INVESTIGATING THE CAUSES OF DELAYS IN HIGH RISE BUILDING CONSTRUCTION PROJECTS IN PUNE CITY: A CASE STUDY APPROACH

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Abstract

Construction projects for high-rise buildings are complicated, entailing several parties and different tasks. The timely completion of such projects is crucial to avoid cost overruns and client dissatisfaction. However, delays are common in the construction industry, especially in high rise building projects. Therefore, this research aims to investigate the causes of delays in high rise building construction projects in Pune city through a case study approach. The results of this research indicate that the most significant causes of delays in high rise building construction projects in Pune city are inadequate planning, poor communication and coordination among project stakeholders, delays in approvals and permits, shortage of skilled labour, and changes in project scope and design. Construction projects frequently experience delays, particularly in high-rise building projects. This research paper aims to investigate the causes of delays in high-rise building construction projects in Pune city, India. A case study approach was used, and data were collected from several ongoing construction location for a high-rise in Pune. The study identified various causes of delays, such as poor project planning and scheduling, inadequate project management, material shortage, poor communication among project stakeholders, and weather conditions.

Keywords - Construction delay, cost over-run, Effects of delay, High-rise building, and Time over-run.

I. Introduction:

The study adopts a case study approach, where data is collected from several ongoing projects for high-rise buildings in the city and the paper presents the findings of the study, which identifies various causes of delays such as poor project planning, inadequate project management, material shortage, poor communication among project stakeholders, and weather conditions. The paper also suggests possible solutions to mitigate these delays such as effective project planning, better project management practices, and

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ensuring adequate and timely availability of materials, enhancing communication among stakeholders, and implementing appropriate risk management strategies. The study concludes that the findings of the research will benefit project managers and stakeholders in the construction industry in Pune City by providing them with a better understanding of the causes of delays and possible solutions to mitigate them.

Production job delays are a typical occurrence, and they virtually always result in cost and schedule overruns. The parties engaged in a construction project, such as developers, contractors, and consultants, suffer when a project is delayed. Among these repercussions include the development of antagonistic connections, mistrust, disputes, a hearing, funding issues, and a general sense of unease towards one another. To reduce and prevent delays in any construction project, it is crucial to identify the true causes of each one.

II. LITERATURE REVIEW:

1) Anita Rauzana, 2022

The study, titled "An Analysis of Causes of Delay and Time Performance in Construction Projects," tries to investigate these factors. There are three different forms of project delays: compensable, non-compensable, and concurrent. Collaboration among property owners, builders, and project planners is crucial to a construction project's success. Construction projects may be hampered by a variety of circumstances, including but not limited to changes in project design, poor project management, a lack of materials, labour concerns, and weather conditions.

2) Desai Megha, 2019

To determine what causes building projects to be delayed. To find 59 reasons of delay, the study employed a significance index approach and a questionnaire survey.

According to the study's findings, the main causes of the delay were a lack of workers, a delay in the supply of the materials, a low level of workforce productivity, and a delay in the owner's progress payments. The quality of management during construction, the quality of management during design, and the coordination of design were identified as the top three factors that negatively affect the delivery of construction projects on time performance. The primary reasons for the delays were the designer, user modifications, weather, site problems, late delivery, and economic circumstances.

3) Veera Vijay; Divi 2017

Time, quality, and money are the three key considerations that are extremely important in any building project. Of these, time is particularly important as it can have a significant impact on project quality and cost, and can even lead to disputes between parties. The elimination of efficiency, project acceleration, negotiation, mediation, litigation, and even project cancellation are all possible effects of these effects. Therefore, these secondary impacts of delays must be carefully considered and managed to ensure successful project completion.

4) Saurabh Thorat, 2017

Time and expense overruns, decreased profits, subpar finished products, project abandonment, and conflicts resulting in arbitration are a few of these effects. The paper emphasizes the importance of identifying and managing these impacts to minimize their negative effects on the construction project. By highlighting the potential consequences of delay, the research offers valuable insights for project manager, stakeholders seeking to ensure the successful completion of construction projects.

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III. Objectives of Study:

1. To determine the reasons for construction project delays for high-rise buildings in India.

2. To rank the identified causes of delay using the RII (Relative Importance Index) method.

3. To propose remedial solutions for addressing delays in high rise building construction projects.
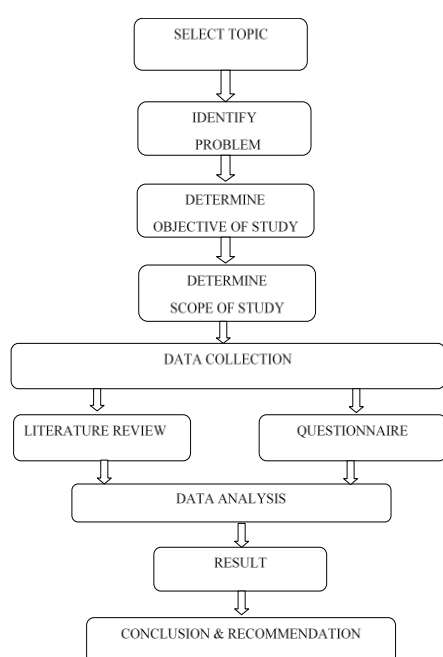
IV. Methodology:

Figure no. 1

V. RESEARCH FRAMEWORK BASED ON METHODOLOGY:

1. Conducted a comprehensive literature review of high-rise construction buildings and analysed previous research on delays in high-rise building construction.

2. Developed a set of questions based on the literature review to conduct a questionnaire survey focused on the research objectives.

3. Administered the questionnaire survey among engineers and contractors who are associated with the relevant field to gather data on

the causes of delays in high-rise building initiatives.

4. To identify the most frequent delays that impact the development of high-rise structures, the data from the questionnaire survey will be evaluated using the Relative Importance Index (RII) Method.

5. In consideration of the results of the questionnaire survey, appropriate suggestions will be provided to address the identified delays in high-rise building construction.

6. A Likert scale is used to collect data by assigning ratings to each factor:

1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly agree

Table no. 1

VI. DATA COLLECTION:

To gather information on project-related aspects, the survey was carried out on 8 to 10 construction sites, the survey involved gathering information from experienced professionals such as senior and junior engineers, project managers, architects, and others who had at least 10 years of experience.

1. The study focused on 40 different variables that may lead high-rise construction projects to be delayed. These factors were grouped into different project, customer, the contractor, advisor, designer, material, machinery, labour, and external variables are some examples of these categories. This suggests that the study aimed to take a comprehensive approach to identify all possible factors that could contribute to project delays.

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2. The study collected data from experienced professionals such as senior and junior engineers, project managers, architects, and others. These professionals had at least 10 years of experience, which suggests that they had encountered and dealt with project delays in the past. Collecting data from such experienced professionals would help to ensure that the study was based on real-world experience and insights.

3. The study focused on high-rise buildings that were between 10 to 20 floors in height. This suggests that the study was not limited to supertall skyscrapers but also included mid-rise and tall buildings. This could be beneficial for professionals involved in the design and construction of such buildings.

4. The study could provide valuable insights and recommendations for professionals involved in high-rise building projects. By identifying and analysing the various factors that can cause delays, the study could help project teams to proactively address and mitigate these issues, resulting in more efficient and successful project outcomes.

VII. TECHNICAL ANALYSIS BY RII (RELATIVE IMPORTANCE INDEX) METHOD

1. A method for doing a relative significance analysis consists of the RII (relative importance index).

2. RII (relative importance index) method is often utilized to evaluate the likelihood and consequences of ethical and unethical issues by assigning scores to each attribute.

3. To calculate the RII values for both the probability and impact of ethical

and unethical issues, a 5-point Likert scale was used in the formula.

$$RII = \frac{\Sigma w}{(A \times N)} = \left\{ \frac{(5n5+4n4+3n3+2n2+n1)}{(A \times N)} \right\}$$

Formula no. 1

RII is a scale that ranges from 0 to 1 ($0 \leq$ index ≤ 1).

The weighting given to each criterion by respondents is denoted by "w," and it ranges from 1 to 5. A score of 1 denotes a factor to be of very low relevance, while a score of 5 denotes a factor to be of great importance. In this paper, the highest weight assigned to any criterion was 5, denoted by "A." "N" represents the total number of respondents. The variables (n1, n2, n3, n4, n5) indicate the number of respondents who gave each factor a rating. for both ethical and unethical issues.

| Sr. No.	Factors	Mean	RII	Rank
1.	Owner's failure to make progress payments	4.75	0.11	1
2.	Changes in scope of the project	4.5	0.11	2
3.	Inadequate contractor site management and oversight	4.5	0.11	3
4.	Ineffective penalties for delay	4.37	0.10	4
5.	Contractor's difficulties in funding the project	4.25	0.10	5
6.	Contractor and outside party disputes	4.25	0.10	6
7.	Contractor handling work on more than one site	4.25	0.10	7
8.	Poor judgement in estimating time and resources	4.12	0.10	8

| No.	Cause	Mean	Weight	Rank
9.	Duration of the original contract is too minimal.	4	0.1	9
10.	Delay in Change orders by owner	4	0.1	10
11.	Type of project bidding and award	3.87	0.09	11
12.	Preparation of scheduling work delay	3.87	0.09	12
13.	Project design.	3.75	0.08	13
14.	Unavailability for early completion	3.75	0.09	14
15.	Modifications to the standards for the materials used during construction	3.75	0.09	15
16.	Equipment breakdowns	3.75	0.09	16
17.	Inadequate investigations by designer during the design phase	3.62	0.09	17
18.	Legal disputes	3.62	0.09	18
19.	Inadequate design team experience	3.62	0.09	19
20.	Restriction of site supervisor's authority by owner	3.5	0.08	20
21.	Complexity of project design	3.5	0.08	21
22.	Delay in manufacturing special building materials	3.5	0.08	22
23.	Inadequate and unclear details in working drawing.	3.375	0.08	23
24.	Delay by client to handover and deliver the site to the contractor.	3.37	0.08	24
25.	Owner poor communication with construction parties	3.37	0.08	25
26.	Poor by the client the other parties during construction	3.37	0.08	26
27.	Owner's inability to make decisions quickly	3.37	0.08	27
28.	Rework because of construction-related mistakes	3.37	0.08	28
29.	Inadequate surveying and data gathering prior to design	3.37	0.08	29
30.	Quality assurance and controls	3.25	0.08	30
31.	Harsh weather conditions	3.25	0.08	31
32.	Insufficient communication between owner and designer during the design phase.	3	0.07	32
33.	Postponement in assembling in uncommon structure materials	3	0.07	33
34.	Low profitability and effectiveness of equipment's	3	0.07	34
35.	Unclear and inadequate details in drawing	2.87	0.07	35
36.	Low degree of equipment operator's expertise	2.75	0.06	36
37.	Design specialist failed to comprehend the owner's requirements	2.5	0.06	37
38.	Public holidays	2.5	0.06	38
39.	Mistakes, inconsistences and ambiguities, in specification and drawing	2.25	0.05	39
40.	Corruption	1.87	0.04	40

VIII. GRAPHICAL REPRESENTATION:
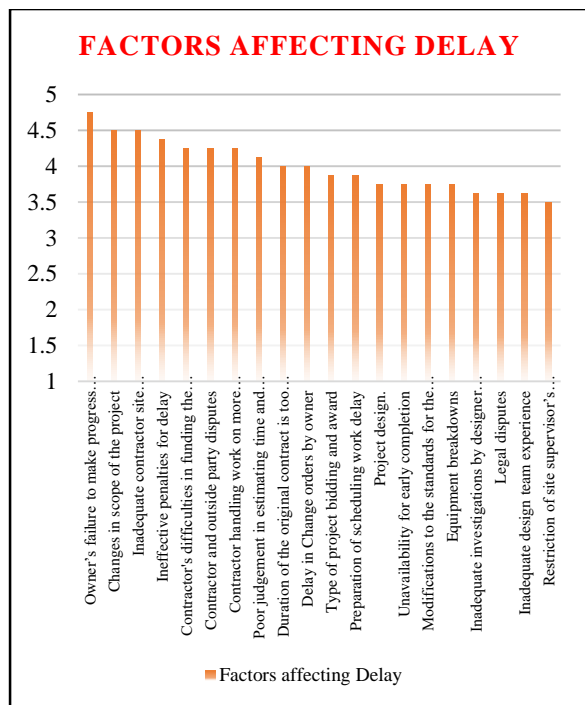
Graph no. 1 Consisting factors from point 1 to 20
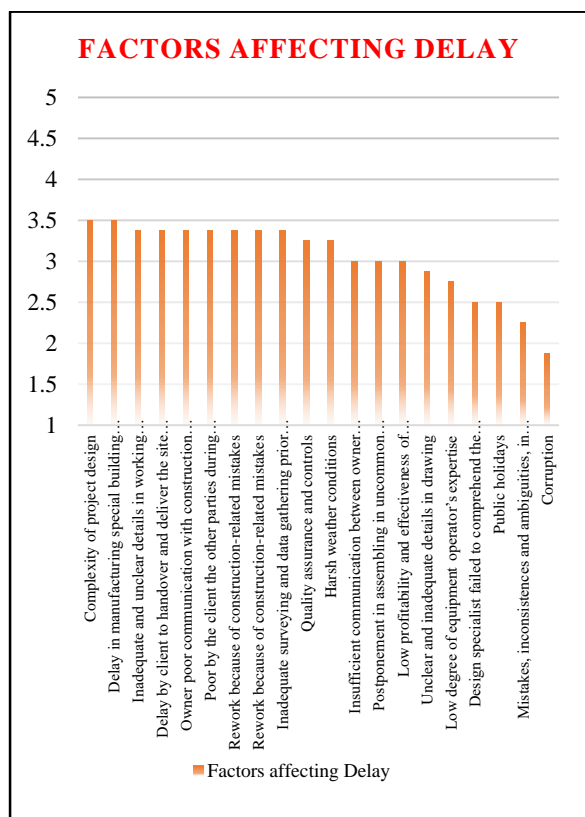
Graph no. 2 Consisting factors from point 21 to 40

IX. CONCLUSIONS AND RECOMMENDATIONS:

1. The study's objectives were achieved by analysing the outcomes of interviews conducted with various engineers and consultants in construction industry in Pune city. The results of the questionnaire demonstrated that most of delay causes had to do with problems of payments and design changes. Many factors associated with consultants were due to a lack of understanding of the client's requirements, inadequate project information, and missing details in the drawings, among other reasons.

2. The survey found that delays in high-rise buildings also occur due to site supervision, project financing, and other factors. External factors such as changes in government regulations, location, and the availability of qualified labour can also contribute to delays. According to the RII (Relative Importance Index), these are the top 10 reasons for delays, were as follows:

Graph no. 3

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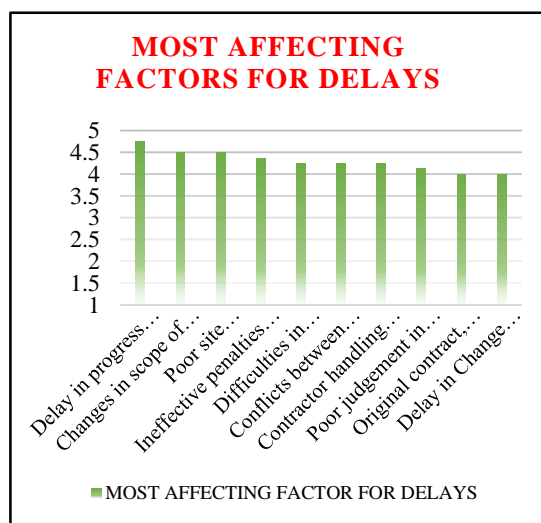
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3. Construction delays can result in significant losses for owners and builders and can impact the construction sector's economy. Previous expertise of potential delays while constructing is essential for constructing of high towers as the investments in these projects are substantial, and delays are relatively common due to the complexity of the construction process. This research study aims to pinpoint the reasons for and the extent of construction delays in tall structures in Pune city.

4. While delays in construction projects are inevitable, they can be minimized or avoided by effectively identifying and analysing their causes. Due to the variety of construction projects in terms of dimensions, nature, geography, and other variables, study into delays associated with building projects is a subject that has been extensively studied. It may be possible to bring about much-needed changes in the construction sector by looking into the reasons and consequences of delays on various projects at different levels.

X. FUTURE SCOPE OF WORK:

In order to enhance project management and reduce delays, the application of scheduling techniques, both conventional and advanced IT-based, can be explored. The utilisation of effective software tools nowadays in the market can aid in planning and monitoring projects with greater ease than before. Considering the significant investment required, it is recommended that scheduling be made an updates should be required on frequent intervals and made an essential component of the contract agreements. Moreover, these software packages can also be used for managing project schedules and creating a visual communication medium to facilitate better understanding and collaboration between stakeholders.

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