Study and Critical Assessment of Influencing Factors in Construction material Management (CMM)

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Abstract

Material Management of the construction project involves several factors and attributes of various types contribute to their extent of impact on the project. These factors were identified by consultations with experts and practicing engineers apart from reviewing literatures and carrying out a pilot study. Questionnaire was designed for the experiment and administered on selected construction professionals of varying capacities. The obtained responses were factored. Using the data, statistical model has been constructed. The model was analyzed using SPSS and the outcome such as frequency, mean variations and deviations and other statistical parameters were obtained. The variations mean and deviations were considered and represented in the bar chart and pie charts for the possible interpretation of the results quantitatively. It was evident from the results of analysis that the resource management and supportive management of the project play a key role in making the successful completion of the project. In next level factors such as the technical competence, financial management and management efficiency were found dominant as per the analysis. However the factors related to social and environmental and safety were given least importance by the respondents. This study is limited by the number of respondents, however the same has been carried out on a larger experiment with large number of respondents to get the outcome more accurate. The detailed analysis, interpretations and the summary of the findings were discussed and elaborated in this article.

Keywords: Construction material management (CMM), Socio Project Contribution, Environmental and safety, Supportive role of owner and management, Technical competence of the project, Management efficiency, Financial management capability, Resource Management, SPSS

1. INTRODUCTION

The Social impact considerations are central to contemporary material management strategies. The review highlights research gaps and proposes future directions for integrating social trends into CMM frameworks. The study examines sustainable material selection, waste minimization, inventory control, hazardous material handling, and the integration of environmental and safety management systems. While extensive research has addressed technical aspects such as procurement systems, inventory control, and logistics, the supportive role of owners and top management remains comparatively underexplored. The findings indicate that technically competent project teams leverage modern tools, standardized procedures, and data-driven approaches to enhance material management outcomes. to identify key dimensions of management efficiency in construction material management, examine contemporary practices, and highlight strategies that enhance project performance. Financial management capability within CMM refers to the ability of project organizations to plan, allocate, control, and optimize financial resources associated with material procurement, storage, handling, and utilization. Construction projects are resource-intensive systems in which materials, labor, equipment, capital, and information must be efficiently planned, allocated, and controlled. Ineffective resource management often results in material shortages, excessive inventory, cost overruns, and reduced project performance.

Construction projects consume vast quantities of materials, and inadequate material management can lead to cost overruns, delays, and waste. Beyond operational efficiency, social expectations related to sustainability, technology, and ethical practices are shaping how materials are managed from selection and supply to waste handling and reuse. This review synthesizes literature examining social trends that directly impact CMM and supply chain strategies.

The construction industry is one of the largest consumers of natural resources and a major generator of waste and occupational hazards. Material-related activities account for a substantial portion of construction costs, environmental impacts, and safety incidents. Consequently, construction material management has evolved beyond logistics and cost control to encompass environmental stewardship and worker safety.

Environmental regulations, sustainability goals, and stricter safety standards have compelled construction organizations to adopt systematic material management practices. This review critically examines scholarly contributions that address construction material management from environmental and safety perspectives, focusing on how material-related decisions influence sustainability outcomes and accident prevention.

Construction material management encompasses planning, procurement, transportation, storage, handling, and control of materials from source to point of use. Inefficiencies in these processes often lead to cost overruns, schedule delays, material wastage, and safety hazards. The literature increasingly recognizes that technical tools alone cannot ensure effective material management.

Instead**,** support from project owners and top management plays a decisive role in shaping policies, providing resources, enforcing accountability, and fostering coordination among stakeholders. This paper reviews prior studies to synthesize knowledge on how owner and management support contributes to successful construction material management.

Construction projects are material-intensive, with materials accounting for a significant proportion of total project cost. Ineffective material management often results in cost overruns, delays, quality defects, and excessive waste. Prior studies emphasize that beyond organizational policies and external factors, the technical competence of the project team is fundamental to achieving effective material management. Technical competence refers to the ability of project stakeholders to apply engineering knowledge, construction methods, information technologies, and managerial skills in a coordinated manner. This paper reviews the literature to analyze the role of technical competence in strengthening construction material management systems.

Materials typically account for 50–70% of the total cost of construction projects, making their management a critical managerial function. Management efficiency in construction material management refers to the ability of project teams to plan, procure, store, handle, and utilize materials in a manner that minimizes waste while maximizing productivity and cost effectiveness. Inefficient material management has been repeatedly identified as a major contributor to project failure, particularly in developing economies where logistics and coordination challenges are prevalent.

Recent advancements in project management methodologies, lean construction principles, and digital technologies have intensified scholarly interest in improving management efficiency within CMM systems. This review consolidates academic perspectives on how managerial practices influence material-related efficiency and overall project outcomes.

Financial management capability in CMM encompasses budgeting accuracy, cost forecasting, procurement financing, payment scheduling, inventory valuation, and monitoring of material-related cash flows. Literature suggests that construction firms with robust financial controls integrated into material management systems demonstrate superior cost performance and reduced financial risk exposure. This review synthesizes prior research to identify key dimensions, impacts, and challenges of financial management capability in CMM.

Resource management in construction material management encompasses the planning, procurement, storage, handling, utilization, and monitoring of materials to achieve optimal performance objectives.

2. LITERATURE REVIEW

Huang, S., & Lee, H. (2024) looks at how smart technologies influence material flow and management efficiency. The authors emphasize the importance of data-driven decision-making,

IoT integration, and real-time analytics for improving material handling on smart construction sites.

Tagamud and Mir (2024) provide an overview of how sustainable materials contribute to reduced environmental impacts, improved indoor air quality, and healthier built environments, highlighting the interconnected nature of environmental and social benefits.

Bhasin, M., & Patel, N. (2023) examine the effects of the COVID-19 pandemic on material management, highlighting supply chain disruptions, labor shortages, and increased transportation costs. They argue for the need for more resilient and flexible procurement systems to mitigate such risks.

The systematic review by **Cataldo et al** (**2022**) outlines sustainable supply chain frameworks in construction, emphasizing the need for long-term collaborative relationships and the integration of sustainability components, including social dimensions, into supply chain processes.

Silva, C., & Almeida, L.(2022) assesses the environmental factors affecting material management in the construction sector. The authors discuss regulatory constraints, the increasing demand for sustainable materials, and how environmental concerns influence material choices and management practices.

Udeaja, C., & Barrett, P. (2021) explores how material shortages influence project delays, particularly in large infrastructure projects. It identifies contributing factors, such as poor supply chain management and ineffective material tracking systems, and suggests mitigation strategies.

Yang, J., & Cheng, W. (2020) investigates how emerging technologies, such as RFID and drones, influence material management. The authors find that technology improves tracking, reduces errors, and enhances decision-making in material procurement and storage processes.

Tang, L., & Qian, X. (2019) focuses on the broader supply chain factors that affect material management, including transportation delays, fluctuating material prices, and vendor reliability. It offers solutions for mitigating supply chain risks through better forecasting and supplier diversification.

Elghaish, F., &Abrishami, S.(2018) highlights how procurement strategies influence material management. It examines the impact of contract types, supplier relationships, and lead times on the timely delivery and quality of construction materials.

Chileshe, N., &Kikwasi, G. (2017) identify and prioritize critical success factors in material management, such as supplier reliability, project scheduling, and inventory control systems. They argue that effective communication among stakeholders plays a crucial role in managing materials effectively.

Kasim,N.,&Sulaiman, R. (2016) explores the factors that influence on-site material management efficiency, including storage conditions, material handling techniques, and workforce skills. The research shows how project success is linked to efficient materials logistics and management.

Kibert (2016) emphasized that life-cycle-based material selection enables construction projects to minimize environmental burdens across extraction, manufacturing, transportation, use, and end-of-life stages. These findings suggest that environmental considerations must be embedded at the earliest stages of material decision-making.

Ajayi, S., Oyedele, L., & Bilal, M. (2015) identifies key factors that contribute to material waste in construction projects, such as poor planning, inaccurate forecasting, and inefficiencies in handling. The authors emphasize the importance of waste minimization strategies through better management practice

Improper storage and handling of materials significantly increase material degradation and waste generation. **Hasanbeigi et al (2014).** Demonstrated that optimized inventory control and just-in-time delivery systems reduce surplus materials, on-site congestion, and waste. Efficient storage practices further prevent contamination of soil and water caused by cement, chemicals, and fuels.

Literature consistently identifies material planning as a primary determinant of environmental performance. **Tam et al o(2007).** reported that inaccurate quantity estimation and poor procurement practices lead to excessive material waste and disposal. Sustainable procurement strategies, including local sourcing and the selection of recycled or low-impact materials, have been shown to reduce embodied energy and greenhouse gas emissions.

Recent research supports the integration of environmental management systems with occupational health and safety frameworks. **Zhou et al (2005).** Demonstrated that integrated systems improve compliance, reduce environmental incidents, and lower accident rates. Construction material management is identified as a critical operational area where environmental and safety objectives converge.

3. MATERIAL MANAGEMENT CONCEPTS:

Construction material management is a comprehensive process that involves the planning, procurement, handling, and utilization of materials required for construction projects. Effective material management is critical to ensuring that projects are completed on time, within budget, and to the desired quality standards. Several key concepts underpin construction material management, each of which plays a vital role in the success of a construction project.

FIG1 1

Material Planning and Forecasting: This involves estimating material needs at different stages of a project to avoid shortages or surpluses. Accurate planning prevents delays and extra costs by coordinating between project teams and procurement.

Procurement and Supplier Management: Acquiring materials involves selecting reliable suppliers, negotiating contracts, and ensuring timely deliveries. Strong supplier relationships help secure better pricing and consistent quality.

Inventory Management: Effective inventory control tracks material usage, minimizes waste, and ensures materials are available when needed. Integrated systems reduce the risks of overstocking or under stocking.

Logistics and Transportation: Ensuring timely delivery of materials through efficient logistics coordination is crucial. Poor logistics can lead to delays or damage to materials.

Material Handling and Storage: Proper handling and storage of materials reduce damage and ensure safety. Storage should protect materials from environmental factors and facilitate easy access.

Just-in-Time (JIT) Delivery: JIT minimizes on-site inventory by aligning material delivery with immediate needs. This approach reduces storage costs but requires precise planning and *coordination.*

Waste Management and Sustainability: Emphasizes reducing, reusing, and recycling materials to minimize waste. Sustainable practices lower costs and improve project efficiency.

Cost Control and Budgeting: Monitoring expenses and staying within budget requires tracking material costs and adapting procurement strategies based on market conditions.

Information Management and Communication: Digital tools facilitate real-time data sharing and tracking of material usage, orders, and inventory, improving coordination and decision-making.

Risk Management: Identifying and mitigating risks like material shortages, price fluctuations, and supply chain disruptions ensures materials are available without impacting timelines or costs.

4.GENERAL FACTORS AFFECTING CMM

As the construction is involving many attributes which are grouped as in general viz social related factors, safety and environmental, technical, competence, supportive management, management efficiency, financial management and resource management are shown in the figure2.

Fig:2

4.1 Socio Project Contributions

Social factors play a significant role in construction material management, influencing decisions, processes, and outcomes. Here are some key social factors that affect construction material management Abilities and Training for the Workforce, Cultural Perspectives and Customs, Local Influence and Community Relations, Interaction and Involvement of Participants, Economic Disparities and Resource Access, Social Expectations and Norms, Workforce dynamics and labour relations, Public Attitude and Media Power, Influence of Government and Policy, The Cultural Perspectives and Customs of the Demographic Factor

4.2 Environmental and Safety

Environmental clearance and safety in construction material management are crucial for ensuring that construction activities are conducted in an environmentally responsible manner, minimizing negative impacts on the environment and safeguarding public health. Here's an overview of how environmental clearance and safety relate to construction material management Compliance with regulations and sustainable material sourcing, Pollution control and waste management, Effects on Regional Ecosystems, Safety Factors in the Management of Construction Materials, Safe Material Storage and Hazardous Material Handling, Training and Awareness, Emergency Readiness and Reaction Ensuring compliance with environmental regulations reduces the project's ecological footprint and helps protect natural resources. Proper management of materials, particularly hazardous ones, ensures a safer working environment and reduces the risk of accidents. Adhering to environmental and safety regulations prevents legal issues and potential fines or project delays. Sustainable material management practices contribute to the long-term sustainability of construction projects, enhancing their overall value.

4.3 Supportive role of owner and management

In construction material management, organizational relations play a crucial role in ensuring efficiency, cost-effectiveness, and smooth project execution. Here's how organizational relations support thisSync and Interaction, Supplier Connections, Internal Cooperation, Resolution of Conflicts, Methodical Scheduling, Feedback Loops, Training and Development, Compliance and Safety

4.4 Technical competence of the Project

Technical competence in managing construction materials is critical for ensuring that projects are executed efficiently, within budget, and to the required quality standards. Comprehending Material Properties, Quality Control and Assurance, Inventory Management, Procurement and Supply Chain Management, Cost Management Logistics and Storage, Regulatory Compliance, Sustainability Practices, Technical Documentation, Technology and Tools.

4.5 Management efficiency of construction materials management

Management efficiency in construction materials management involves optimizing processes to ensure that materials are procured, stored, and utilized effectively. High efficiency in material

management can lead to cost savings, reduced delays, and improved project outcomes. Here are key factors that contribute to management efficiency: Accurate Forecasting and Planning, Streamlined Procurement Processes, Optimized Inventory Management, Effective Storage Solutions, Use of Technology, Integrated Supply Chain Management, Regular Monitoring and Reporting: Cost Control Measures, Training and Development, Clear Processes and Procedures, Feedback and Continuous Improvement By focusing on these factors, construction projects can achieve higher efficiency in material management, leading to better project performance, cost savings, and timely project completion.

4.6 Financial Management Capability

The financial management capability of construction material management refers to the ability to
The financial management capability of construction material management refers to the ability to efficiently and effectively plan, allocate, monitor, and control the financial resources related to the procurement, handling, and use of construction materials. It directly impacts project costs, timelines, and profitability. Key elements of financial management capability in construction material management include: Budget Planning and Allocation, Cost Control and Monitoring, Cash Flow Management, Procurement and Vendor Management, Inventory and Stock Control, Waste and Loss Minimization, Contingency Planning, Technological Integration for Financial Management

4.7 Resource management

Resource management in construction material management involves optimizing the use of resources such as materials, labor, and equipment to ensure efficient project execution and minimize waste. Here are key elements of effective resource management: Resource Planning for Material Requirements Planning: Determine the type and quantity of materials needed for each phase of the project based on detailed project plans and schedules. Resource Scheduling: Align material procurement and delivery schedules with project timelines to ensure that resources are available when needed. Resource Allocation is the Material Allocation: Distribute materials to different parts of the project based on requirements and priorities. Ensure that materials are allocated in a way that supports project progress and reduces downtime. Labor and Equipment: Allocate labor and equipment resources efficiently to match material availability and project needs. Coordinate with project managers to align resource use with project activities. Performance Monitoring is Establish key performance indicator Continuous Improvement: Regularly review and improve resource management processes based on performance data and feedback from project teams. Effective resource management ensures that materials, labor, and equipment are used efficiently, contributing to project success, cost savings, and timely project completion.

5.ASSESSMENT OF IMPACT ON THE FACTORS AFFECTING CMM.

The survey is carried out in two parts consisting of demographic and questionnaire survey. The statistical model using SPSS is being developed and analyzed,. In each category the factors are identified and grouped and accounted for analysis, since analyzing each and every factor might consume a lot of time and to be a laborious task. A number of attributes pertaining to the factors of social, environmental and safety were consolidated and grouped. The factors responsible for finance were grouped and titled as finance management. Likewise these groups were formed and used for the analysis as category wise.

5.1 Factor Rating

Factor rating is used as 1-5 point likert scale method. It's a type of psychometric responses for surveying and this type of likert scale is widely used in the market research. Likert scale method is allowed by the respondents to responses of their level agreement of the questionnaire survey. In this study the likert scale was used to rate their opinion about the schedule overrun in the project.

5.2 Demographical analysis and results

The semi structured questionnaire was circulated among the construction professionals in various projects and retrieved their responses of the questionnaire about the present project. The data were collected with various techniques such as face interview, mail and friends of friends through questionnaire.

The questionnaire were split into two parts such as Part A and Part B. the Part A consists of personal details of respondents and project characteristics like designation, Type of organization, type of project, type of scheduling etc., The second Part B consist of fifty Five factors which are influencing the construction project scheduling. Later, The Part B was grouped under seven categories namely.

The survey method is useful to collect wide range of information and large amount of participants to refer any kind of issue in the research. The questionnaire was designed based on literature study and experts opinions in the pilot study. The questionnaire was constructed by using semi structured form where the participants can freely express their opinion. In this study the questionnaire was distributed to two hundred and seventy projects and retrieved only two hundred and ten hundred responded were filled completely. The percent of responses of questionnaire is 77.78% and it could be consider as good response to proceed the analysis.

Data were collected from various construction professionals such as Project managers, project engineers and site engineers etc., through face to face interviews and mail in case the difficult to meet face to face. The descriptive statistics was considered to know about the respondents details. From Table 1, designation and other project parameters were analysed and presented. When the respondents' profile is considered, the highest contribution was from Site Engineers (25.14%)**,** followed by Planning Engineers (24.95%) and Project Managers (18.48%) respectively. shows that the highest contribution of company profile was from private limited companies and that is (80%) which shows the maximum responses were obtained from private

limited companies only.

The project responses were obtained covering major cities in southern part of India and they were categorized under five heads such as residential, commercial, industrial, infrastructural projects and others as shown in Table 1. It is found that the samples collected are a well-balanced mix having all types of projects, proving the consistency in the outcome of the research. When the project scheduling is considered, the highest contribution was from time-based scheduling (58.86%)**,** followed by resource-based scheduling (22.10%). In order to derive the best possible outcome of the survey, the questionnaire and research objectives were explained to the professionals during data collection.

5.3 Ranking of factors Impact

The SPSS (Statistical Packages of Social Studies) tools used to find the impact of factors in the CMM. The 5 point likert scale was used to distinguish the range of responses for nil(0) to severity (5) of the schedule overrun in the project. The mean and mode value were calculated to tank the top most critical factors for CMM Disputes.

Table 1

Demographic features	**Frequency**	**Percentage**
Designation		
Construction Engineer	33	6.29
Project Manager	97	18.48
Project Engineer	112	21.33
Planning Engineer	131	24.95
Site Engineer	132	25.14
Others	20	3.81
Years of experience		
1 – 3	78	14.86
3 – 5	106	20.19
5 -1 0	127	24.19
10 – 15	103	19.62
> 15	111	21.14
Project Characteristics	**Frequency**	**Percentage**
Type of project		
Residential	105	20.00
Commercial	217	41.33
Industrial & others	89	16.95
Infrastructure	114	21.71

Built up area (sq.ft)		
Up to 10000	226	43.05
> 10000	299	56.95
Project Size		
Small & Medium	153	29.14
Large	141	26.86
Very Large	231	44.00
Budget of the Project in crores		
Up to 70	232	44.19
> 70	293	55.81
Type of scheduling		
Resource	116	22.10
Time	309	58.86
Line of Balance	72	13.71
Others	28	5.33
No of Project ReCMMd		
Nil	122	23.24
1 – 2	160	30.48
3 – 5	177	33.71
> 5	66	12.57

Table: 2

Factors No	FACTOR INFLUENCING CONSTRUCTION PROJECT SCHEDULE	MEAN	SD	MODE
F1	Whether the local/Socio Project Contribution hurdles affect the schedule of project?	2.54	1.188	3
F2	Whether the local people co-operate for the work progress?	2.76	1.115	3
F3	Whether the work is affecting local / government policies?	2.39	1.190	1
F4	Whether the project is affected by change of Government?	2.27	1.235	1
F5	Is there any local disturbance by the political members?	2.34	1.262	1

F6	How far the project is affected due to any payment of stockholders?	2.58	1.266	2
F7	Whether the project is completed the target based on payment systems by contract?	2.92	1.186	3
F8	Whether the schedule is being affected due to lack of finance?	2.69	1.319	2
F9	How far the project has a sufficient technical support by the workers/engineer in the project?	3.58	1.099	4
F10	Whether you classify the project in the technical aspects in the time of scheduling	3.44	1.107	4
F11	Do you have a separate consultant team for the technical support?	3.14	1.352	4
F12	How far the project was inspected at the time of major activities?	3.64	1.114	4
F13	How far the planned resources can be obtained at the time of work?	3.46	1.073	4
F14	How far the project has faced problems by the neighbourhood issues?	2.65	1.136	3
F15	How far the planning of housekeeping is implemented in your project?	3.43	1.167	4
F16	Whether any specific Measurements is followed to maintain good environment?	3.42	1.172	4
F17	How far their project is run by hierarchical process?	3.30	1.112	3
F18	Whether the designation/category is followed based on experience or education system of employee?	3.56	1.120	4
F19	How far the project faced internal dissatisfaction among the workers?	2.63	1.165	2
F20	How far the project is using advanced technological methods?	3.37	1.062	3

F21	How far the project follows resources documentation systems?	3.48	1.056	4
F22	How far the project identifies the waste of resources?	2.95	1.139	3
F23	How far is the co-operation among the stakeholder in the project?	3.08	1.143	3
F24	Whether the project scheduling is developed based on earlier project parameter/ information?	3.18	1.062	3
F25	Whether the project has faced unavailability of materials?	2.59	1.178	2
F26	Whether the project is affected due to increase of materials prices?	2.79	1.172	3
F27	Whether the project is centralized procurement systems?	3.18	1.251	3
F28	Whether the project has sufficient vendors?	3.39	1.170	4
F29	Are there any shortage of materials, labour and Machinery as planned in the schedule?	2.71	1.185	2
F30	Whether the project is affected due to interrelationship with the craft / crew?	2.46	1.168	2
F31	Whether the project was rectified based on review system?	3.03	1.079	3
F32	How far the project is being affected contractor or sub-contractors?	2.76	1.152	3
F33	How far decision will be taken if any issues occur on the project?	3.29	1.082	4
F34	How far the client interference in making changes in the project?	3.30	1.184	3
F35	How far the recruitment and evaluating the status of contractors and sub-Contractor in the project?	3.22	1.093	3
F36	How adequate the project is implementing new	3.21	1.108	3

	methods and technology?			
F37	How adequate training and knowledge sharing about new method & New technology to the concern team/crew in the project?	3.36	1.113	4
F38	Whether you satisfy the communication among the owner consultant and contractor?	3.58	1.020	4
F39	How far the project is affected in the conceptual/preliminary approvals by the authority?	2.98	1.133	2
F40	How far the project contractual made with conditions towards the scheduling?	3.12	1.075	3
F41	How far your project delayed due to rework and repair in the project?	2.66	1.148	2
F42	How far the availability of labour as per scheduling of the project?	3.27	1.017	3
F43	How far the availability of plant & Machinery as per scheduling?	3.32	1.063	4
F44	How far the availability of supply of material as per scheduling in this project?	3.36	1.032	4
F45	Whether in the scheduling has allotted shutdowns in the project? (Equipment maintenance, weekday leaves)	2.69	1.243	4
F46	How far the leaves, and holidays maintain in the scheduling? (Type of calendar 5, 7 days, day and night Shift.)	2.93	1.174	4
F47	How far the project is affected due to natural calamities?	2.82	1.132	3
F48	How the scheduling can be prepared according to the climatic conditions?	2.79	1.182	3
F49	How the geological parameters in the projects can be anticipated?	2.87	1.129	3

F50	How far the project has been scheduled based on geographical/topographical data's?	2.98	1.171	3
F51	How far the project is affected due to site preparation?	2.62	1.122	2
F52	What is the impact of major or minor accident in the project scheduling?	2.49	1.204	2
F53	How much the welfare of the society (pollution, safety, indirect labour market, legal aspects) is considered in the project scheduling?	3.41	1.142	4
F54	Whether in the Construction sites generate high levels of dust typically from concrete, cement, wood, stone and silica	3.21	1.108	3
F55	Whether in the Construction sites to use of Eco Friendly Materials?	2.46	1.168	2

The factors are ranked based on the mean value and given in Table 2. The top five factors with high mean values are inspection of major activities at the time of execution (Mean = 3.64)**,** technical support by workers and engineers (Mean = 3.58)**,** communication among the stakeholders (Mean =3.58)**,** provision on proper designation based on education (Mean = 3.56)**,** and resource documentation (Mean = 3.48)**.** However, in the case of mode values, the topmost factors opted by the engineers are provision on proper designation based on education (Mode = 4)**,** resource documentation (Mode = 4)**,** and planned resources obtained at the time of the project (Mode = 4), which could significantly influence the scheduling of the project.

Consequently, the 55 critical factors were grouped into seven categories such as Socio Project Contribution, Environmental and Safety, Supportive Role of Owner and Management, Technical Competence of the Project, Management Efficiency, Financial Management Capability, and Resource Management based on the survey questions influencing construction project scheduling.

Table:3

Group	**Seven Schedule Affecting Groups**	**N**	**Mean**	**Std. Deviation**
G1	Socio Project Contribution	525	2.46	1.20
G2	Environmental and safety	525	2.93	1.15
G3	Supportive role of owner and management	525	3.10	1.10

G4	Technical competence of the project	525	3.16	1.15
G5	Management efficiency	525	3.26	1.14
G6	Financial management capability	525	2.91	1.17
G7	Resource Management	525	3.06	1.10

Fig:1

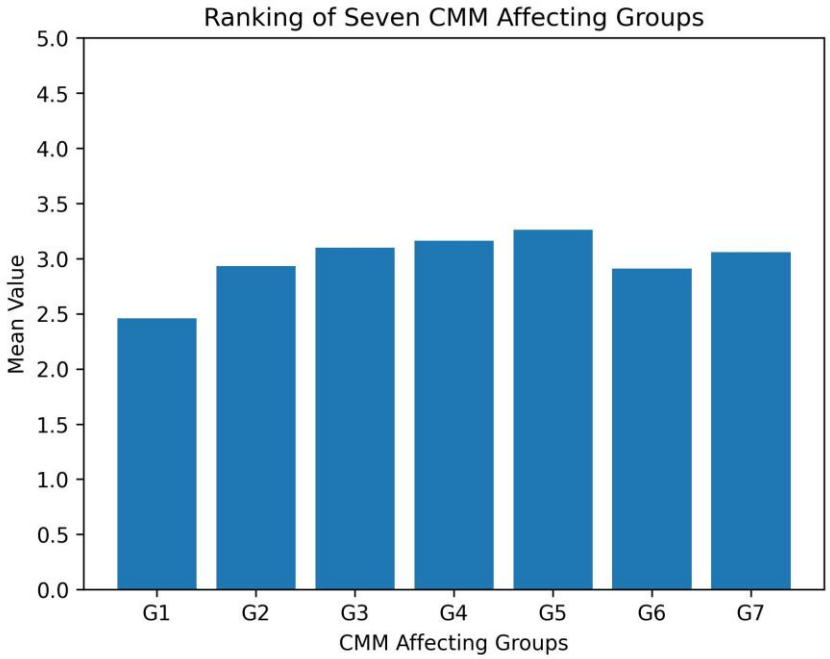

Table 3 shows the mean values of seven CMM affecting groups. The maximum mean value 3.26 has been observed for the management efficiency group. Following that, resource management has a mean value of 3.06, and the least mean value among the groups is observed for socio project contribution (2.46).

6. CONCLUSIONS AND RECOMMENDATION

In India, CMM-based construction project management is still a relatively new concept in the construction industry. It is expected that this trend will change in the near future. This study includes the identification of critical factors and critical groups influencing construction scheduling. A questionnaire survey comprising 55 identified critical factors was conducted with field experts, and 525 responses were collected from professionals employed at various projects. The top five factors among the 55 were identified by ranking them based on mean values. The most important factor was lack of inspection of major activities at the time of execution, with the highest mean value of 3.64**.** However, the mode values suggest differing opinions regarding

scheduling issues, particularly in provision on proper designation based on education, where unqualified personnel handling concerned activities was rated high with a mode value of 4.Later, the 55 factors were synchronized into seven groups to better address CMM-related issues. Among these, the topmost group identified based on mean value was management efficiency (Mean = 3.26). This study assists project planning and scheduling teams in identifying activities with varying impacts from different factor groups governing successful scheduling and execution. The quantitative evaluation of factor impacts supports management in making informed decisions in construction projects. These findings highlight multiple aspects of strengths and weaknesses influencing project success among stakeholders. Continuous evaluation is essential to measure project effectiveness. The collected data were subjected to a 5-scale impact analysis, and the scores were used to assess scheduling performance based on perceived impacts of associated factors.

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