ANALYSIS OF CAUSES OF DELAY IN ANY CONSTRUCTION PROJECT

Vidya M. Patil¹, Aniket M. Undale², Govinda M. Singh³, Sangram S. Patil⁴, Sushant T. Sathe⁵ and Vaibhav H. Pisal⁶

¹Asst.professor, Civil Department, Annaasaheb Dange College of Engineering and Technology, Ashta
²,³,⁴,⁵,⁶B.E scholar, Civil Department, Annaasaheb Dange College of Engineering and Technology, Ashta

Abstract—Construction industry is one of the most important industries in the India. Construction sector gives the contribution to build up the social, cultural and economic development of the country. But now a day’s delay for the construction projects has become the main threat to all developments related to this sector. These delays are common in all types of construction project. Although these delays can’t be avoided as they contribute different scales, they can be minimized by previously knowing them and taking necessary precautions. The study was mainly focused to find out the major causes contributing to delay in construction and to give the remedial measures to minimize them. Total 36 causes were found by previous studies. The survey was carried out by distributing questionnaire to the various parties of construction such as contractor, consultant and owner. The collected data obtained from the questionnaire survey was analyzed by using relative importance index and the major factors were ranked according to their contribution to delay.

Keywords—Construction projects, Causes of construction delay, Questionnaire survey, Relative importance index, Construction industry

I. INTRODUCTION

Most of construction projects suffer delays. The effects of these delays may be of considerable magnitude on the efficiency of the project. It is possible to reduce these delays through recognition of their real causes. Definitions of delays in construction can be presented in several ways. Delay could be defined as the time overrun beyond the accomplishment time in the agreement or beyond the time the contract parties agree upon for the delivery of the project (S. Assaf and S. Al-Hejji, 2006). Also it can be defined as the distinction between the real finish date and the estimated date (S. Faradi, and S.M. El-Sayegh, 2006). Also it is defined as the period during which the project or part of it has been extended or not completed due to unexpected conditions (B. Bramble and M. Callahan, 1987). Therefore the delay in construction project can be expressed as the time overrun or extension of time behind the date agreed upon by the contract parties. Construction delay is a worldwide incidence in the construction industries, which is generally related to overrunning cost and time. Construction delays have an adverse impact on the project sponsor, client, project team member and participant involved in the entire project, which frequently result to disagreement, suspicion, financial problem and claims, lawsuit, and renegotiations (Megha and Bhatt 2013).

Although the Indian construction industry has gained far more importance in recent times because of opening up of Indian markets and the arrival of megaprojects for infrastructure development, the performance of Indian construction projects. A study conducted by Infrastructure and Project Monitoring Division of Ministry of Statistics and Programme Implementation reports that out of 646 central sector projects (which are of order of more than $4.45 million) Costing around $50 trillion and average project duration of 6 to 7 years, about 40% are behind schedule and the delay ranges from 1 to 252 months (http://www.mospi.nic.in).

II. OBJECTIVES

1) To investigate the major causes of delay in building construction.
2) To investigate the effects of construction projects delay.
3) To suggest the possible ways of minimizing the delay in project.
III. LITERATURE REVIEW

In 2002, Abadalla M. Odeh, Hussien T. Battaineh carried out the study for finding the most important causes of delay in construction project with traditional type contract from the viewpoint of construction contractors and consultants. Results of this survey indicate that contractor and consultant agreed that owner interference, inadequate contractor experience, financing and payment, labour productivity, slow decision making, improper planning, delay due to subcontractor are among the top ten most important factors (Abadalla M. Odeh, Hussien T. Battaineh, 2002).

In 2011, N. Hamzah, M.A. Khoiry, I. Arshad, N. M. Tawil and A. I. Che Ani studied the delay that happened in public higher learning institution that conducted by Ministry of Higher Education. A numbers of cases are recorded. Recent case is at main campus of University Malaysia Kelantan and second case of delay is a construction of research complex in National University of Malaysia, Bangi. Both cases are experienced delay. They stated that delays give increase to disturbance of work and loss of productivity, late completion of project increased time related costs, and third party claims and abandonment or termination of contract. It is important that general management keep track of project progress to reduce the possibility of delay occurrence or identify it at early stages (N. Hamzah, M.A. Khoiry, I. Arshad, N. M. Tawil and A. I. Che Ani, 2011).

M. E. Abd El-Razek; H. A. Bassioni; and A. M. Mobarak studied the causes of delay in building construction projects in Egypt in 2008. In their study they stated that “Financing by contractor during construction” was identified as the top cause of delay by both the owner and consultant. The view of the consultant can be considered as an intermediate result with a degree of impartiality. Furthermore, the contractor results identified this cause as the third most important, and the first within his responsibility. These results show how this cause can greatly affect a project delay and suggest the importance of using cash flow analysis, based on a realistic schedule on the project level, within the whole contractor organization to coordinate cash requirement among projects (M. E. Abd El-Razek; H. A. Bassioni; and A. M. Mobarak, 2008).

IV. RESEARCH METHODOLOGY

The research methodology for the present study included the two stages which are primary data collection and secondary data collection. The primary data collection included collection of information from personal investigation, questionnaire survey, interviews of various respondents. The primary data was collected through survey by making use of questionnaire and interviews of respondents. The questionnaires were given to the respondents who were supposed to fill the questionnaire and return it back.

In the secondary data collection, the data is collected from already published, analyzed work of other researchers or people. Therefore this information was used to support the current study or findings. In this study secondary data was collected through online journals, published articles, books and internet websites. The analysis of the collected data from the questionnaire was carried out on Likert scale as less important, medium important, high important, and very high important. Then by using Relative Importance Index (RII), rank of the causes contributing major delays in the construction was found out.

V. QUESTIONNAIRE DESIGN

Questionnaires used for the survey were consisting of selected causes of the construction delay from the previous literature. In order to quantitatively confirm the causes of construction delay obtained from the previous literature , questionnaire were designed for contractor, consultant and the stack holder of the survey may keep themselves apart from the contribution to cause delay to construction, so the different questionnaires were designed for contractor, consultant and owner. Each cause was measured on the Likert scale of four points as less important, medium important, high important, very high important.
VI. DATA ANALYSIS

Data analysis of the questionnaire is to find out the importance of each cause of construction delay, its effects on the construction and the possible ways to minimize the construction delay. The analysis of data obtained is done by using index called as Relative Importance Index (RII). Data analysis consists of following:

1) Calculation of relative importance index of each cause –Relative Importance Index (RII) is calculated by using following formula as

\[ RII = \frac{\sum W}{A \times N} \]

Where,
- RII = Relative Importance Index
- W = Weight given to each cause by respondent (1 – 4)
- A = Highest weight (i.e. 4)
- N = Total number of respondents

2) Ranking of causes of delay depending upon the Relative Importance Index (RII).

VII. RESULT AND DISCUSSION

Table (1), table (2) and table (2) show the factors causing delay in the construction projects with their importance index and the ranking of each factor according to their Relative Importance Index.

As shown in table no (1), according to contractor’s point of view; first important factor of delay is “Shortage of labour” which has Relative Importance Index (RII) as 0.977. The second important factor is “Unrealistic contract duration” which has RII as 0.955. Third ranked factor of delay is “Slow permits by government or municipality” with the importance factor as 0.932. According to consultant’s point of view as shown in table (2), first important factor is “Shortage of labour” with an importance index (RII) of 0.942 points. Second importance factor is “Delay in payment by owner” with an importance index of 0.846 and the third importance factor is “Shortage of construction material in market”with an importance index 0.808. According to owner’s point of view “Improper labour management”, “Complexity of design”, “Shortage of labour” are top three importance factors with an importance index of 0.955 points.

Table 1- Ranking factor by contractor’s point of view

| NO. | Delay Causes                          | RII Value | Rank |
|-----|--------------------------------------|-----------|------|
| 1   | Inadequate experience of consultant   | 0.818     | 10   |
| 2   | Delay in producing design documents  | 0.795     | 11   |
| 3   | Unclear details in drawing           | 0.568     | 21   |
| 4   | Complexity of design                 | 0.841     | 9    |
| 5   | Redesigning/ changes in original design | 0.886    | 7    |
| 6   | Delay in giving instructions         | 0.591     | 20   |
| 7   | Delay in payment by owner            | 0.886     | 6    |
| 8   | Change in order by owner during construction | 0.614 | 19 |
| 9   | Slow decision making by owner        | 0.705     | 14   |
| 10  | Suspension of work by owner          | 0.864     | 8    |
| 11  | Unrealistic contract duration        | 0.955     | 2    |
| NO | Delay Causes                                                                 | RII Value | Rank |
|----|------------------------------------------------------------------------------|-----------|------|
| 12 | Poor communication of owner with contractor                                  | 0.500     | 23   |
| 13 | Delay in material delivery                                                   | 0.659     | 17   |
| 14 | Shortage of construction material in market                                  | 0.727     | 13   |
| 15 | Shortage of equipment                                                        | 0.682     | 16   |
| 16 | Low efficiency of equipment                                                  | 0.477     | 25   |
| 17 | Shortage of labours                                                         | 0.977     | 1    |
| 18 | Effect of Subsurface conditions (Water table, hard rock)                     | 0.409     | 26   |
| 19 | Accidents during construction                                                | 0.636     | 18   |
| 20 | Slow permits by government/ municipality                                     | 0.932     | 3    |
| 21 | Unavailability of utilities at site (water, electricity)                     | 0.705     | 15   |
| 22 | Changes in government regulations / laws                                     | 0.909     | 4    |
| 23 | Legal disputes between various parties                                       | 0.773     | 12   |
| 24 | Corruption                                                                   | 0.886     | 5    |
| 25 | Inaccessibility of site                                                      | 0.545     | 22   |
| 26 | Bad weather condition                                                        | 0.500     | 24   |

Table 2- Ranking factor by consultant’s point of view

| NO | Delay Causes                                                                 | RII Value | Rank |
|----|------------------------------------------------------------------------------|-----------|------|
| 1  | Rework due to error during construction                                       | 0.365     | 30   |
| 2  | Improper construction method followed by contractor                          | 0.500     | 29   |
| 3  | Inadequate supervision by contractor                                          | 0.635     | 23   |
| 4  | Ineffective planning and scheduling by contractor                            | 0.769     | 7    |
| 5  | Less experience of contractor                                                 | 0.712     | 10   |
| 6  | Contractors work load                                                        | 0.673     | 16   |
| 7  | Frequent changes in sub-contractors                                           | 0.673     | 19   |
| 8  | Improper labour management                                                   | 0.615     | 24   |
| 9  | Improper material management                                                  | 0.577     | 26   |
| 10 | Less experience of technical staff of contractor                             | 0.635     | 22   |
| 11 | Delay in payment by owner                                                    | 0.846     | 2    |
| 12 | Change in order by owner during construction                                 | 0.692     | 13   |
| 13 | Slow decision making by owner                                                | 0.712     | 12   |
| 14 | Suspension of work by owner                                                  | 0.692     | 14   |
| 15 | Unrealistic contract duration                                                 | 0.673     | 18   |
| 16 | Poor communication of owner with contractor                                  | 0.500     | 28   |
| 17 | Delay in material delivery                                                   | 0.788     | 4    |
| NO | Delay Causes                                                                 | RII Value | Rank |
|----|------------------------------------------------------------------------------|-----------|------|
| 18 | Shortage of construction material in market                                  | 0.808     | 3    |
| 19 | Shortage of equipment                                                         | 0.692     | 15   |
| 20 | Low efficiency of equipment                                                   | 0.538     | 27   |
| 21 | Shortage of labours                                                          | 0.942     | 1    |
| 22 | Effect of Subsurface conditions (Water table, hard rock)                      | 0.635     | 20   |
| 23 | Accidents during construction                                                 | 0.673     | 17   |
| 24 | Slow permits by government/ municipality                                      | 0.788     | 5    |
| 25 | Unavailability of utilities at site (water, electricity)                      | 0.712     | 11   |
| 26 | Changes in government regulations / laws                                       | 0.769     | 6    |
| 27 | Legal disputes between various parties                                        | 0.712     | 9    |
| 28 | Corruption                                                                    | 0.577     | 25   |
| 29 | Inaccessibility of site                                                       | 0.731     | 8    |
| 30 | Bad weather condition                                                         | 0.635     | 21   |

Table 3- Ranking factor by owner’s point of view

| NO | Delay Causes                                                                 | RII Value | Rank |
|----|------------------------------------------------------------------------------|-----------|------|
| 1  | Rework due to error during construction                                       | 0.864     | 8    |
| 2  | Improper construction method followed by contractor                           | 0.818     | 10   |
| 3  | Inadequate supervision by contractor                                          | 0.773     | 14   |
| 4  | Ineffective planning and scheduling by contractor                             | 0.636     | 20   |
| 5  | Less experience of contractor                                                 | 0.727     | 18   |
| 6  | Contractors work load                                                         | 0.932     | 4    |
| 7  | Frequent changes in sub-contractors                                           | 0.568     | 22   |
| 8  | Improper labour management                                                    | 0.955     | 1    |
| 9  | Improper material management                                                  | 0.818     | 12   |
| 10 | Less experience of technical staff of contractor                              | 0.591     | 21   |
| 11 | Inadequate experience of consultant                                           | 0.500     | 27   |
| 12 | Delay in producing design documents                                           | 0.773     | 13   |
| 13 | Unclear details in drawing                                                    | 0.864     | 9    |
| 14 | Complexity of design                                                          | 0.955     | 2    |
| 15 | Redesigning/ changes in original design                                       | 0.750     | 17   |
| 16 | Delay in giving instructions                                                  | 0.545     | 23   |
| 17 | Delay in material delivery                                                    | 0.705     | 19   |
| 18 | Shortage of construction material in market                                   | 0.818     | 11   |
| 19 | Shortage of equipment                                                         | 0.886     | 7    |
|   | Low efficiency of equipment | 0.568 | 24 |
|---|----------------------------|-------|--|
| 21 | Shortage of labours        | 0.955 | 3  |
| 22 | Effect of Subsurface conditions (Water table, hard rock) | 0.545 | 25 |
| 23 | Accidents during construction | 0.500 | 25 |
| 24 | Slow permits by government/municipality | 0.773 | 15 |
| 25 | Unavailability of utilities at site (water, electricity) | 0.500 | 29 |
| 26 | Changes in government regulations/laws | 0.886 | 5  |
| 27 | Legal disputes between various parties | 0.727 | 16 |
| 28 | Corruption | 0.886 | 6  |
| 29 | Inaccessibility of site | 0.545 | 26 |
| 30 | Bad weather condition | 0.386 | 30 |

### VIII. CONCLUSION

The study focused on finding the major causes of construction delay. Total 36 causes of delay were selected based upon the literature study. Based on these selected causes questionnaires were formed for contractors, consultants and owners separately and distributed to them. The results were analysed using Relative Importance Index (RII) and causes were ranked by contractor point of view, consultant point of view and owner point of view.

According to contractor’s point of view “Shortage of labour” is most important factor causing construction delay. Also according to consultant’s point of view “Shortage of labour” is the most important factor for delay. And by owner’s point of view “Improper labour management” is most important factor of delay. So the most important factors of delay according to all three stockholders of survey are related to “Labours”.

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