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# A FRAMEWORK FOR ENHANCING PROJECT MANAGEMENT COMPETENCY IN THE CONSTRUCTION SECTOR

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**Abstract.** The success of the construction sector is dependent on its diverse workforce and its role in driving growth. India's economy is significantly tied to construction, especially residential and commercial projects. Effective project management relies on technical, knowledge-based, and soft skills. Realistic management techniques and stakeholder relationships are vital for success. The transition from construction to operations occurs during the handover phase. Developing project management competence is crucial in the midst of failures and delays. This study aims to improve Indian construction through a model developed through an online survey of civil engineering, architecture, and project management professionals. Factor analysis identifies key success factors grouped into project management competency, environmental factors, financial viability, operational efficiency, and structural safety. Recommendations involve the adoption of technology such as BIM, skill enhancement, and sustainability promotion, which can address sectoral challenges and support Indian construction growth. Further research is suggested for industries and global construction contexts. Insights are relevant for Indian construction professionals.

***Keywords****: construction industry; project management; competencies; stakeholder relationships; Indian construction sector.*

## INTRODUCTION

The success of the construction industry is largely attributed to the diversity of its workforce, which comes from a wide range of academic specialities. This sector includes a wide range of initiatives that address the needs of states, societies, and individuals while promoting rapid growth and development. It has grown and expanded over the years in many different parts of the world. India's economy is highly dependent on the construction sector, which generates 6.5 % of its GDP on average. The sectors of residential and commercial construction are crucial for the growth of the market.

Effective project management and workplace productivity depend on professional competencies. A significant part is played by knowledge-based and technical competencies related to project process groups, such as initiation, planning, execution, monitoring, and closing. For effective teamwork in projects, "soft skills" such as sociotechnical and managerial competencies are also necessary. Examining the value of realistic project management techniques is essential to ensure on-time project delivery (Atout, 2020). Understanding project process analysis and maintaining constant, constructive relationships between the project manager, the team, and the project stakeholders from the project's inception to completion are essential for project management success. In summary, the handover phase, during which the client receives the finished project, marks the end of construction project management (Gasik, 2015). Operations management, as opposed to construction project management, is typically responsible for producing the subsequent ongoing management of goods or services.

Researchers have outlined the various phases that can be applied to e projects. Those project models frequently depict the development of a project as following a linear path from idea to decision to execution and delivery. However, these projects frequently require iterations where the projects need to be re-defined. In reviewing the agile methodologies used in IT projects, researchers found that they have iterative components that are pertinent to real estate development projects (Olsson et al., 2015).

The findings show that developing and using project management competence has an impact on the construction project. The fact that the construction industry has experienced numerous project failures suggests the need for a strong project management process and knowledge. Construction delays are widely recognised as one of the persistent challenges in the construction industry, significantly impacting project success in terms of time, cost, and quality. These delays have a detrimental effect on the overall progress of construction projects, leading to increased expenses, extended timelines, and compromised workmanship (Salunkhe & Patil, 2014). The potential impact of both sides on the project's technical planning was highlighted. By using proper construction techniques and efficient reporting and monitoring measures, project parties can establish a common standard for managing on-site construction projects, which could potentially reduce numerous errors and errors in the subsequent construction phase (Doloi, 2013).

The purpose of this study is to develop a model to improve project management practices in the Indian construction industry. The literature review is covered in Section 1, and the study methodology, data analysis, and findings are covered in Section 2, 3, and Section 4.

# 1. REVIEW OF LITERATURE

In the Indian construction industry, project management is essential to ensure project completion on time, cost-effectively, and with high quality. However, given the size of the nation, its intricate regulatory structure, and the rapid technological advancement, managing construction projects in India is difficult. There are stages in the process of planning, designing, obtaining materials, building, and giving.

Collaboration between stakeholders such as architects, engineers, contractors, and clients is necessary for effective project management.

## 1.1. Factors Affecting Project Management in the Construction Industry

Figure 1 illustrates the principal determinants and sub-determinants influencing project management within the domain of the construction industry. Central determinants include administration, value, personnel, and ecological considerations.

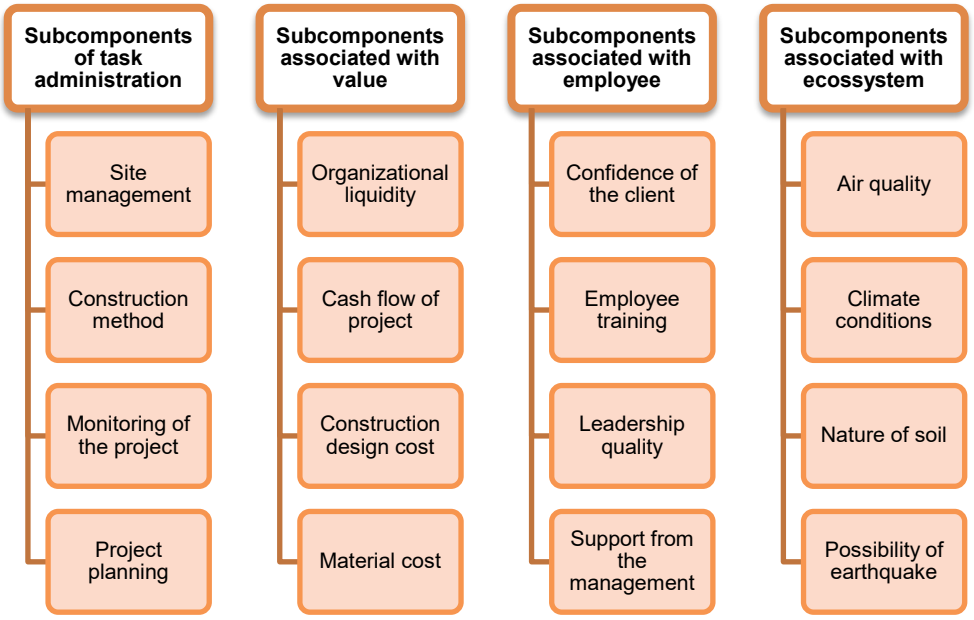


**Fig. 1.** Four factors affecting the project management in construction (Created by the author).

### *1.1.1. Subcomponents associated with task administration*

The timely achievement of objectives, adherence to the budget, and compliance with quality standards are all made possible by project management, which is essential for a project's successful completion. Site management is crucial for the efforts of the Indian construction sector to maximise resources, maintain quality control (Oppong et al., 2017), and prioritise safety. The efficient use of resources, maintaining quality standards, and promotion of a secure working environment for construction workers are all made possible by effective site management (Enshassi et al., 2021). In India's construction industry, selecting the construction method has a large impact on project management, affecting the spending plan and the schedule. The quality assurance of building a structure is dependent on construction techniques. Choosing the most effective strategy can result in cost savings, a shorter construction period, and better quality (Jadhav & Bhirud, 2015). Project monitoring is also essential for successful project management in the construction industry because it enables early identification of issues and risks, prevents delays and cost

overruns, and maximises resource allocation. Managers can ensure efficient use of resources (time and money), prevent setbacks, and improve overall effectiveness by closely monitoring project progress (Shrivas & Singla, 2022). The findings reveal that the five significant factors contributing to the problem are inefficient change orders, unrealistic contract durations, delayed variation orders for additional quantities, payment delays for completed work, and inefficient contractor planning and scheduling practices by contractors (Rachid et al., 2019).

### *1.1.2. Subcomponents associated with value*

The results showed (Pheng & Chuan, 2006) that the different priorities for working hours, site conditions, project complexity, materials and supplies, project size, project duration, and time availability. Uncertain inflation rates and fluctuating exchange rates can also have an impact on an investment's profitability over the long term by affecting a project's cash flow, material costs, and labour costs. The study's findings demonstrated that despite operating in the same sector and locale, small and large businesses used various liquidity management strategies. The large entities preferred a moderate approach, while the small entities preferred a conservative one. Additionally, it was established that the phenomena of financial liquidity and the profitability of economic entities have an inverse relationship (Zimon et al., 2022). The study by Adjei et al. (2018) identifies critical cash flow factors that affect project profitability and must be considered both before and during project execution.

### *1.1.3. Subcomponents associated with the employee*

The study by Jadhav et al. (2015) identifies several factors that contribute to variation orders, such as misunderstandings, poor technology use, and insufficient resources. These orders had a significant negative impact on educational buildings, with increased construction costs, longer construction times, client dissatisfaction, and project failure being the most notable effects. According to the study by Tabassi et al. (2011), training organisations can use efficient training methods for construction workers. These techniques include encouraging self-learning and taking part in standardised exams, sending trainers to construction sites for on-the-job training (OJT), and conducting brief training courses at fixed centres. As mentioned in the study by Buba and Tanko (2017), a project manager must motivate and commit group members to work together as a team to achieve project objectives to achieve good project performance as measured against quality. One of the most crucial and fundamental components of effective project management is leadership. Leadership is the art of influencing the behaviour of other team members to successfully complete tasks and achieve goals. Leadership is more than just managing people or projects. The study by Markute et al. (2016) also highlights that among building renovation project managers, there are 14 leadership traits that are related to project performance and uncertainty, underscoring the need for more empirical studies. Controlling cost, time, and quality variations and improving project performance depend on managing uncertainty factors. The study by Bayhan et al. (2019) revealed that while lean practitioners highlight the need for top management support as the biggest obstacle to lean implementation, they also

emphasise the importance of having a clear understanding of lean technical requirements. The study by Sanchaniya et al. (2023a) found that both internal and external factors significantly impact the management effectiveness of construction companies. Key internal factors include control over labour results, use of incentives and penalties, and employee relationships, while significant external factors involve competitive activity, economic and political crises, and fluctuations in the energy and raw materials market.

### *1.1.4. Subcomponents associated with the ecosystem*

Using the construction project schedule as a tool to reduce air pollution in urban areas, research helps produce cleaner products. The study by Nawaz et al. (2023) suggests that waste-producing construction materials can be reduced with effective management. For managing construction projects in hot weather, research has shown that experience, the workforce, and future planning are essential. With its effective application, construction can continue without interruption and meet project completion dates despite extremely hot conditions (Alshebani & Wedawatta, 2014). The lifecycle of a construction project is significantly affected by extreme weather conditions, variations in rainfall, and temperature changes (El-Sawalhi & Mahdi, 2015). Due to the negative effects of expansive soils on construction, particularly for homes, businesses, and roads, civil engineers have a difficult time choosing the best soil type for projects. Civil engineering structures may suffer from weakening stability and susceptibility to water damage from expansive soils. However, it has been discovered that adding lime to expansive soil will improve its physical characteristics and alleviate these problems (Thanappan et al., 2020). The analysed data show that several elements, such as institutional procedures, rebuilding methods, project execution, and stakeholder management, work together to significantly influence how successfully post-disaster home reconstruction projects are carried out (Sanchaniya et al., 2023b). By presenting a comprehensive model for post-earthquake housing reconstruction, the study advances existing theory. It also has a practical benefit in that it offers useful tools and suggestions to stakeholders, such as government representatives, to ensure the successful planning, development, and execution of housing reconstruction projects (Tupenaite et al., 2017; Suleiman et al., 2023). The study by Sanchaniya et al. (2023c) highlights the importance of environmental sustainability practices in the real estate industry in India. Their findings emphasise the need for improved environmental sustainability to promote sustainable management in the Indian real estate sector.

## 2. RESEARCH METHOD

The research methodology involves conducting an online survey among professionals in the disciplines of civil engineering, architecture, and project management. In conjunction with renowned alliances of construction companies and academic engineering programmes, the survey is carried out. Its objective is to pinpoint crucial success factors for managing construction projects in the Indian

construction industry. The results of the survey data collection are then classified using factor analysis to create a model that can improve project management procedures in the Indian construction market. This model offers professionals in India's construction industry a framework for improving project management procedures, which will ultimately lead to better project outcomes. The study chose to use a methodical online survey carried out in India using a digital platform such as Google Forms to ensure thorough coverage. To generalise the findings, the researchers use statistical methods to analyse the data and assess the representativeness of the sample. Given that conditions and practices span the country, it is significant to note that the survey results are applicable to the entire Indian construction market. Representatives from various Indian regions and business categories are included in the sample of professionals. The statistical techniques ensure that the sample accurately represents the professional population in the Indian construction market and that the data accurately reflects the Indian context. To ensure alignment with previous research, the authors also evaluate their results against the body of knowledge on project management practices in India. The survey was conducted among project management, civil engineering, and architecture experts with PMP certifications. The Project Management Institute (PMI) offers the Project Management Professional (PMP) certification, which is a widely respected credential in the construction industry. It indicates that a person has proven to have the knowledge, abilities, and experience necessary to manage projects successfully. A PMP certification is advantageous in the construction industry as it shows a strong understanding of project management concepts, tools, and techniques. With the help of this certification, professionals are better equipped to manage construction projects, including duties such as maintaining quality control and managing stakeholders, schedules, budgets, and resources.

## 3. DATA COLLECTION AND PREPARATION OF SURVEY

A survey that ran from April 10 to April 20, 2023 served as the main data source for this study. To ensure the quality of the questionnaire, the established standards from the literature review were incorporated into its design. An open-ended question section was added to the self-created questionnaire to obtain more information from respondents. The survey focused on a sample of 78 professionals with specialities in project management and civil engineering from different parts of India. Personal information, project management, financial considerations, labour considerations, and environmental factors were the five categories that made up the questionnaire. To create a model to improve project management procedures within the Indian construction industry, this study used the factor analysis method.

## 4. RESULT AND ANALYSIS

To categorise the results of the survey and establish crucial success factors for the management of building projects, an exploratory factor analysis was performed using the Statistical Package for the Social Sciences (SPSS). To analyse and

understand complex statistical data, researchers frequently use SPSS. Table 1 lists the results of the Bartlett and Kaiser–Meyer–Olkin (KMO) tests. The dataset used in the study was suitable for factor analysis, according to the KMO measure of sampling adequacy, which was found to be 0.766. This implies that the dataset's variables are sufficiently related to support this analysis. Furthermore, the results of Bartlett's sphericity test revealed a significant discrepancy between the identity matrix and the correlation matrix of the variables (approximate chi-square = 447.692, *df* = 120, *p* = 0.001). This suggests that the variables were related to one another rather than independent, which is a prerequisite for performing factor analysis.

**Table 1.** Results of KMO Test (SPSS software)

| **KMO and Bartlett's test** | | |
|---|---|---|
| Kaiser–Meyer–Olkin measurement of sampling adequacy | | 0.766 |
| Bartlett's test of sphericity | Approx. chi-square | 447.692 |
| | *df* | 120 |
| | Sig. | 0.000 |

Therefore, based on the findings of both tests, it is recommended that to a factor analysis be performed on the dataset to explore the underlying factors that affect the project management process within the Indian construction market. This analysis would help determine areas in which project management procedures need to be improved and contribute to creating a model intended to improve project management in the Indian construction market. Table 2 shows the overall variance of the analysis of the primary components.

**Table 2.** Total Variation of PCA (created by the authors using SPSS software)

| **Total variance explained** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Initial eigenvalues | | | Extraction sums of squared loadings | | | Rotation sums of squared loadings | | |
| | Total | % of variance | Cumulative % | Total | % of variance | Cumulative % | Total | % of variance | Cumulative % |
| 1 | 5.52 | 34.53 | 34.53 | 5.52 | 34.53 | 34.5 | 2.81 | 17.58 | 17.58 |
| 2 | 1.50 | 9.42 | 43.95 | 1.50 | 9.42 | 43.95 | 2.66 | 16.66 | 34.25 |
| 3 | 1.25 | 7.83 | 51.79 | 1.25 | 7.83 | 51.79 | 2.34 | 14.66 | 48.91 |
| 4 | 1.18 | 7.40 | 59.19 | 1.18 | 7.40 | 59.19 | 1.48 | 9.29 | 58.23 |
| 5 | 1.08 | 6.75 | 65.95 | 1.08 | 6.75 | 65.95 | 1.23 | 7.73 | 65.95 |
| 6 | 0.934 | 5.834 | 71.784 | | | | | | |
| 7 | 0.804 | 5.027 | 76.811 | | | | | | |
| 8 | 0.759 | 4.747 | 81.558 | | | | | | |
| 9 | 0.592 | 3.697 | 85.254 | | | | | | |
| 10 | 0.514 | 3.210 | 88.464 | | | | | | |
| 11 | 0.465 | 2.908 | 91.372 | | | | | | |
| 12 | 0.399 | 2.492 | 93.864 | | | | | | |
| 13 | 0.338 | 2.111 | 95.974 | | | | | | |
| 14 | 0.269 | 1.680 | 97.654 | | | | | | |
| 15 | 0.205 | 1.284 | 98.938 | | | | | | |
| 16 | 0.170 | 1.062 | 100.000 | | | | | | |
| Extraction method: principal component analysis | | | | | | | | | |

A statistical technique called principal component analysis (PCA) is used to significantly preserve information while reducing the dimensionality of a large dataset. The total variance explained by the PCA analysis is summarised in Table 2. In addition to the percentage of variance explained by each component and the cumulative percentage of variance explained, the total variance explained by each component before and after rotation is explained. The findings indicate that the first component explains 34.534 % of the overall variance, the second component 9.423 %, etc. The first component accounts for 34.534 % of the total variance explained, and as we move down the table, this value rises until it reaches 100 % with the last component.

The number of principal components that should be retained in the analysis can be determined using this information. The first five components, in this case, account for 65.950 % of the total variance, and the five components collectively account for 65.950 % of the variance. Therefore, keeping the first five components would effectively reduce the dimensionality of the data while still providing a reasonable representation of the original data.

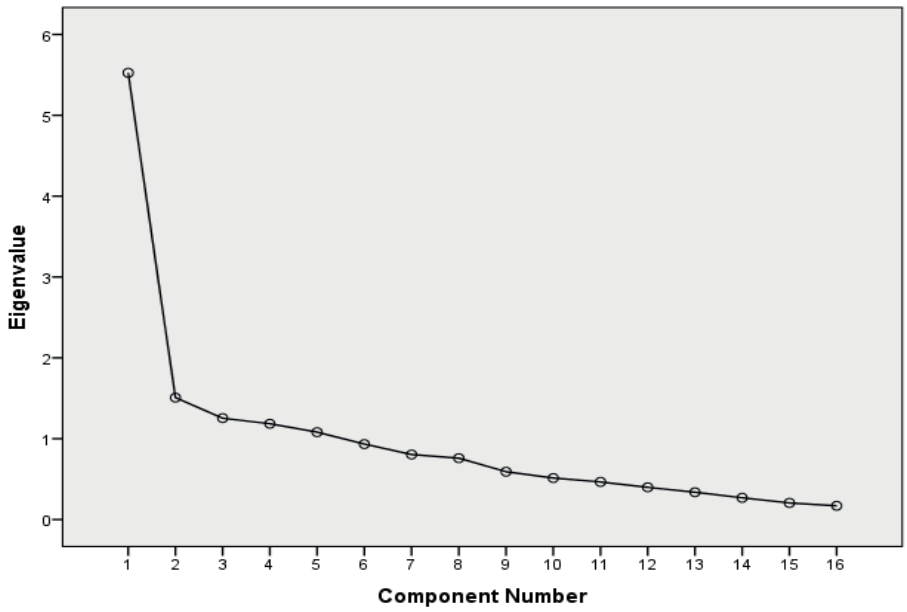


**Fig. 2.** Scree plot (created by the authors using SPSS software).

The scree plot is a visual representation that plots the individual component eigenvalues in descending order against their corresponding component numbers or corresponding component numbers in descending order. In a given set of components, it is frequently noticed that the first component tends to have the highest eigenvalue while succeeding components have decreasing eigenvalues. After the first few components, the scree plot clearly shows a decline in eigenvalues, followed by a relatively stable curve segment with smaller eigenvalues.

Based on this analysis, the principal component analysis effectively condensed the initial set of 15 questions to just four significant factors. Figure 2 shows how

scree charts are used in factor analysis. This study can use the graph to evaluate the trend towards decreasing diversity displayed by each succeeding component, allowing them to decide how closely they should examine each factor. The number of principal components is calculated using scatterplots, and the eigenvalues for each principal component are located using a scree plot. The eigenvalues are shown on the vertical axis, and the number of components is represented on the horizontal axis. The graph shows a rising trend in depth.

**Table 3.** PCA Component Matrix (created by the authors using SPSS software)

| **Component Matrix[a]** | | | | | |
|---|---|---|---|---|---|
| **Factors** | **Component** | | | | |
| | 1 | 2 | 3 | 4 | **5** |
| Site management | 0.466 | | 0.476 | 0.566 | |
| Construction method | 0.641 | | | | |
| Monitoring of the project | 0.572 | | | | |
| Proper planning | 0.525 | | | | |
| Organisational liquidity | 0.802 | | | | |
| Cash flow of project | 0.605 | | | | –0.629 |
| Construction design cost | | | | 0.642 | |
| Material prices | 0.695 | | | | |
| Confidence of the client | 0.485 | | –0.532 | | |
| Employee training | 0.709 | | | | |
| Leadership training | 0.720 | | | | |
| Support from the management | 0.539 | –0.472 | | | |
| Air Quality | 0.605 | 0.536 | | | |
| Climatic conditions | 0.657 | | | | |
| Nature of soil | 0.572 | 0.558 | | | |
| Possibility of earthquake | | | 0.661 | | |
| Extraction method: principal component analysis | | | | | |
| [a] 5 extracted components | | | | | |

A component matrix, used in factor analysis, displays the correlation coefficients between the extracted components and the observed variables, indicating the strength and direction of their associations. In our study, we extracted five components using principal component analysis (PCA) to simplify the data and identify the underlying causes of shared variance. Statistical techniques, such as eigenvalue analysis and consideration of cumulative variance, helped guide the decision to extract five components. The loadings of the component matrix must be analysed to interpret the components, with higher values indicating stronger associations with factors. We gain insight into the main factors affecting project management in the Indian construction market by understanding these elements. This information makes it easier to create robust models for improving the project management procedure and to create robust models for enhancing the project management procedure.

For example, site management displays high factor loadings on Components 1, 3, and 4, which indicate strong associations (0.466, 0.476, and 0.566, respectively). Similarly, to how materials prices exhibit a high factor loading on Component 1

(0.695), a strong correlation is implied. In contrast, Component 1 (0.641) and Component 3 (−0.532) have the strongest associations with the construction method (0.485) and the confidence of the client, respectively. The component matrix obtained using SPSS is shown in Table 3.

**Table 4.** Rotated Component Matrix (SPSS software)

| **Rotated component matrix[a]** | | | | | |
|---|---|---|---|---|---|
| | **Component** | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Site management | | | | 0.843 | |
| Construction method | | 0.512 | | | 0.520 |
| Monitoring of the project | 0.706 | | | | |
| Proper planning | 0.713 | | | | |
| Organisational liquidity | | | 0.687 | | |
| Cash Flow of Project | | | 0.873 | | |
| Construction design cost | | | | 0.460 | –0.485 |
| Material prices | | | 0.684 | | |
| Confidence of the client | | | 0.439 | | |
| Employee training | 0.642 | | | | |
| Leadership training | 0.769 | | | | |
| Support from the management | 0.572 | | | 0.418 | |
| Air quality | | 0.798 | | | |
| Climatic conditions | | 0.739 | | | |
| Nature of soil | | 0.763 | | | |
| Possibility of earthquake | | | | | 0.775 |
| Extraction method: principal component analysis.<br>Rotation method: varimax with Kaiser normalisation. | | | | | |
| [a] The rotation converged in 8 iterations | | | | | |

A rotated component matrix is a matrix that shows (see Table 4) the loadings of variables on each component after rotation in the factor analysis and the principal component analysis. Rotation is used to make the loading matrix more understandable and more superficial. In this instance, the initial component matrix underwent a varimax rotation with Kaiser normalisation, producing a more precise structure with higher loadings on fewer components, making interpretation easier. Values above 0.4 in the rotated component matrix denote significant correlations between variables and components. Both positive and negative values are present in each component under analysis. There is a strong correlation between subfactors and components when the Pearson correlation coefficient is more significant than 0.4, highlighting the strength of this relationship.

The rotated component matrix is helpful for establishing correlations between the chosen components. Analysts can understand the underlying structure by looking at the loadings. The rotation matrices are shown in Fig. 3.

Component 1 exhibits strong correlations with cash flow, organisational liquidity, and site management, indicating that corporate and financial aspects are closely related. Leadership development, soil type, climatic conditions, and air quality have high loadings in Component 2, indicating their importance for effective project management and leadership. Component 3 emphasises the

importance of project monitoring, appropriate planning, and employee training for effective project management. The primary focus of Component 4 is the potential for an earthquake, highlighting its special consideration in project management. The cost of construction design and management support is also related to Component 5, suggesting their interdependence and potential influence on project success. Analysts used the results of the factor analysis to segment the data. They were able to find correlations and learn more about the connections between the selected components by using the rotated component matrix.

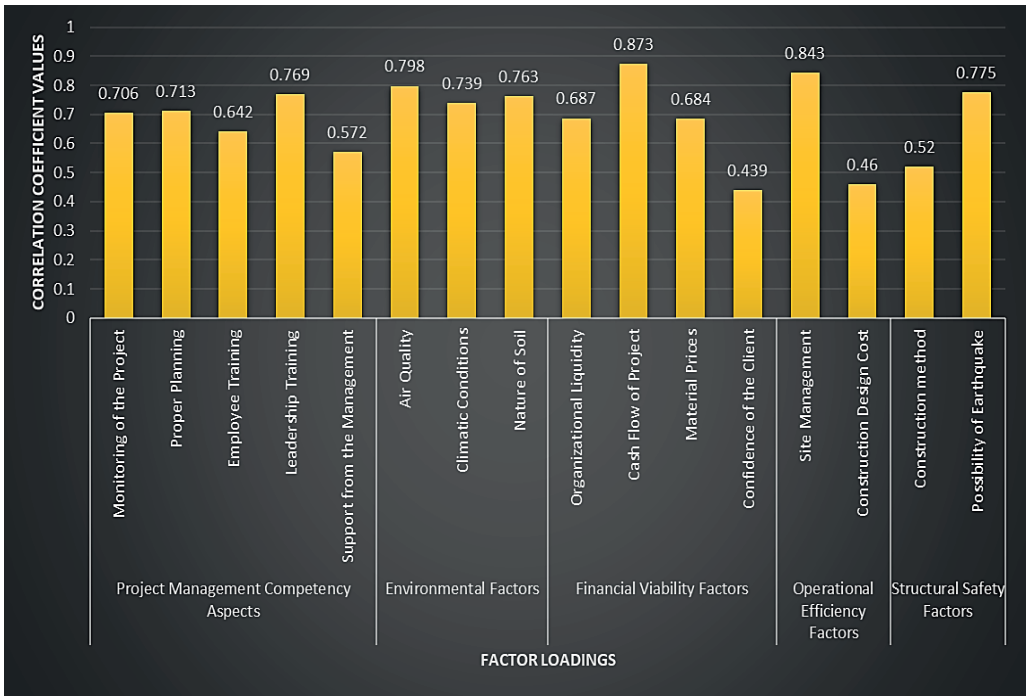


**Fig. 3.** The defined factor loadings (created by the authors).

A set of variables from the survey was divided into five different components using factor analysis. The first element – project management competency – includes aspects like project oversight, careful planning, employee training, leadership development, and management support. These elements are essential for effective management of construction projects. Monitoring, meticulous planning, employee training, leadership development, and management support are all necessary for effective project management. These elements help to meet project milestones, complete work on schedule, and satisfy clients.

Air quality, climatic conditions, and soil nature make up the second component – environmental factors (EF). Due to their effects on soil stability, construction methods, and air quality, these factors must be considered when planning construction projects. The dangers of poor air quality for people working on construction sites and building materials highlight the need for monitoring and control. Unfavourable weather can hamper progress and endanger worker safety, which requires careful planning and oversight. The quality and stability of the soil

impact the project's foundation, and security is affected by the quality and stability of the earth, necessitating an assessment and mitigating actions. To be successful in a construction project, these environmental factors must be considered and managed effectively.

The third component, financial viability factors (FV), comprises organisational liquidity, project cash flow, material prices, and client confidence. These elements are essential to a financial stability and long-term viability of a construction project. Project success can be hampered by a lack of liquidity, cash flow problems, fluctuating material prices, and client confidence. However, the successful completion of a project depends on adequate liquidity, favourable cash flow, effective material cost management, and confident clients.

The cost of site management and construction design is the fourth element of operational efficiency factors in construction projects. Site management involves monitoring labour, resources, subcontractors, safety, schedules, and finances to guarantee on-time completion, cost containment, and quality. The focus is on choosing technologically advanced materials, designs, and methods that still adhere to quality standards. Effective site management, cost-effectiveness, timely completion, and successful project results are made possible by prioritising operational efficiency.

The construction method and the probability of earthquakes are two important criteria in the fifth component – structural safety factors (SS). Methods used during construction significantly impact the structural soundness and security of a building, and taking earthquake risk into account is essential for risk mitigation. Proper planning, design, and implementation are required to guarantee structural integrity, reduce the possibility of collapse or damage to structural integrity and reduce the likelihood of collapse or damage. Proper planning, design, and implementation are required.

# CONCLUSIONS

As a result, the research effectively responds to the research questions and offers insightful information on project management procedures in the Indian construction industry. The study emphasises that the critical phases to achieving successful project results are initiation, planning, execution, monitoring, control, and closure. Additionally, the study identifies variables such as task administration, value, employee variables, and ecosystem variables that greatly influence the success of project management in the Indian construction market.

The authors create a theoretical framework to improve project management procedures in the Indian construction industry through a thorough review of the literature and data analysis. This framework emphasises the importance of technology, communication, lean building, skill development, contract management, sustainability, and teamwork. Processes can be optimised and made more efficient by implementing contemporary technologies like building information modelling (BIM), drones, and 3D printing, as well as better communication and lean construction principles.

The improvement of project management processes is highly dependent on the development of human resources skills, proper contract management, sustainability practices, and stakeholder collaboration. The proposed theoretical framework may address several issues facing the sector, such as a lack of skilled labour, infrastructure constraints, regulatory barriers, contractual conflicts, financial difficulties, and safety concerns. Implementing a framework can result in more effective, affordable and sustainable projects. Using this framework can result in more effective, affordable, and sustainable projects that are more effective, affordable, and sustainable, supporting the expansion and development of the Indian construction industry.

Several recommendations are made for additional research in this area as we progress. Future researchers can expand the study beyond the construction industry to other industries and look at different factors that improve project management procedures. It is also advised to consider alternative analytical stances, considering alternative analytical perspectives to enhance the accuracy and dependability of future investigations. Reliability and precision of the results can be further enhanced by increasing the sample size in research studies. Additionally, broadening the study's focus beyond India to incorporate international construction markets would offer a more comprehensive understanding of project management procedures.

For civil engineers, project managers, and architects looking to improve project management procedures within the Indian construction market, the factors and findings of this study are highly relevant. The identified factors can be applied on construction sites to encourage the adoption of project management practices, which can be applied on construction sites. These recommendations should be considered in future research projects to advance the depth and breadth of knowledge in project management techniques.

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