

A CASE STUDY ON SCHEDULE DELAY ANALYSIS IN CONSTRUCTION PROJECTS IN GWALIOR

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Abstract - Construction schedule delays may be explained by means of the late completion of construction work in comparison of designed schedule of project. If the reasons of the construction projects schedule delay are found then the project schedule delay in construction can be reduced. The aim of this thesis is to quantify the top most dangerous factors of schedule delay in Gwalior region and nearby areas by using relative importance index (R.I.I.) method so that chances of schedule delay in construction projects are minimized and reduce the effects on different parties due to project delay. In this study, 44 dissimilar factors of schedule delay were selected after the past review of literature then arranged them in 9 primary sets. The R.I.I. of all factors were computed separately using R.I.I. method. On following the survey outcomes, the top causative groups and factors (that require more consideration) of delays in Gwalior region were explained. The top most important factors causing delay were Ineffective planning and scheduling, Errors and late in producing design papers, Late in progress outflows, Less understanding of owner in construction, and Late delivery of materials. Contractor related group of factor is ranked first top most important group which cause schedule delays while factors of group related to Owner ranked second most significant group.

Key Words: Construction, Delay factors, R.I.I.

1. INTRODUCTION

Construction delays are very common in most projects everywhere in the world. Some delays may occur in the preconstruction stage which is well-defined as the period start from the initial idea of the project to the signing of the agreement between the owner and the contractor; but some delays may happen in the construction time that is the period between the actual construction works is start and end. Construction Project schedules are normally dynamic and uncertain. A number of controllable and uncontrollable factors can badly disturb the project plan and create a tendency of delays. These delays definitely produce undesirable effects on project performance. Schedule delay in the end of a construction project may be a main trouble for contractors leading to overpriced disputes and adverse connections between project contributors. The challenge is

to find out or calculate the net impact of construction delays correctly. Or else, there may seem delay claims stuck between all parties and members involved in the construction process. The scheme of schedule delay analysis technique should be satisfactory to all contributors through the project.

2. AIM AND OBJECTIVE

Analysis of a number of factors disturbing the project schedule and suitable measures that can be occupied to reduce the tendency of delay in developing city Gwalior and nearby areas are the main aim of the study. There are following steps of the study.

- I. Find out the factors affecting project schedule in the construction industry.
- II. To sort the delay reasons according groups.
- III. Calculation of R.I.I. of delay factors and show the position of the groups and all factors in order to their R.I.I. value on project delay.
- IV. To find out the most causative groups and factors which affect schedule.
- V. For reducing delay makes recommendations and conclusion of the study.

3. LIST OF FACTORS CAUSES SCHEDULE DELAY

Factors affecting project schedule and cause delay in construction projects based on research and literature survey are:

1. Consultant associated factors
 - Absence of knowledge of consultant in construction
 - Complications between design engineer and consultant
 - Late in performing inspection and testing
 - Late in revising and approving design papers
2. Contractor associated factors
 - Changing of subcontractors again and again

- Lack of skill of contractor
 - Unsuitable construction procedures
 - Ineffective planning and scheduling
 - Obsolete technology
 - Rework due to errors
3. Design associated factors
- Complication in design
 - Design errors made via designers
 - Nonexistence of skill of design team in construction
 - Errors and late in producing design papers
 - Wrong understanding of owner's necessities by designer
4. Equipment associated factors
- Shortage of equipment
 - Frequent equipment breakdowns
 - Low efficiency of equipment
5. External associated factors
- Accidents during construction
 - Changes in government regulations and laws
 - Late in earning licences from municipality
 - Late in final check and approval by a third party
 - Late in giving services
 - Price fluctuations
 - Problem with neighbours
 - Unfavourable weather condition
6. Labor associated factors
- Shortage of workers
 - Small output of labour
 - Own clashes among labor
 - Strike
 - Unqualified / inadequate experienced labor
7. Material associated factors
- Modifications in material varieties and specifications in the course of construction
 - Destruction of arranged materials
 - Late delivery of materials
 - Shortage of construction materials

8. Owner associated factors

- Clashes between partners
- Late in progress outflows
- Late in site supply
- Wrong feasibility study of project
- Less understanding of owner in construction
- Absence of motivations for contractor to complete ahead of plan

9. Project associated factors

- Difficulty of project
- Legal disputes between project participants
- Unfavourable contract clauses

4. METHODOLOGY AND ANALYSIS

The methodology selected for this research paper is questionnaire survey. The form is made contains 44 factors which cause the delay in schedule of project on the basis of detailed literature survey. After this, we generate the survey form. One of the most significant portion of the study is the "collection of correct data" for effective study of delay analysis. For this purpose, take a definite number of persons which are related to construction industry for collecting essential data record. Total 33 questionnaires have collected after meeting professionals i.e. Project manager, Owner's, Project engineers and Site Engineers. In these forms, they tick for ranking the factors 1 to 5. Table 1 shows the ordinary scale and the given digits 1, 2, 3, 4 and 5 are a numerical indication of dissimilar level of grade.

Table -1: Ordinary Scale Used For Data Measurement

EFFECT OF FACTOR FOR SCHEDULE DELAY					
LEVEL OF DELAY	NO DELAY	LITTLE DELAY	MODERATE DELAY	LARGE DELAY	VERY LARGE DELAY
SCALE	1	2	3	4	5
FACTORS	p1	p2	p3	p4	p5

After the collecting data, Relative Importance Index (RII) technique is used for the analysis of the survey data. RII is calculated by given formula,

$$R.I.I. = \frac{5(p_5) + 4(p_4) + 3(p_3) + 2(p_2) + 1(p_1)}{5(p_1 + p_2 + p_3 + p_4 + p_5)}$$

Here,

p1 = total persons who ticked for no delay for each factor

p2 = total persons who ticked for little delay for each factor

p3 = total persons who ticked for moderate delay for each factor

p4 = total persons who ticked for large delay for each factor

p5 = total persons who ticked for very large delay for each factor

*RII values always lies between 0 to 1.

5. RESULTS AND DISCUSSION

The relative importance index (R.I.I) was calculated for every single reason to detect greatest and smallest momentous project delay factors in this industry. These factors were ranked according to the computed RII values of each factor. On the basis of rank, the top 10 most vital factors affecting schedule were presented below.

Table 2: Top 10 most significant factors affecting schedule in construction

No.	Top 10 most significant factors affecting schedule	Group of factor	R.I.I.	Rank
1	Ineffective planning and scheduling	Contractor Related	0.770	1
2	Errors and late in producing design papers	Design Related	0.733	2
3	Late in progress outflows	Owner Related	0.733	3
4	Less understanding of owner in construction	Owner Related	0.721	4
5	Late delivery of materials	Material Related	0.715	5
6	Shortage of worker	Labor Related	0.709	6
7	Nonexistence of skill of design team in construction	Design Related	0.709	7
8	Lack of skill of contractor	Contractor Related	0.703	8
9	Changing of subcontractors again and again	Contractor Related	0.691	9
10	Late in giving services	External Related	0.685	10

Graph between top 10 most significant factors and their R.I.I. value given below,

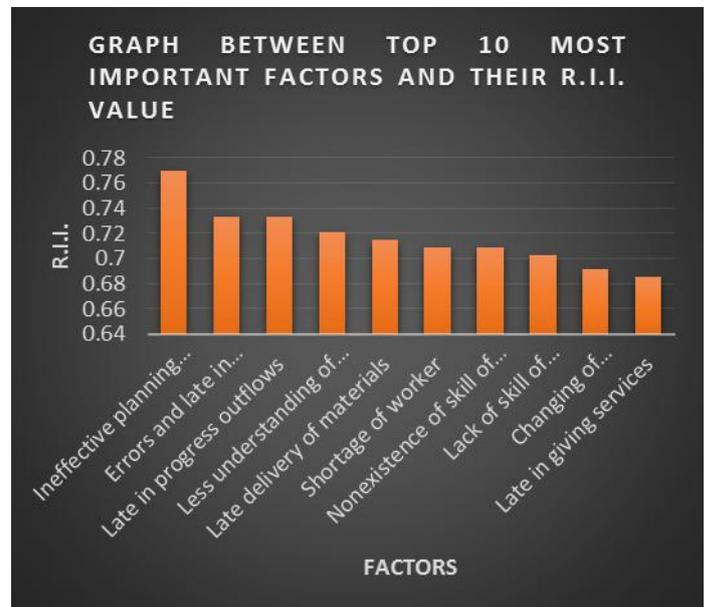


Chart-1: Graph between top 10 most significant factors and their R.I.I. value

After getting highest RII value 0.770, Ineffective planning and scheduling is ranked as no. 1 factor; which affect the project schedule in Gwalior region and nearby areas. It is most important thing needed high attention when the project is going to schedule in Gwalior. For this contractors are require give proper attention on the time of project planning and scheduling stage.

Errors and late in producing design papers ranked as factor no. 2 after getting RII value 0.733; it means designers should not make Errors and late in producing design papers because it create chances of schedule delay in project.. Similarly Late in progress outflows by owner ranked as factor no 3 on the basis of RII value 0.733; so the owners require do not late in progress payments of contractors because it weakens the contractor ability to finance the work. Here rank 2 factor and rank 3 factor have same RII value. So that we assign these rank according to their number of respondents who selected n5 for each factor. Which factor have more n5 value from all same RII value factors ranked first then so on...

Knowledge and experience of owner is one of the key factors in construction because lack of experience of owner can cause schedule delay in projects, therefore less understanding of owner in construction projects ranked as 4 and their RII value is 0.721.

Late delivery of materials ranked as 5 with RII value 0.715; so material management in construction is very important so that material should be provided on time otherwise delay situation arises in projects. Similarly Shortage of worker got the ranking 6 with RII value 0.709; so that sufficient number of labor is necessary for finishing the project on time. Nonexistence of skill of design team in construction got 7th rank with RII value 0.709. It shows that experienced design team for construction projects are necessary so that does not affect the schedule.

Lack of skill of contractor is ranked 8 with RII value 0.703. Means it is necessary to hire experienced contractors in the construction projects for timely completion of project. Changing of subcontractors again and again is at 9th position with RII value 0.691 so do not allow frequent changing of subcontractors in between project tasks. From the top most 10 factors, late in giving services (like electricity, water) ranked last 10th delay factor with RII value 0.685. Hence utilities required for performing any activity very essential and provided on time.

6. CONCLUSION AND RECOMMENDATIONS

At present, the construction industry is the second biggest industry in India. It supports in developing and attaining the objective of society. The management of time is very critical in this industry because time equals to money thus estimating chances of schedule delay may play a significant role in the direction of project success. Basic knowledge of project schedule delay for the duration of whole project can save money and time. Because of difficulty and lengthy time of projects, Investment and risks are more in this industry. "Cost overrun" and "Time overrun" of projects are two basic disadvantages of construction industries. We find that delay in designed schedule of project is the basic reason for these disadvantages.

Some recommendations would be proposed for reducing the chances of schedule delay:

- ❖ Contractors are recommended that proper care are taken in the project planning and scheduling stage. It is necessary to hire experienced contractors in the construction projects for timely completion of project and do not allow frequent changing of subcontractors in between project tasks.
- ❖ Owners are recommended that do not late in progress payments of contractors because it weakens the contractor ability to finance the work. Owners should have full knowledge about

construction work and also have that level of experience so that they easily handle the project. Feasibility study of any project is very important so owners should be very precautious before taking any final decision related to project.

- ❖ Designers should not make errors and late in producing design papers because it create schedule delay in project. For this they needed experienced design team for construction projects and it is also important for the design engineers that they clearly understand the requirements of the owner before starting the work.

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