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# Analytical Study on Factors Affecting Scheduling of Multiple Projects

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***Abstract*—In this research an attempt has been made to find out the basic practical approach used on Construction site for handling the Multiple Project and also the crucial factors related to Multi Project Scheduling, which were finalized by non-structured interviews and literature studies. Total 25 main factors were fixed for questionnaire survey and by interviewing various agencies of construction industry like Architects/Management Consultants, Developers and Contractors and from their reviews by using RII and IMPI techniques the analysis was done for Building. After Analysis was done it was Clearly Understood that there was not any Proper Technique and Not any software based approach used to handle the Multiple Project to complete within the Predefined Schedule. After analyzing the 25 factors there are 7 Common Crucial factors for Building Project which are More Frequent to give their impact on Scheduling i.e.: Poor Site Management and Supervision, Ineffective Project Planning and Scheduling, Availability of Local Labour and Raw Materials, Inadequate Contractor Experience, Incompetent Project Team, Co- Ordination, Priority of Project If multiple projects scheduling is done by considering these crucial factors then the possibility of successfully completion of project can be increased.***
***Keywords— RII - Relative Importance Index Method, IMPI - Importance Index Method***

## I. INTRODUCTION

A project or a site is a temporary process, which has a defined start and end time, a set of tasks, and a budget, that is developed to complete a well defined target or objective. Project management is the application of knowledge, skills, tools, and techniques to project or site activities in order to meet or exceed stakeholder needs and expectations. An effort is being made in present study for multi projects with the help of modern software's considering resource constraints.

*A. Basically there are five project management processes*

*1)* Initiation
*2)* Planning
*3)* Executing
*4)* Monitoring & controlling
*5)* Closing

Most of the owners in construction industry usually have more than one large on-going construction projects. In construction industry more than one project are working in single owner and multi owner. In which there can be four types: i) Single owner has various projects at one location, ii) Single owner has various projects at different location, iii) Multiple owners have various projects at different location, iv) Multiple owners have various projects at one location. In many areas there is no use of proper scheduling techniques. Therefore most of projects are gets delayed and their cost is increases day by day. At planning stage prepare schedule and tracking of that schedule at regular interval is very essential.

The management of multi-projects scheduling is not simply an aggregate of single project. Because the owner have to face too many constraint. But if considering that all constraint and make scheduling so during execution project work is completed as per the scheduled time.

Resource constraint is a most important constraint that can be affected on multiple projects. So that when doing scheduling to arrange a proper resource allocation therefore project work is completed on scheduled time.

Civil engineering construction field is still unorganized Optimization & quality work scheduling and planning is essential, economy and time bound

completion of work. Utilization and efficient allocation of resources like man, machine and material is not being practiced enough.



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Delays can be avoided or minimized when their causes are clearly identified. The aim of this report was to identify the delay factors in construction projects, since delays are considered to be a serious problem in the construction industry. The paper addressed the most significant factors and groups to cause delays.

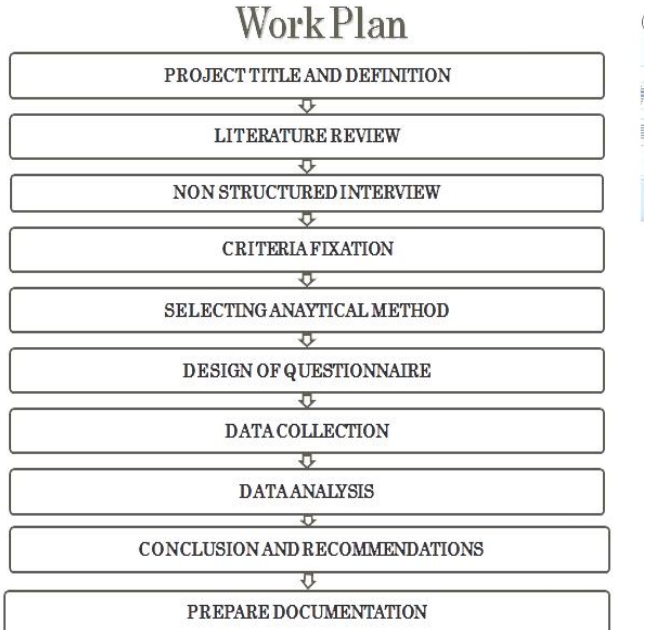
## II. RESEARCH AND METHODOLOGY

First phase of the work includes finalization of the scope and objective of the study. After this, literature and non-structured interview related to multiple projects scheduling techniques, factors affecting on multiple projects scheduling and various types of constraints has been finalized. Now, based on the various factors affected on multiple projects scheduling questionnaire was prepared for carrying out the survey analysis. The questionnaire was circulated amongst the various architects/management consultants, developers and contractors to get their opinions regarding the most crucial factors of multiple projects scheduling in construction projects.

Later, information through different set of question naira was collected and was analyzed according to the aim of study. Using Relative Importance Index data analysis and ranking was done.

The data collected to determine the most influential factors on project management of the project was done through a survey by explorative questionnaire to the respondents involved in daily activities of construction firms in various regions in the Gujarat region of India. The questionnaire was designed so that respondents can give the rank to their answers based on their opinions. The analysis of these data was done by a method named relative importance index (RII) method as well as important index (IMPI).

TABLE NO. 1




Data were gathered through questionnaire. Here, three types of questionnaire were prepared. In the first part, non-structured interview (see Appendix C), second part preliminary survey and third part was prepared for finding relative importance of each factors (see Appendix D). Kometa et al. used the Relative Importance Index method to determine the importance of the different factors and effects of delays. The same method is adopted in this study within various groups (i.e. developers, architects/management consultants, contractors). The four-point scale ranged from 1 (not important) to 4 (very important) was adopted.

In the second approach, Data were gathered through a survey, analysed by using frequency, severity and importance indices, taking in view developers, architects/management consultants and contractor. For each factor two questions were asked:

What is the phenomena of occurrence for this factor?

And

What is the degree of severity of this factor on multiple projects delay?

Both frequency of occurrence and severity were categorized on a four-point scale. Frequency of occurrence is categorized as follows: always, often, sometimes and rarely (on 4 to 1 point scale). Similarly, degree of severity was categorized as follows: extreme, great, moderate and little (on 4 to l point scale). A Survey questionnaire is shown in appendix D



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*A. Relative Importance Index (RII) Method*

Relative importance index method helps to determine the relative importance of the various factors contributing generation of construction waste of major firms. The four-point scale ranging from 1 to 4 is adopted and it is transformed to relative importance indices (RII) for each factor as follows:

$$RII = \Sigma W / (A \times N)$$

Where:-

W is the weight given to each factor by the respondents and ranges from 1 to 4

A = the highest weight = 4

N = the total number of respondents

*B. Importance Index (IMP.I.) Method*

Importance Index Method helps to determine the relative importance of the various factors as a function of severity & frequency of their occurrence. Here we will use this method to determine important index for factors that contributing generation of construction waste of major construction firms.

*C. Frequency Index (F.I.)*

A formula is used to rank risk event based on frequency of occurrence as identified by The participants.

Frequency Index (F.I.) (%) = $\Sigma$ a (n/N) × 100/4

Where,

a = constant expressing weighting given to each response (ranges from 1 for rarely up to 4 for always),

n = frequency of the responses, N = total number of responses.

*D. Severity Index (S.I.)*

A formula is used to rank risk base on severity as indicated by the participants.

Severity Index (S.I.) (%) = $\Sigma$ a (n/N) x 100/4

Where,

a = constant expressing weighting given to each response (ranges from 1 for little up to 4 for severe),

n = frequency of the responses, N = total number of responses

*E. Importance Index (IMPI.)*

The importance index of each event is calculated as a function of both frequency and severity indices as follows:

Importance Index (IMP.I.) (%) = […(%)…(%)] × 100

## III. SURVEY WORK AND DATA COLLECTION

The survey work shall be carried out within the scope of the study and among the selected respondents (architect/project manager, owner, and contractor) of the sample. The questionnaires will be distributed to respondents and data will be collected through these filled questionnaires. By these questionnaires the perceptions of respondents with regarding to factors contributing generation of construction multi project scheduling will be determined.

This chapter deals with collection of feedbacks from various stakeholders (Contractor, Developer, and Architect/Management Consultant) and calculation of sample size from population. The details of various stakeholders who were approached during field survey are given in this chapter. Further it gives details of responses received for data analysis.

List of Respondents for Building Project

| | Architects/ Management consultants | Developers | Contractors | Total |
|---|---|---|---|---|
| Surat | 5 | 7 | 9 | 21 |
| Navsari | 6 | 21 | 9 | 36 |
| Vyara | 3 | 19 | 8 | 30 |
| Total | 14 | 47 | 26 | 87 |



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TOTAL RESPONDED PERSONS – 87 NOS

## IV. DATA ANALYSIS METHODS

Data were gathered through a survey & analysed by using two different techniques: Relative Importance Index (RII) technique and Importance Index (IMPI) technique.

**RII technique:** The procedure used in analysing the results was aimed at establishing the relative importance of the various factors responsible for delay of project by giving rank to the factors of delay by RII technique. The questionnaire gave each respondent an opportunity to identify the factor that was likely to factors delay by giving the response "very important, important…..etc."

**IMPI technique**: In this method of analysing data, for each factor two questions were asked to find out Frequency Index and Severity Index and on basis of this Importance index is calculated for ranking to factors. These two questions were what is the frequency of occurrence for this factor? And what is the degree of severity of this factor on project delay? Both frequency of occurrence and severity were categorized on a four point scale. Frequency of occurrence is categorized as follows: always, often, sometimes and rarely (on 4 to 1 point scale). Similarly, degree of severity was categorized as follows: extreme, great, moderate and little (on 4 to l point scale). A Survey questionnaire is shown in Appendix D (section C & D).

## V. RESULT

| Factors Affecting Multiple Projects Scheduling | RII | RANK | Factors Affecting Multiple Projects Scheduling | IMPI |
|---|---|---|---|---|
| Scheduling Techniques and Software | 1.0000 | 1 | Priority of Project | 98.2143 |
| Co- Ordination | 1.0000 | 2 | Availability of Local Labour and Raw Materials | 96.4605 |
| Poor Site Management and Supervision | 1.0000 | 3 | Incompetent Project Team | 96.4605 |
| Ineffective Project Planning and Scheduling | 1.0000 | 4 | Scheduling Techniques and Software | 96.4286 |
| Financial Capacity | 0.9821 | 5 | Ineffective Project Planning and Scheduling | 94.6429 |
| Priority of Project | 0.9821 | 6 | Poor Site Management and Supervision | 92.9847 |
| When Project Scope Changes | 0.9821 | 7 | Co- Ordination | 87.8827 |
| Availability of Local Labour and Raw Materials | 0.9643 | 8 | Lack of Experience of Owner in Construction Projects | 84.5663 |
| Financial Constraints of Contractor | 0.9643 | 9 | Types of Project | 82.9401 |
| Delay in Progress Payments | 0.9643 | 10 | Inefficient Use of Equipment | 81.3138 |

## VI. CONCLUSION

Delays can be avoided or minimized when their causes are clearly identified. The aim of this report was to identify the delay factors in construction projects, since delays are considered to be a serious problem in the construction industry. The paper addressed the most significant factors and groups to cause delays.

According to the findings above, following points can be recommended in order to minimize and control delays in construction projects:

*A.* Advance arrangement of equipment's should be made or equipment should purchase on rent.

*B.* The quality and experience of labor supply can have major impact on the projects. Inexperienced labor may lead to inefficient work and may cause accidents during construction.

*C.* Site management and supervision should be made in a correct manner. Administrative staff should be assigned to make necessary arrangements to complete the project within specified time while satisfying required quality and estimated cost.

*D.* Approval of design documents should not be late, since it could delay the progress of work. Progress payments should be made



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on time to contractor to finance the work.

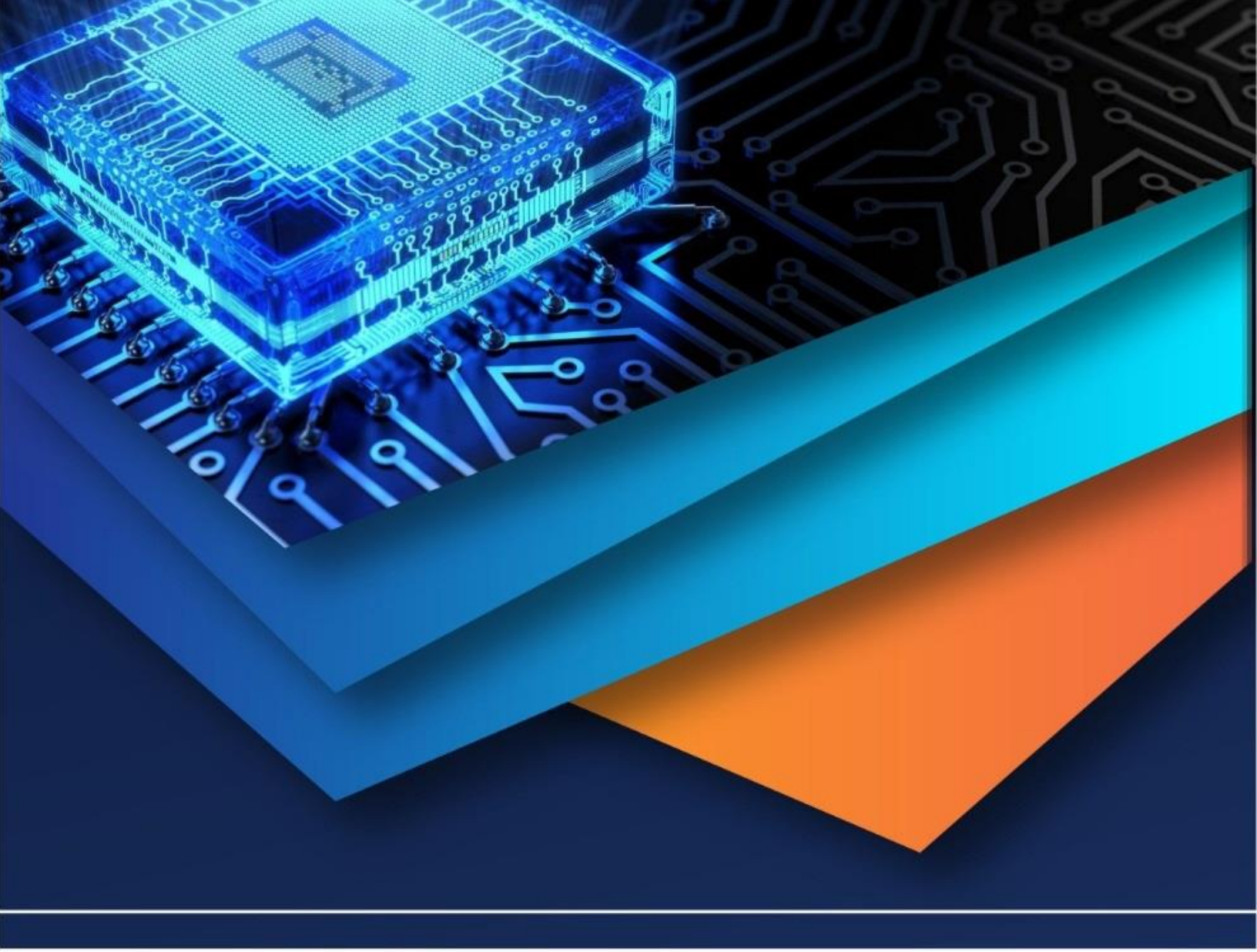
*E.* Finding out G.L. water pipe connection leakage and quickly take appropriate action consulting with structural engineer like (Pile foundation, providing impervious layer etc.)

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