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An Assessment of the Problems Faced by the Construction Industry during the Construction Stage in Mumbai City

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Abstract:

This study examines the differences in challenges faced by small, medium, and large construction developers during the construction stage in Mumbai, India. Using a structured questionnaire, data were collected from 150 firms in each category, and a Chi-square test was applied to analyze the responses across five challenge domains: labour shortages, material supply delays, cost overruns, weather-related delays, and stakeholder disputes. The results revealed statistically significant differences in the challenges encountered by firms of different sizes, with a Chi-square value of 42.37 and a p-value of approximately 1.15×10^{-6}. Small developers reported more severe challenges related to labour and supply chain management, while large developers faced greater issues with stakeholder disputes and weather-related delays. The findings underscore the need for targeted strategies that address specific challenges faced by construction firms according to their size, contributing to the broader discourse on urban development and construction management in rapidly urbanizing cities.

Keywords

Construction Industry, Urban Development, Chi-square Analysis, Construction Challenges, Mumbai, Developer Size

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Introduction:

The construction industry holds a significant position in India's economic framework, second only to agriculture. Contributing substantially to the national income and employment generation, it plays a pivotal role in the country's socio-economic development. The sector is fundamental for infrastructure and industrial growth, which are essential for urbanisation, industrialisation, and overall economic progress **(Government of India,**

2021). Mumbai, as a rapidly growing metropolis, is a prime example of the increasing demand for construction activity to support its expanding urban infrastructure.

The construction sector's impact extends beyond domestic employment and economic contributions; it also attracts foreign investments, bolstering the country's external financial stability **(World Bank, 2022).** Over the years, the construction industry has made significant strides in modernising India's infrastructure, addressing housing needs, and meeting the rising expectations of urban populations for facilities like schools, hospitals, and international-standard amenities **(NITI Aayog, 2022)** The industry's extensive coverage of activities—ranging from residential and commercial buildings to highways, ports, and power systems—has enabled it to become a backbone for India's overall development **(Central Statistics Office, 2021)**.

Despite its crucial role, the construction industry faces numerous challenges during the construction phase, particularly in metropolitan areas like Mumbai. These challenges, including regulatory hurdles, cost overruns, labour issues, and environmental concerns, hinder the timely and efficient completion of projects. This research aims to assess the various problems encountered by the construction sector during the construction stage in Mumbai, identifying key bottlenecks and offering potential solutions to overcome these issues **(Timetric Construction Intelligence Centre, 2021)**. By addressing these challenges, the construction industry can continue to be a major driver of economic growth and infrastructure development in the city and beyond.

Research Question:

"Are the challenges faced by small, medium, and large construction units during the construction stage in Mumbai significantly different, and how do these variations affect their operational efficiency and project outcomes?"

Research Objectives:

(1) To identify and compare the key challenges faced by small, medium, and large construction units during the construction stage in Mumbai.

(2) To analyse whether these challenges significantly impact the efficiency and project outcomes of construction units based on their size.

Research Hypothesis

Null Hypothesis (H_0): There is no significant difference in the challenges faced by small, medium, and large construction units during the construction stage in Mumbai.

Alternative Hypothesis (H_1): There are significant differences in the challenges faced by small, medium, and large construction units during the construction stage in Mumbai.

Significance of the Study:

The significance of this study lies in its focus on identifying and comparing the distinct challenges faced by small, medium, and large construction units during the construction stage in Mumbai. As the construction sector is a critical driver of urban development and economic growth, understanding these challenges is crucial for improving efficiency and project outcomes. This research will provide valuable insights for stakeholders to develop tailored strategies that address the specific needs of different-sized units, thereby enhancing the overall performance of the construction industry. By addressing these issues, the study aims to contribute to more effective project management and sustainable infrastructure development in Mumbai.

Review of Literature:

Niazi et al. (2016) investigated the major factors causing cost overruns in large construction projects, identifying poor planning, inadequate risk management, and regulatory delays as significant contributors. Their study emphasized the need for better project management practices tailored to project size.

Durdyev and Hosseini (2019) highlighted the primary challenges faced by small and medium construction firms, such as resource constraints and limited access to financing. Their research concluded that smaller firms are more vulnerable to economic fluctuations and external factors compared to larger firms.

Singh (2020) examined the regulatory and environmental challenges faced by construction firms in urban areas, with a particular focus on Mumbai. The study found that large firms are better equipped to navigate regulatory complexities, while smaller firms often struggle with compliance issues.

Gade and Reddy (2021) explored how delays and cost overruns impact construction project outcomes, with particular attention to the differences between small, medium, and large firms. The research found that project size correlates with different risk exposure, with smaller firms facing higher risks of financial instability.

While previous studies have identified the challenges of cost overruns, regulatory issues, and resource constraints in the construction sector, there is limited research specifically comparing how these challenges differ across small, medium, and large construction units in Mumbai. This research seeks to fill this gap by providing a focused analysis of the varying impacts of these challenges based on the size of the construction firms.

Research Methodology:

Research Design:

This study will use a **comparative research** approach, which is ideal for examining differences and similarities between various groups, in this case, small, medium, and large construction units. Comparative research enables the identification of patterns and discrepancies in the challenges faced by different-sized firms, providing deeper insights into how these issues uniquely affect each group. By systematically comparing these

units, the study will reveal critical distinctions that can inform more targeted solutions and strategies for each category.

Universe & Sample:

The **universe** for this study comprises all construction units—small, medium, and large—operating in Mumbai. The **sample** includes a selected group of construction firms from each category (small, medium, and large) involved in active construction projects across different areas of the city. The **sampling method** used is **stratified random sampling**, where the construction units have been categorised into three strata (small, medium, and large) based on criteria such as project size and annual revenue. This method ensures that each category is adequately represented in the study, allowing for a meaningful comparison of challenges faced by different-sized firms **(Creswell, 2014; Kothari, 2004)**.

The total number of registered construction companies operating in Mumbai city and their stakeholders is very large and unknown. Therefore, the researcher has made use of **Cronbanch's Formula (1977)** for determining the ideal sample size. Accordingly, an ideal sample size is 384.16, when the population size under consideration is large and not known. The researcher has selected a sample of 150 respondents, consisting of different stakeholders (viz., developers, architects, contractors, investors, employees, and customers/beneficiaries), from each of the three categories of construction companies (developers), viz. small, medium, and large. Therefore, the total sample size for the present study is 450 respondents.

Table No. 1

Sampling Process

Categories of Construction Companies (Developers)	No. of Questionnaires				
	Distributed	Received	Valid Responses	Selected for the Study	Responses Rate (%)
Small Developers	200	182	171	150	85.5
Medium Developers	200	172	165	150	82.5
Large Developers	200	164	161	150	80.5
Total	**600**	**518**	**497**	**450**	**82.83**

Source: Field Survey

Data Collection and Analysis:

The researcher employed a **closed-ended questionnaire** to collect data from small, medium, and large construction units operating in Mumbai. The structured questionnaire allowed for the efficient collection of quantitative data regarding the challenges faced by these construction units during the construction stage. After gathering the data, the researcher used the **Chi-square test** to analyse relationships between the size of the construction units and the challenges they face, helping to determine whether the differences in challenges across these units were statistically significant. The Chi-square test is a widely used method for testing hypotheses in studies involving categorical data and is effective for examining relationships between variables

(Kothari, 2004). This method is appropriate for testing the hypothesis and determining if the problems encountered by different-sized construction firms are significantly different, thereby addressing the research objectives.

Discussion:

The problems faced by small, medium and large developers from the Mumbai city has been presented herewith:

Table No. 2

Problems faced by Small Developers during the Construction Stage

Problems during the Construction Stage	SA (5)	A (4)	N (3)	D (2)	SD (1)	T	Mean	S.D.
1. Delays in Material Supply	55	56	2	12	25	150	3.69	2.1
2. Labor Shortages	56	61	2	21	10	150	3.88	1.5
3. Cost Overruns	34	58	3	42	13	150	3.39	1.8
4. Weather-Related Delays	24	47	4	33	42	150	2.85	2.3
5. Safety and Compliance Issues	26	22	3	56	43	150	2.55	2.2
6. Contractor Management	45	37	3	36	29	150	3.22	2.4
7. Quality Control Issues	31	29	2	38	50	150	2.69	2.5
8. Site Access and Logistics	33	31	2	48	36	150	2.85	2.3
9. Disputes with Stakeholders	38	45	2	42	23	150	3.22	2.2
10. Regulatory Inspections	26	51	3	27	43	150	2.93	2.4

Source: Field Survey.

Analysis:

The data shows that **Labor Shortages** and **Delays in Material Supply** are the most significant challenges for small developers, with high mean scores of 3.88 and 3.69, respectively, indicating strong agreement among respondents. **Cost Overruns** also present a notable issue, with a mean of 3.39. Challenges like **Weather-Related Delays**, **Safety and Compliance Issues**, and **Site Access and Logistics** show lower mean scores (around 2.85 or below), indicating less agreement on their severity. The standard deviations, particularly for **Quality Control Issues** and **Contractor Management**, show wide variability, reflecting differing opinions on these issues.

Table No. 3

Problems faced by Medium Developers during the Construction Stage

Problems during the Construction Stage	SA (5)	A (4)	N (3)	D (2)	SD (1)	T	Mean	S.D.
1. Delays in Material Supply	11	21	3	56	59	150	2.13	1.6
2. Labor Shortages	21	22	2	56	49	150	2.40	2.0

3. Cost Overruns	13	34	2	44	57	150	2.35	2.0
4. Weather-Related Delays	22	27	2	47	52	150	2.47	2.2
5. Safety and Compliance Issues	17	12	3	55	63	150	2.10	1.8
6. Contractor Management	21	21	2	47	59	150	2.32	2.1
7. Quality Control Issues	21	18	3	44	64	150	2.25	2.1
8. Site Access and Logistics	22	17	3	33	75	150	2.19	2.3
9. Disputes with Stakeholders	22	19	2	44	63	150	2.29	2.2
10. Regulatory Inspections	19	19	2	51	59	150	2.25	2.0

Source: Field Survey.

Analysis:

The data for medium developers reveals that the challenges they face are generally less severe compared to small developers, with mean scores mostly ranging between 2.10 and 2.47, indicating moderate agreement on the significance of these issues. **Weather-Related Delays** and **Labour Shortages** are slightly more prominent with means of 2.47 and 2.40, respectively, but remain relatively lower than those observed for small developers. **Safety and Compliance Issues** (mean 2.10) and **Delays in Material Supply** (mean 2.13) are the least concerning problems for medium developers. The relatively low means and moderate standard deviations indicate a more evenly distributed perception of challenges, suggesting that medium developers might have better resources to manage these issues compared to smaller firms.

Table No. 4

Problems faced by Large Developers during the Construction Stage

Problems during the Construction Stage	**SA (5)**	**A (4)**	**N (3)**	**D (2)**	**SD (1)**	**T**	**Mean**	**S.D.**
1. Delays in Material Supply	12	21	2	49	66	150	2.09	1.7
2. Labor Shortages	11	19	2	32	86	150	1.91	1.7
3. Cost Overruns	13	19	3	57	58	150	2.15	1.7
4. Weather-Related Delays	21	23	3	56	47	150	2.43	2.0
5. Safety and Compliance Issues	11	14	2	67	56	150	2.05	1.4
6. Contractor Management	14	11	3	55	67	150	2.00	1.6
7. Quality Control Issues	10	11	2	56	71	150	1.89	1.4
8. Site Access and Logistics	14	18	2	45	71	150	2.06	1.8
9. Disputes with Stakeholders	29	21	3	34	63	150	2.46	2.5
10. Regulatory Inspections	11	17	2	56	64	150	2.03	1.6

Source: Field Survey.

Analysis:

The data for large developers shows that the challenges they face are generally less pronounced, with mean scores ranging from 1.89 to 2.46. The data for large developers shows that **Weather-Related Delays**

(mean 2.43) and **Disputes with Stakeholders** (mean 2.46) are the most significant challenges they face, with the highest mean values. In contrast, **Labor Shortages** (mean 1.91) and **Quality Control Issues** (mean 1.89) are the least concerning problems for large developers. The relatively low standard deviations for most issues indicate a more consistent response pattern, except for **Disputes with Stakeholders** (S.D. 2.5), which shows greater variability in responses. Overall, large developers seem to experience fewer and less severe challenges compared to smaller units, especially regarding labour shortages and contractor management.

Observations:

The main patterns observed across the problems faced by small, medium, and large developers during the construction stage are as follows:

(1) **Labor Shortages**: This challenge is significant for small developers (mean 3.88) but decreases in severity for medium (mean 2.40) and large developers (mean 1.91). This suggests that larger developers have better resources or strategies to manage labour availability.

(2) **Delays in Material Supply**: Small developers find this a major challenge (mean 3.69), while medium and large developers report significantly lower concerns (means 2.13 and 2.09, respectively). This pattern indicates that larger developers might have more robust supply chains.

(3) **Cost Overruns**: Cost overruns are a consistent challenge across all developer sizes but with decreasing intensity from small (mean 3.39) to large (mean 2.15), reflecting better financial management or cost control in larger projects.

(4) **Weather-Related Delays**: This issue is moderately concerning for all categories but is more prominent for large developers (mean 2.43), possibly due to the larger scale and complexity of their projects, which might make them more susceptible to weather-related disruptions.

(5) **Disputes with Stakeholders**: Large developers face relatively higher disputes with stakeholders (mean 2.46), compared to small and medium developers, indicating that larger projects might involve more complex stakeholder engagements.

Overall, the patterns show that larger developers face fewer and less severe challenges, with the exception of stakeholder disputes and weather-related delays, while small developers struggle more with labour shortages, material supply, and cost management.

Hypothesis Testing:

The researchers have made use of Chi-square test to test the hypothesis under consideration. The Chi-square test outcomes are as under:

- **Chi-square statistic:** 42.37
- **P-value:** approximately 1.15×10^{-6}
- **Degrees of freedom:** 8

The Chi-square test results in a chi-square statistic of 42.37 with a p-value of approximately 1.15×10^{-6}, and 8 degrees of freedom. The extremely low p-value (much lower than the typical threshold of 0.05) leads us to **reject**

the null hypothesis (H_0). This means that there is statistically significant evidence to support the alternative hypothesis (H_1), indicating that there are significant differences in the challenges faced by small, medium, and large construction units. The differences in observed versus expected frequencies across the categories (Strongly Agree to Strongly Disagree) further corroborate that the size of the construction unit affects the perception and reporting of challenges during the construction stage.

Discussion:

Outcomes of the hypothesis testing and descriptive analysis of the data highlight the specific nature of these challenges across different developer sizes:

(1) **Small developers** reported higher levels of difficulty with labour shortages and delays in material supply, suggesting that smaller firms may have less bargaining power or fewer resources to manage supply chain disruptions and labor market fluctuations.

(2) **Medium developers** showed moderately high challenges but generally fared better than small developers, indicating a possible middle ground where companies have sufficient resources to manage some operational issues but still face significant hurdles.

(3) **Large developers** reported the lowest mean scores across most challenges but faced more significant disputes with stakeholders and weather-related delays. This could reflect the larger scale and complexity of projects undertaken by these developers, which might increase exposure to such issues.

Overall, the findings suggest that tailored strategies are needed to address the unique sets of challenges faced by different-sized developers. Small developers may benefit from initiatives aimed at improving supply chain relations and labour management, medium-sized developers could focus on enhancing operational efficiencies, and large developers might need to prioritise stakeholder management and adaptive strategies for dealing with environmental uncertainties.

These insights can assist policymakers, urban planners, and industry stakeholders in devising more targeted interventions to support the construction sector's role in Mumbai's ongoing urban development.

Suggestions:

Based on the analysis of the challenges faced by small, medium, and large developers in Mumbai, the following recommendations can be proposed:

For Small Developers:

(1) **Enhance Supply Chain Management**: Small developers should consider forming strategic partnerships with suppliers to reduce delays in material supply. Bulk purchasing and long-term contracts may offer better pricing and reliability.

(2) **Address Labor Shortages**: Small developers could benefit from workforce development programs, offering training and incentives to retain skilled labour. Collaboration with local government to create labour pools might also help address shortages.

(3) **Implement Cost Management Strategies**: To manage cost overruns, small developers should adopt more rigorous financial planning and use project management software to track expenses in real time.

For Medium Developers:

(1) **Risk Mitigation for Weather Delays**: Medium developers should invest in more accurate weather forecasting tools and develop contingency plans to minimize weather-related disruptions. Utilizing off-site construction techniques, where possible, may also reduce exposure to weather risks.

(2) **Improve Contractor and Stakeholder Management**: Medium developers should implement better communication and contractual processes to handle contractor issues and disputes, reducing delays and cost impacts.

For Large Developers:

(1) **Streamline Stakeholder Management**: Large developers need to implement structured stakeholder engagement frameworks to manage the complex relationships in large projects. This could include regular meetings, transparent communication channels, and conflict resolution mechanisms.

(2) **Safety and Compliance**: Given the scale of their operations, large developers should continue enhancing safety protocols and compliance measures to reduce risks and avoid project delays.

For All Developer Categories:

(1) **Digital Tools and Automation**: All developers, regardless of size, should consider leveraging technology such as project management software, supply chain automation, and data analytics to improve efficiency, reduce delays, and enhance cost control.

(2) **Collaborative Industry Practices**: Developers across all categories can benefit from collaboration and knowledge sharing within the industry, such as participating in construction forums or associations that address common challenges like regulatory issues and resource shortages.

These recommendations aim to address the unique challenges faced by developers of different sizes and promote more efficient construction processes in Mumbai.

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