International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.01, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

ROOT CAUSE ANALYSIS OF DELAYS ON RESIDENTIAL CONSTRUCTION PROJECTS IN KOLHAPUR CITY

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ABSTRACT

The construction industry has much complex in nature as it involves large number of activities involved within. Managing all these activities is very difficult task even though a proper management some factors affect the project. So the method to track and mitigate these causes affecting the project is needed.

In this research, paper the causes affecting delays on residential projects in Kolhapur city, Maharashtra are taken to study. The questionnaire designed for collection of data and then data analyzed using RII (Relative Importance Index)method. In this paper, the 37 individual causes affecting project duration are categorized into 8 main groups for the study purpose. And the delays are considered as the planned duration with actual duration of the activity. This paper is aimed on knowing the causes of delays occurrence. The causes which vary the planned duration and actual duration of task during construction stage are considered as delays for this research purpose. These causes in construction task can affect the cost of the project so this study is important in cost saving manner as well as for improvement of the organizational method, which are currently used in construction industry. The RII (Relative importance index) method is used to know the effect of such causes on performance. This study helps in knowing the exact causes of delay occurrences with the help of questionnaires prepared and analysed using 'Relative importance index'.

The RII ranking shows that the causeslike Delay in progress payment by owner, Unqualified workforce, Low productivity of labour, Personal problem of labour, Difficulties in financing project have very high RII which are most affecting factors causing delays of construction of residential buildings in Kolhapur city. Cause and effect relationship will act as the base of this study and will help develop suitable and sustainable method. Time and money saving factors interdependency will strategically produce outcomes. The results obtained from this study help produce high end graphs which seizes all the details of delays and overall performance of the project.

Keywords:bar chart tracking,Construction management, Delay, Relative Importance Index, variation

I.INTRODUCTION

Time in construction is directly proportional to money (more the time increases the money required and vice versa).To propose proper time it required to study the factor causing delay and variation. Delay and variation are caused due to intense nature of the construction and its nature, therefore it necessary to analyze it's through their roots. Any planning undertaken is done first on the paper calling it paper work and then executed practically. But the practical state is always complex and strategic. The analysis of the practical conditions 100% accurate is impossible to task. Which cause variation and delays. The delays associated cannot be complete interpreted but can be minimized giving for result.

To study the variations, delays and its association with time and money, it is necessary to calculate the causes and its roots and sustain suitable remedies to be adopted. The remedies will provide a brief avoid delays. In this research proper accumulation of data from various sites with the help of questionnaires linked with delays is done. The analysis of this data with the comparison of paper work is interpreted the questionnaire are distributed to each class of respondent i.e. owner, contracted, engineer, worker, etc. and their review over which questionnaires is adopted to its importance in delays. The "Relative importance index" method is used as a practical backbone and major and minor root causes of delays are listed. The research of this kind helps us plan any construction project keeping the delays mandatory and attaining remedies to reduce its intensity.

II.MOTIVATION OF THE STUDY

The motivation of this study is to target on the delay analysis and find the causes of delay occurrences. The delay occurrence is severe problem in construction industry. It is necessary to enlist causes of delay its effect on the projects probability. The study will help to know the root causes of delays and it will be helpful to adopt preventive measures to minimize it. This study gives a brief idea of the major delays and sustain them before undertaking project.

The delays entitled will help us to target on the cause & effect relationship & proceed through a platform which will be suitable & sustainable. The time saving & money minimizing factors will be useful to be developed form this study.

III.RESEARCH CONSTRAINTS

3.1 LOCATION: KOLHAPUR

The data was collected from residential buildingsfrom Kolhapur region, Maharashtra, India having suitability mentioned in site selection criteria. These sites were tracked. The data collection was done from the bar chart & muster of actual work which is followed by a set of questionnaires. Four residential site with well-prepared bar chart is taken for the data collection purpose. At the initial stage planned data is compared to actual work data & the number of delays or its magnitude in days is calculated. For the comparison of delays the bar chart

scheduling is used as base line and the delayed time duration was noted at each activity. After knowing the occurrence of the delay the various causes causing this time delay was then evaluated with the help of questionnaires. Questionnaire being the base line in the latter stage and were designed using various information linked with causes of delay in suitable research papers. Quantitative method for the purpose data collection is adopted with the help of well-prepared questionnaires. Each class of respondent is asked to pose his view over the causes listed & this data is analyzed. The onsite interviews are taken for this purpose, in which the care is taken that the all levels of authorities are involved in this process i.e. from labour to the higher authority of the project. Therefore, consideration of all levels of authority gives the exact cause of the delay in construction tasks.

3.2 QUESTIANNAIRE DESIGN

The questionanaries is prepared with, the site information, interviwer position and his authority towards work, type of task and factors causing delay. The questionarie is devided in to two main parts. First part is related to genearal information of respomdent. Second part include the list of the identified causes of delay in construction project. These causes are classified in to 8 groups according to the main source of i.e. owner, contractor, consultant, design, materails, equipment, labour and other.

For each cause from 8 main causes few questions were asked related to each main cause.artings were given to each of the question having a frequency from strongly disagree to strongly agree andrespectively enlisted with numbers 1 to 5. Thus the Relative importance index (RII) of each acuse questioned was found out.

3.3 SITE SELECTION CRITERIA

Following Criteria was stated for selection of site

1) The site should be residential or commercial building.
2) It should be in working state.
3) Complexity associated with its construction should be ample in amount.
4) It should contain all class of respondents to detail the questionnaires.
5) Site should cover maximum activities within data collection period..

The five point ranking system is adopted for ranking the 8 main causes. The ranking of causes gives us the effectiveness of particular cause on performance of project. The 8 causes are ranked with the help of RII method. The causes of affecting maximum risk on the project performance worked out for suggestive method development.

The 5 point ranking system is adopted, in which the 40 respondent are selected whom related to construction industry. And their responses are taken and analyzed for following method of ranking i.e. RII method by which risk of causes are found. The score is given in between 1 to 5. Depending upon their effects on the project performance. This is to know their perspective about the causes and their effect on project performance.

IV.THE INDIVIDUAL CAUSES AND THEIR GROUPING

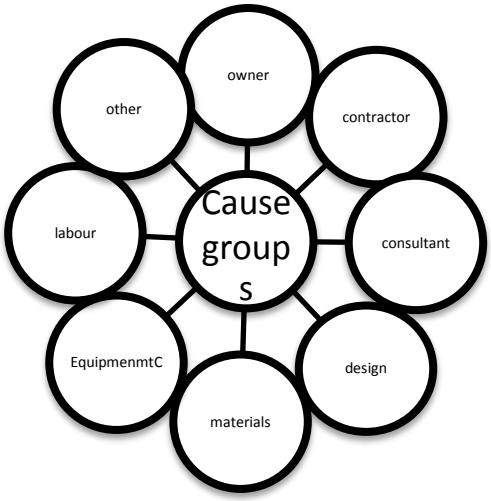


Fig: cause grouping

The individual causes are acrrried out through visiting the peoples on the sites. These are selected with different level of authority. The purpose of such is to take consideration of perpective of each level of authority. The reviews are taken from the lower to higher authority. The following chart show the grouping of individual causes into their main group.

The 37 individual causes are grouped in 8 main causes group. The group are taken for ranking purpose and then as per frequency of the individual causes of cause group are considered for minimizing the delays from the construction site.

Group	Individual causes
1. Owner	1. Dealy in progress payment by owner 2. Change oreder by owner during construction 3. Delay in revising and providing design document by owner 4. Delay in provision of material by owner 5. Poor communication and coordination with other paties 6. Descision making process 7. Suspension of work
2. Contractor	1. Difficulties in financing project 2. Rework due to error during construction 3. Dispute between contractor and other parties (consultant and owner)

Group	Individual causes
	4. Poor site management and supervision by contractor 5. Ineffective plannning and scheduling
3. Consultant	1. Improper instruction method 2. Delay in inspection and testing 3. Delay in major change 4. Poor communication 5. Dispute between consultant designer
4. Design	1. Mistake in design document 2. Delay in producing desing document 3. Unclear and inadequte details in drawing 4. Insuficient data collection and survey before design 5. Misunderstanding of owner requirements by desimg engineer
5. Materials	1. Change in material type and specification 2. Delay in material delivery 3. Poor resourse management 4. Delay in manufacturing special building material 5. Poor material handling on site
6. Equipment	1. Equipmnt breakdowns 2. Low level of equipment operator skill 3. Low productivity and efficiency of equipment
7. Labour	1. Shortage of labour 2. Unqualified work force 3. Low productivity of labour 4. Personal problems of labours
8. Other	1. Climatic condition 2. Unavailability of utitlities (water, electricity etc.) 3. Effect of social and cultural factors

V.RELATIVE IMPORTANCE INDEX METHOD FOR RANKING OF THE CAUSE GROUP

The cause groups are analyzed by using mean RII method of ranking. For this purpose, 40 respondents are selected concerning to civil industry. As they have enough knowledge about causes of delay. The respondent has experience of 2-10 year in construction industry.

The formula used for this method is as below:

International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.01, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

$$\text{RII} = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{5(n_1 + n_2 + n_3 + n_4 + n_5)}$$

$1n_1$ = The number of respondents who answered ' strongly disagree '

$2n_2$ = The number of respondents who answered ' disagree '

$3n_3$ = The number of respondents who answered ' slightly disagree '

$4n_4$ = The number of respondents who answered ' agree '

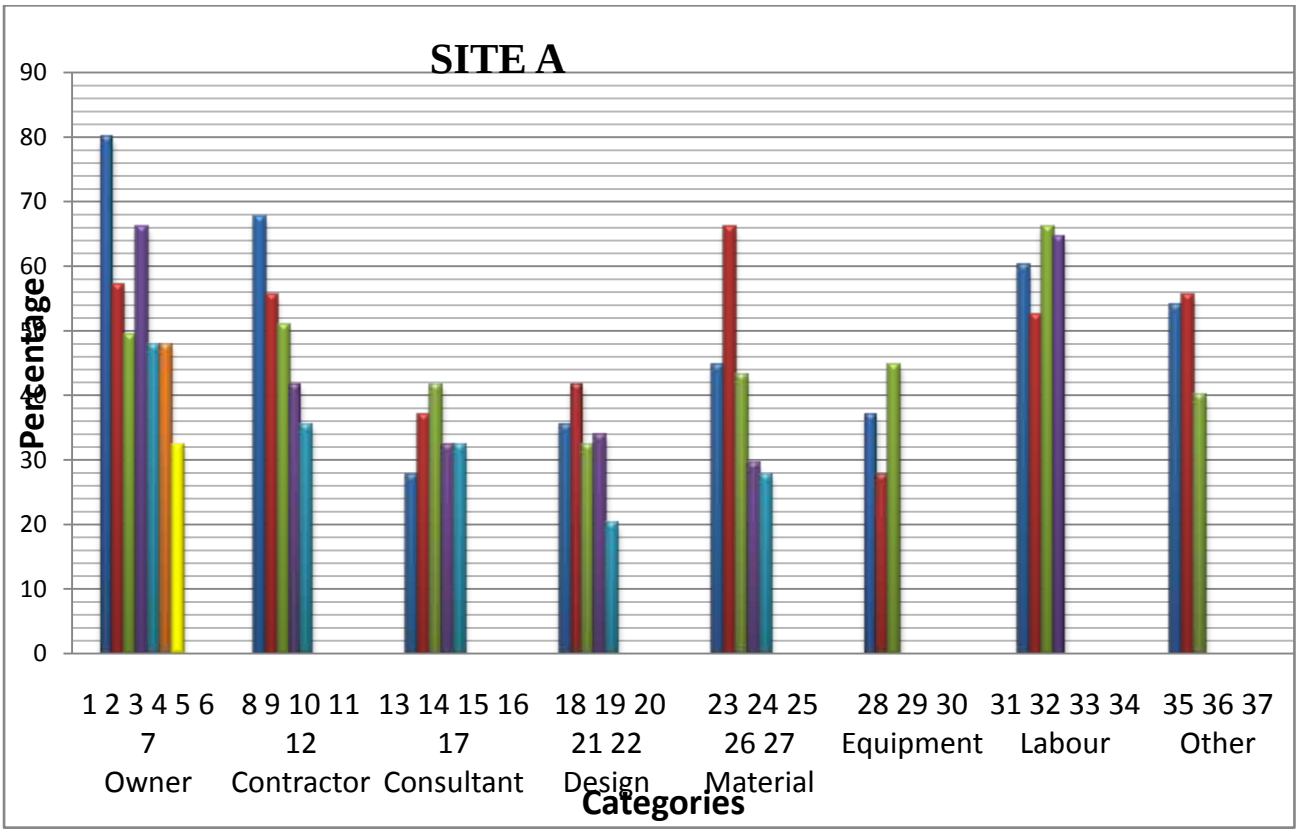
$5n_5$ = The number of respondents who answered ' strongly agree '

Category	Strongly disagree	Disagree	Slightly disagree	Agree	Strongly agree
Response rated	1	2	3	4	5

(Table– Response factor)

VI.RESULTS

The graphs below showing relative importance index verses the causes



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Volume No.07, Special Issue No.01, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Sr. no	Factors responsible for delays	Categories	Relative importance index
1	Delay in progress payment by owner	OWNER	80
2	Change order by owner during construction		56.92
3	Delay in revising and providing design documents by owner		49.23
4	Delay in provision of material by owner		66.15
5	Poor communication and co-ordination with others		47.69
6	Decision making process		47.69
7	Suspension of work		32.30
8	Difficulties in financing project	CONTRACTOR	67.69
9	Rework due to error during construction		55.38
10	Dispute between contractor & other parties (consultant and owner		50.76
11	Poor site management and supervision by contractor		41.53
12	Ineffective planning and scheduling		35.38
13	Improper construction method	CONSULTANT	27.69
14	Delays in inspection and testing		36.92
15	Delay in major change		41.53
16	Poor communication		32.30
17	Dispute between consultant designer		32.30
18	Mistakes in design documents	DESIGN	35.38
19	Delay in producing design documents		41.53
20	Unclear and inadequate details in drawing		32.30
21	Insufficient data collection and survey before design		33.84
22	Misunderstanding of owner requirements by design engineer		20
23	Changes in material types and specifications	MATERIAL	44.61
24	Delay in material delivery		66.15
25	Poor resource management		43.07
26	Delay in manufacturing special building material		29.28
27	Poor material handling		27.69
28	Equipment breakdowns	EQUIPMENT	36.92
29	Low level of equipment-operator skills		27.69
30	Low productivity and efficiency of equipments		44.61
31	Shortage of labour	LABOUR	60
32	Unqualified workforce		52.30
33	Low productivity of labour		66.15

34	Personal problem of labour		64.61
35	Climatic conditions	OTHER	53.84
36	Unavailability of utilities (water, electricity, etc.)		55.38
37	Effect of social and cultural factors		40

The relative Importance indices for each cause is found out and drawn in descending order and then the factors are analyzed for the improvement. Similarly, the study was conducted and RII ranking method was adopted for different sites. In addition, the results are drawn.

VII.CONCLUSION

The generally the causes like Delay in progress payment by owner, Unqualified workforce, Low productivity of labour, Personal problem of labour, Difficulties in financing projecthave very high RII which are most affecting factors causing delays of construction of residential buildings in Kolhapur city.

The RII method may be the very effective method to track, monitor and to find out the root causes for delays. On which the remedial measures can be applied to achievecontinuous improvement policy within the organization.

From the results obtained it is evident that tracking of work both planned and actual should followed to note down delays and collectively produce a relative method to tackle such causes of delays, thus saving time and money asset.

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