge and skills of technical staff - For small project or short time period project they used unskilled labour at low cost. So that they don't attain features of new technology equipment.

4. Improve site management and supervision to achieve completion of work within specified time. In construction site should make sure that there is enough lighting present at night concreting or any other work. Which can reduce number of accidents may reduce delay. Change orders and design should be avoided. These factors may be costly and time consuming. Which affect on construction activities that already has been scheduled. The work sequences may be disturbed.

5. Late reviewing and approving design documents- complex design and incomplete drawings should be avoided. Managing specialist design and drawing approval. They may wish to appoint a design coordinator to be responsible for this.

6. Site mobilization- Activation of a contractor's physical and his resources for transfer to a construction site until the completion of the contract. The mobilization such as office, equipment, labour, vehicles, computers etc.it is that activity carried out after client, which has appointed contractors, the majority of these activities are manage by construction manager.

General Recommendation for minimizing construction delays-

For minimization of delays in construction projects general some following points should be recommended for main stakeholders such as clients and contractors and consultants.

1. Get early warning of delays caused by the client, main contractor or people-

Client delays arise because they may change their minds, give instructions too late or are slow in approving drawings. They tend to overlook the fact that these delays push back the start for contractors and that the contractor is powerless to avoid these delays. Main contractor delays usually involve construction work being completed late, causing subsequent stages to fall behind schedule. In some cases, delays are the result of mismanagement and a lack of coordination. Last but not least, the contractor himself may cause delays, for example by under-resourcing the project in the early stages or by not completing design drawings and getting them approved on time.

2. Make sure the client knows when he should be responsible cause of the delay-

Clients can have selective memories. When they make design changes, issue late instructions, or are slow in approving designs, they need to realize that there is a cumulative effect. Delays cost money, typically the contractor's money. Make the client aware of the effect their actions have on the completion of project stages. Say something like, "Mr Client, I am happy to implement these changes, but I need to point out that we need to reorder equipment and get approvals, both of which will take time." Put it in writing, and have the client acknowledge receipt.

3. Freeze design changes at a certain point to allow time for procurements and approvals-

When there is a fixed deadline there is a "point of no more changes." Too often the sub-contractor is held accountable. So avoid in this type of position.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 8, August 2016

4. Carefully monitor the work done by the earlier contractors-

Make sure delays outside control are recognized and documented. Such delays can impact on financially and need to be recorded and the financial impact issue with by the responsible party. Contractors should not have to bear the cost of others people delays, nor should be blamed for them.

5. Carefully monitor on what the team is doing that may cause delays-

Typical examples include starting late, submitting drawings late, and making blame on contractor's drawings. Where particular team is at fault, contractors will have to absorb the costs and try to make good the delays. When contractors talking about errors, people will more ready to accept your claims when problems arise that are not contractors fault.

6. Mitigate the impact of the delays-

Whatever the cause of the delay, contractors must try to recover the position and should try to accelerate work. After all, if a critical date is missed, it may not contractors fault, the client is responsible for that fault.

7. Manage an entire project efficiently-

This means contractors must have great working relationships with reliable and talented subcontractors. Obtain references of other clients completed projects. Visit former clients and ask them about their experiences, including how he was to work, about able to maintain a schedule.

8. Responsibilities of Contractors-

Contractors should know that, his responsibilities relate to project work. He should able to engage all subcontractors, obtain permits, schedule construction activities, monitor construction quality and pay everyone. He should report to client on a timetable that he agree upon. Arranging necessary road closures and restrictions, diversions of services and connections necessary for the works to be carried out.

Future work

The application of scheduling techniques, either conventional or advanced IT based. The use of the powerful software packages which are currently available can be used to plan and monitor projects with greater ease than was previously possible. This software will spending considerable sums of money and would be justified that all the conditions of a contract would require a schedule to be part of the contract documents and regular updating would also be required. Also, it could be used to manage the schedules required for a project as well as to create a visual communications medium.

Summary

The paper intended that major causes of delay for residential and commercial construction projects in Indian context. From the based on pilot study, from interview of respondents, eighty-three causes were identified under nine major group. The methodology is showed that to identify critical causes from existing technique of relative important index. The questionnaire were distributed on each construction site. Further questionnaire collected has identify ranking of sever causes of delay.

REFERENCES

- [1] Assaf, S. A., M. Al-Khalil, and M. Al-Hazmi, "Causes of Delay in Large Building Construction Projects", Journal of Management In Engineering, Vol. 11, Issue No. 2, pp. 45-50, 1995.
- [2] Kaming, P.F., Olomolaiye, P.O., Holt, G.D., and Harris, "Factors influencing construction time and cost overruns on high rise projects in Indonesia", Journal of Construction Management and Economics, Vol. 15, Issue no. 1, pp. 83-94, 2005.
- [3] Mezher, T.M. and Tawil, W. (1998) Causes of delays in the construction industry in Lebanon. Engineering, Construction and Architectural Management , Vol. 5, Issue No. 3, pp. 252-260, 2005.
- [4] Al-Momani, A.H., "Construction delay: a quantitative analysis", Journal of ProjectManagement, Vol. 18, pp. 51-59, 2000.
- [5] Aibinu, A. A. and Jagboro, G. O., "The effects of Construction Delays on Project Delivery in Nigerian Construction Industry", International Journal of Project Management, Elsevier, Vol. 20, pp. 593-599, 2002.
- [6] Frimpong Y, Oluwoye J, Crawford L, "Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study", International Journal of Project Management, Vol. 21, pp. 321-326, 2003.
- [7] Koushki.P.A, Al-Rashid.K and Kartam.N, "Delays and Cost increase in the Construction of Private Residential Projects in Kuwait". Journal of Construction Management and Economics, Vol. 23, Issue No. 3, pp.285-294, 2005.
- [8] Assaf, S.A. and Al Hejji, S., "Causes of delay in large construction projects". International Journal of Project Management, Vol. 24, pp. 349-357, 2006.
- [9] MuraliSambasivan, and Yau Wen Soon, "Causes and Effects of Delay in Malaysian Construction Industry", International Journal of Project Management, Vol. 25, pp. 517-526, 2007.
- [10] Ghulam Abbas Niaza and KassimGidado, "Causes of Project Delay in the Construction Industry in Afghanistan",EPPM2012, University of Brighton UK,pp. 12-15, 2012.