

Role Of Knowledge Management in Reducing Cost of Quality in Construction Projects

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Abstract—The construction industry is characterized by complexity, fragmentation, and high uncertainty, often resulting in cost overruns and compromised quality. The Cost of Quality (CoQ) is a critical metric that captures the financial impact of quality-related activities and failures. Knowledge Management (KM), on the other hand, facilitates the systematic handling of organizational knowledge to improve efficiency and decision-making. This study investigates the impact of KM practices on reducing CoQ in construction projects. A mixed-method approach involving literature review, questionnaire survey, and statistical analysis using SPSS is adopted. The results reveal a strong relationship between KM processes and reduction in quality-related costs, particularly in minimizing errors, design changes, and skill deficiencies. Reliability analysis confirms the consistency of collected data, while correlation and regression analyses demonstrate a significant positive impact of KM on CoQ reduction. A conceptual framework is developed to integrate KM into quality management systems. The findings suggest that effective KM implementation can significantly enhance project performance, reduce rework, and improve overall cost efficiency.

Index Terms—Knowledge Management, Cost of Quality, Construction Industry, SPSS, Quality Management.

I. INTRODUCTION

The construction industry plays a vital role in economic growth and infrastructure development; however, it is often affected by issues such as cost overruns, delays, and quality deficiencies. One of the primary contributors to these issues is the Cost of Quality (CoQ), which includes costs associated with prevention, appraisal, and failures. Poor quality management results in rework, material wastage, and

increased project costs.

Knowledge Management (KM) provides a systematic approach to capturing, sharing, and utilizing knowledge within organizations. In construction projects, KM helps in reducing repetitive errors by enabling professionals to learn from past experiences. Integrating KM into construction practices enhances communication, improves planning accuracy, and supports better decision-making. This study aims to examine how KM practices can contribute to reducing CoQ and improving project performance.

II. LITERATURE REVIEW

M.V.K Sreenivasa Rao (2022) highlighted that Knowledge Management plays a crucial role in improving communication, decision-making, and productivity in construction projects. The study emphasized that KM practices such as knowledge creation and sharing help reduce errors and enhance operational efficiency. It further noted that poor knowledge transfer increases failure costs, thereby increasing the Cost of Quality. Effective KM implementation was found to significantly minimize these costs.

Grover et al. (2016) explored the application of BIM-based social platforms for knowledge management in construction. The study demonstrated that integrating BIM with collaborative tools enhances communication and facilitates knowledge sharing among stakeholders. This approach helps reduce design-related errors and improves coordination. The research concluded that innovative digital platforms can significantly improve project efficiency.

Yusof et al. (2012) examined the relationship between Knowledge Management and organizational growth in construction companies. The study emphasized that knowledge is a valuable resource that drives innovation and competitiveness. It also highlighted that ineffective knowledge management limits organizational performance.

The authors suggested the need for further empirical research in this area.

Lin et al. (2012) proposed a Communities of Practice-based Knowledge Management system for construction projects. The study demonstrated that this approach improves knowledge sharing among engineers and project teams. It helps reduce project time and cost by improving problem-solving capabilities. The system also supports effective management of tacit knowledge.

Dave et al. (2009) focused on collaborative Knowledge Management in construction projects. The study highlighted the challenges of capturing and reusing project knowledge. It emphasized the role of ICT tools in facilitating knowledge sharing. The research concluded that collaborative KM systems reduce repeated errors.

Lin et al. (2012) (extended study) further validated the effectiveness of Communities of Practice in managing construction knowledge. The study showed that this approach enhances knowledge transfer across projects. It improves learning and reduces problem-solving time. The system was found to be user-friendly and effective.

Carrillo et al. (2006) examined Knowledge Management practices in engineering and construction firms. The study emphasized the importance of capturing and reusing knowledge from previous projects. It highlighted collaboration as a key component of KM. The research provided insights into effective KM strategies.

Sower et al. (2007) investigated the use of Cost of Quality systems in organizations. The study found that many companies do not effectively track quality costs. It also highlighted the relationship between CoQ and quality system maturity. The research emphasized the importance of proper cost tracking.

Love & Li (2000) conducted a detailed study on rework in construction projects. The research identified poor communication and lack of knowledge transfer as major causes of rework. It demonstrated that rework significantly increases the Cost of Quality. The study emphasized the importance of Knowledge Management in reducing rework.

Tserng et al. (2004) proposed an activity-based Knowledge Management system for construction projects. The study highlighted the importance of capturing both tacit and explicit knowledge. It emphasized the role of IT tools in improving knowledge sharing. The system enhances decision-making and project efficiency.

III. SUMMARY OF LITERATURE REVIEW

The construction industry is highly dependent on knowledge and experience for successful project execution. Previous studies have emphasized the importance of KM in improving organizational performance and reducing inefficiencies. Rao (2022) highlighted that KM enhances decision-making and reduces errors in construction projects. Grover et al. (2016) demonstrated that BIM-based platforms improve knowledge sharing and reduce rework. Similarly, Yusof et al. (2012) established a positive relationship between KM and organizational growth. Research on Cost of Quality indicates that failure costs, such as rework and defects, contribute significantly to total project costs. Love and Li (2000) showed that rework is largely caused by poor communication and lack of knowledge transfer. Lin et al. (2012) emphasized that knowledge-sharing systems improve efficiency and reduce problem-solving time. Although the literature confirms that KM can reduce CoQ, there is a lack of quantitative studies establishing this relationship, which forms the basis of this research.

IV. RESEARCH METHADODOLOGY

This study adopts a mixed-method approach combining both qualitative and quantitative techniques. Data were collected through structured questionnaires and semi-structured interviews conducted with construction professionals, including engineers, project managers, and site supervisors.

The collected data were analyzed using SPSS software. Descriptive statistics were used to summarize the data, while reliability testing ensured consistency of responses. Correlation and regression analyses were performed to identify the relationship between KM practices and CoQ factors. The study focuses on KM processes such as knowledge creation, sharing, storage, and application, and their influence on key CoQ components including errors, design changes, and poor skills.

Data Collection

A total of 102 respondents participated in the study. The questionnaire consisted of sections covering:

- KM processes
- CoQ factors
- KM tools effectiveness
- Barriers to KM implementation

Table 1 Analytical Tools

Analysis Type	Purpose	SPSS Tool Used
Descriptive Analysis	Summarize data trends	Mean, Std. Deviation
Reliability Test	Check data consistency	Cronbach's Alpha
Correlation	Identify relationships (KM vs CoQ)	Pearson Correlation
Regression	Measure impact of KM on CoQ	Linear Regression

V. RESULTS AND DISCUSSION

The findings of the study indicate that errors and omissions, design changes, and poor skills are the primary contributors to the Cost of Quality in construction projects. These issues are largely influenced by inadequate knowledge sharing and lack of proper knowledge management practices.

The analysis reveals that KM processes have a strong positive impact on reducing CoQ. Knowledge sharing and knowledge capture were found to be the most influential factors in minimizing errors and improving project efficiency. Knowledge creation and knowledge transfer also play a significant role in addressing design changes and enhancing workforce skills.

Furthermore, the study identifies several KM tools such as post-project reviews, knowledge bases, and cross-project learning systems as highly effective in

reducing quality-related costs. Despite these benefits, the implementation of KM is often hindered by barriers such as lack of awareness, high initial costs, and resistance to change within organizations.

Descriptive Analysis

Descriptive statistics were used to evaluate the importance of KM processes.

Table 2 Mean Scores of KM Processes

KM Process	Mean Score
Knowledge Sharing	3.78
Knowledge Capture	3.65
Knowledge Creation	3.72
Knowledge Transfer	3.69
Knowledge Dissemination	3.60

The results indicate that all KM processes have high mean values (>3), showing strong positive impact on CoQ reduction.

Reliability Analysis

Reliability of the questionnaire was tested using Cronbach's Alpha.

Table 3 Reliability Test Results

Variable Group	Cronbach's Alpha
KM Processes	0.87
CoQ Factors	0.82
KM Tools	0.85

The values are above 0.7, indicating high internal consistency and reliability of the data.

Correlation Analysis

Correlation analysis was performed to determine the relationship between KM and CoQ.

Table 4 Correlation Matrix

Variables	KM Processes	CoQ Reduction
KM Processes	1	0.72
CoQ Reduction	0.72	1

A strong positive correlation ($r = 0.72$) indicates that better KM practices lead to significant reduction in CoQ.

Regression Analysis

Regression analysis was conducted to measure the impact of KM on CoQ.

Regression Equation:

$$\text{CoQ Reduction} = \beta_0 + \beta_1 (\text{KM Processes}) + \varepsilon$$

Table 5 Regression Results

Parameter	Value
R ²	0.52
Beta Coefficient	0.68
Significance (p)	<0.01

R² value of 0.52 indicates that 52% of variation in CoQ is explained by KM practices. The significant p-value confirms that KM has a strong impact on reducing CoQ.

Discussion

The results clearly demonstrate that Knowledge Management significantly reduces the Cost of Quality. KM processes such as knowledge sharing and capture are particularly effective in minimizing errors and design changes.

The study also highlights that failure costs are the most affected component of CoQ, which can be reduced through better knowledge utilization. KM tools such as post-project reviews and knowledge bases further enhance efficiency.

Barriers such as lack of awareness, high cost, and resistance to change must be addressed to ensure successful KM implementation.

VI. PROPOSED FRAMEWORK

Based on the findings, a conceptual framework is developed to illustrate the relationship between Knowledge Management and Cost of Quality. The framework suggests that effective KM practices lead to improved knowledge flow, which reduces errors, enhances communication, and minimizes rework. This ultimately results in a significant reduction in failure costs and overall CoQ. The framework also highlights the importance of addressing organizational barriers to ensure successful KM implementation.

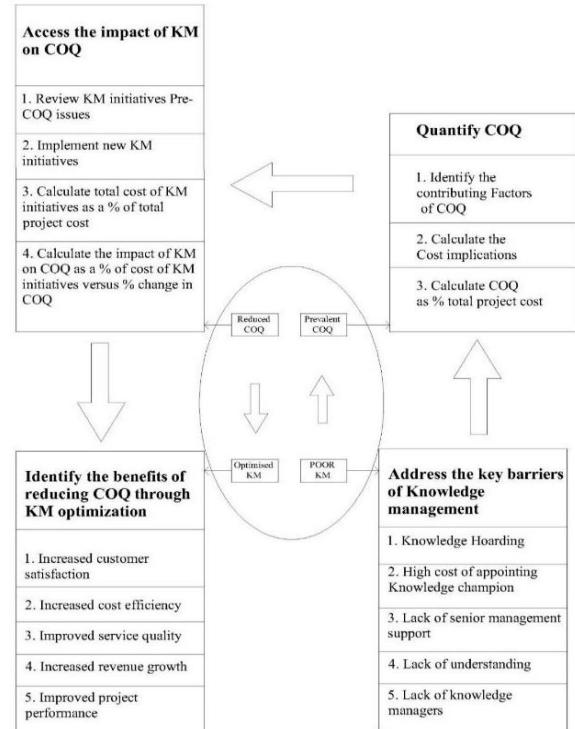


Fig 1- Knowledge Management framework for reducing cost of quality

VII. CONCLUSION

The study concludes that Knowledge Management is a critical factor in reducing the Cost of Quality in construction projects. Effective implementation of KM practices improves communication, enhances decision-making, and minimizes errors, thereby reducing rework and associated costs. The integration of KM into construction management systems can lead to improved project performance, increased efficiency, and higher profitability.

VIII. RECOMMENDATIONS

Construction organizations should adopt structured Knowledge Management systems to capture and utilize project knowledge effectively. Emphasis should be given to developing a knowledge-sharing culture and providing training to employees. The use of digital tools and continuous monitoring of quality costs can further enhance the effectiveness of KM practices. Addressing organizational barriers is essential for successful implementation and long-term benefits.

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