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A Systematic Review to Advance Cost Management Strategies for Rail Projects

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ABSTRACT

Developing a robust rail network has always been a priority for countries, especially those in the process of development. The growth of the rail industry plays a crucial role in boosting a nation's economy and productivity. As multiple national governments are actively developing rail projects to transform public transport from road to rail, it is evident that the knowledge in rail construction cost management needs a revamp after 20 years of research, hence the need of this study. The purpose of this paper is to provide an in-depth review aimed at establishing a standardized framework for identifying and categorizing the factors affecting cost performance in rail projects. As part of this study, a Systematic Literature Review (SLR) of journal publications on rail project cost management from 2016 to 2023 has been started to ascertain the noteworthy contributions that various stakeholders and educators contributed to the knowledge of cost management in rail projects. Ultimately, 23 publications had been selected to be critically analyzed. The analysis sheds light on current research trends, highlights gaps in existing knowledge, and suggests potential avenues for future research. The significant research findings include the need to explore effective stakeholder management in rail projects, developing effective mechanism/framework for all parties to ensure effective cost management and enhancing the connection between research and industry practice in the rail industry. Furthermore, as the thorough examination of literature identifies the research trends, researchers may delve into the fundamental concepts of the subject, draw valuable insights from the assessments, and progress towards areas where research is most needed as well as providing stakeholders and academics with impactful outcome for enhancing rail project cost management in the future.

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1. Introduction

The expansion of the rail industry has a positive influence on a country's economy by enhancing national productivity, connectivity, and sustainability. Data from the Malaysia Ministry of Finance indicates a strong correlation between rail transportation and increased economic activity, as evidenced by the rise in Gross Domestic Product (GDP) and Gross National Income (GNI) (Sahrir Abd Aziz et al., 2018).

Several studies have examined cost management for rail projects (Jayakrishnan et al., 2019). Belayutham et al. (2022) investigated the Last Planner System to improve the performance of rail projects, while Ismail et al. (2021) compiled substantial data to guide future cost management research in the rail industry. Research on rail cost management extends to Africa as well, with Fentahun Kassa (2020) identifying the causes of delays and cost overruns in Ethiopian railway projects, and Tchumtcha Wembe (2022) focusing on stakeholder management in rail projects using Engineering, Procurement, Construction Management (EPCM) procurement in Africa.

There have also been multiple bibliometric review publications on rail cost management. For instance, Hussain et al. (2023) focus on minimizing rail project cost overruns using 5D-BIM, while Elsahly et al. (2023) develop time-cost optimization models for rail projects. Additionally, Farouk & Rahman (2023) explore the integration of BIM in project cost management through a systematic review. Numerous studies underscore the importance of cost management, particularly for rail projects that often involve substantial public funding. Many projects have been reported to experience cost overruns, as illustrated in Table 1.

Reflecting on the research, studies on rail cost performance have been ongoing for over 20 years, and currently evolving to focus on integrations with emerging technologies. Despite this progress, there remains a significant need to examine the latest trends in the field from a broader perspective. Such an examination could offer new research directions, leading to more impactful findings that contribute to the rail industry body of knowledge. Consequently, a Systematic Literature Review (SLR) of journal articles on rail project cost management from 2016 to 2023 has been initiated as part of this study. The primary objectives are to discuss the following aspects:

i. Global rail research trends from 2016 to 2023.
ii. The critical challenges that affect the efficiency of rail project cost management
iii. The identification of gaps in past research.

2. Methodology

According to Yan et al. (2019), systematic reviews are effective for collecting, assessing, and analysing publications on a specific research topic through comprehensive literature searches. The SLR procedure is illustrated in Fig. 1, and the review steps are outlined below:

1. Identifying literature using relevant keywords.
2. Screening by establishing standards for selecting papers related to the specific field of study.
3. Determining eligibility for result analysis and discussion.
4. Providing instructions for adding entries through both forward and backward searching.
5. Identifying a total of 23 relevant articles related to the study.

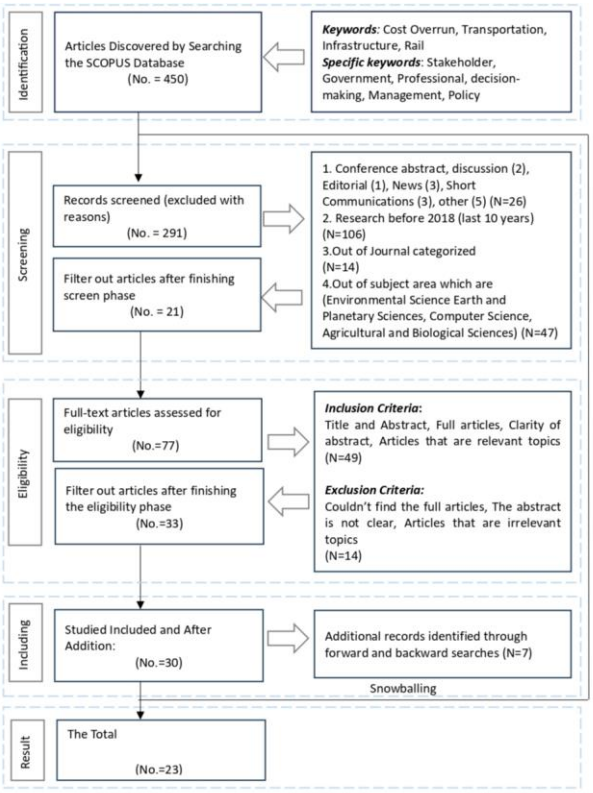

Figure 1 Flow diagram of journal articles selection

The study selected Scopus as the sole search engine due to its extensive and diverse coverage, including non-English journals (Mongeon & Paul-Hus, 2016). Scopus also automatically eliminates duplicates and provides comprehensive citation analysis metrics, such as the h-index, CiteScore, and SNIP (Source Normalized Impact per Paper), which measure the impact and reach of publications (Pranckutė, 2021). The literature sources were restricted to publications from 2016 to 2023 to ensure a focus on the most current findings, avoiding outdated data, highlighting high-impact studies that significantly contribute to the field, and effectively capturing emerging topics for a more impactful review (Gunawan et al., 2019). The criteria used in the SLR are shown in Table 1.

Table 1 SLR Criteria of selection

Filter Category	Criteria
• Keyword	• Cost Overrun' OR 'Transportation' AND 'Infrastructure' OR 'Rail'
• Document Type	• Article and review

Filter Category	Criteria
• Subject area	• Engineering or Social Science
• Time Range	• Published between 2016 and 2023
• Journal categories	• Q1, Q2, Q3, Q4
• Content	• Full articles, Clarity of abstract, Articles that are relevant topics

2.1 Distribution of Articles

Research on rail cost management began in 2003 and has continued steadily from 2003 to 2023. However, as shown in Fig. 2, there was limited research on this topic before 2011, with only five articles published in 2012. Despite the absence of articles in 2005, 2009, 2010, 2014, and 2015, the topic remained relevant and significant. Notably, there was a surge in publications after 2016.

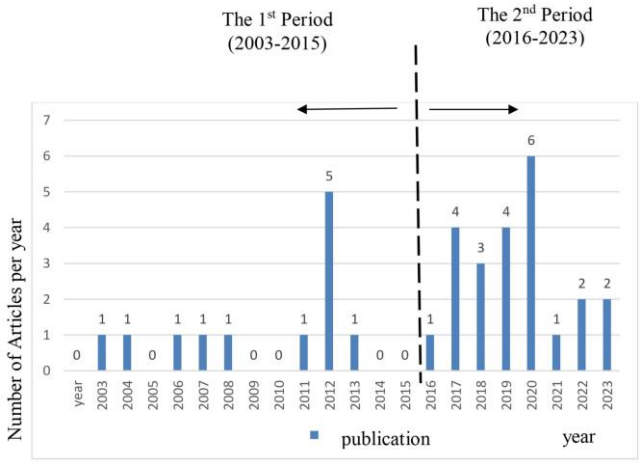

Figure 2 Publications on rail project cost management (2003-2023)

It is noteworthy that the 23 publications from the second period (2016–2023) nearly doubled the 12 articles published during the first period (2003–2015). This surge, as noted by Bouraima et al. (2023), indicates increased efforts by various countries to expand railway transportation while mitigating cost overruns. Developed nations, meanwhile, are focused on securing loan repayments for past rail developments.

In modern project management, advancements in knowledge exploration are expected to drive knowledge-based economic growth (Matahir et al., 2022). Additionally, new railway construction projects bring significant financial impacts and high technical risks, necessitating highly effective project management (Zhang et al., 2020). The growing number of publications reflects a global recognition of the importance of sophisticated project management strategies in achieving successful rail infrastructure development.

2.2 Countries under Investigation

The research article highlights the need for further investigation into the primary causes of cost overruns in global rail projects. There has been no specific study on a rail project in Asia to support these findings, despite the unique conditions and technical requirements of each rail project.

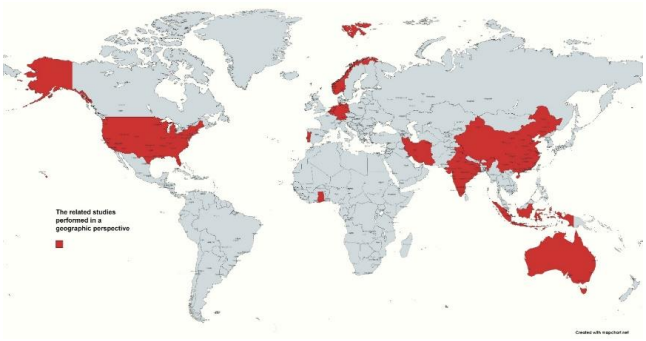

Figure 3 Countries whose literature is covered in the review

As illustrated in Fig. 3, the study samples were distributed across various countries, with the highest in the United Kingdom (n = 6; 22%), followed by India (n = 4; 15%), China (n = 3; 11%), the USA (n = 2; 7%), and one publication each from Australia, the Netherlands, Germany, Norway, Belgium, Africa, Ghana, Portugal, Iran, Hong Kong, Indonesia, and Malaysia (4% each).

According to Andrić et al. (2019), cost overruns are more prevalent in Asia, especially in railway projects compared to road system projects. China is the largest contributor in Asia, followed by India, Iran, Hong Kong, Indonesia, and Malaysia. Europe also faces significant issues with rail cost overruns, exemplified by Germany's Stuttgart 21 Railway, which experienced a cost overrun of EUR 8.2 billion (228% higher than expected) and a six-year delay. In the Netherlands, changes related to processes and human (and organizational) factors are difficult to implement due to limited acceptance of modifications.

In Africa, the Addis Ababa–Djibouti Railway and the Railway Construction Project in Ethiopia are impacted by political and business interests, as well as psychological biases of project parties and stakeholders, leading to significant time overruns. East Africa Railways continues to face challenges with critical infrastructure investments and intraregional railway connections. The rail projects with cost overruns are detailed in Table 2.

Table 2 Countries with cost overrun in rail projects

Country	Rail Projects	Reference
• **Germany**	• Stuttgart 21 Railway	•Steininger et al. (2021)
• **Netherland**	• Deutsche Bundesbahn (DB) and Deutsche Reichsbahn (DR)	•Opoku et al. (2022)

Country	Rail Projects	Reference
• **Africa**	• East Africa Railway	•Bouraima et al. (2023)
• **Ethiopia**	• Addis Ababa–Djibouti Railway	•Gashaw & Jilcha, (2022)
• **China**	• Fuzhou-Xiamen-Zhangzhou Railway, Jinxing Intercity Railway, Jinan - Zhengzhou (Jisheng), Fangdong Railway, • Guizhou Huangtong - Guangxi Baise railway (30.6%)	•Ansar et al. (2016)
• **Hong Kong**	• Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) (38.19%)	•Huo et al. (2018)
• **India**	• Amrit Bharat train-set (31%)	•Kumar et al (2019)
• **Denmark**	• The New Line Copenhagen-Ringsted (44.7%)	•Trabo et al. (2012)
• **Canada**	• Line rapid rail transit in Vancouver, British Columbia ($700m)	•Sroka (2021)
• **United Kingdom**	• Great North Rail Project (100%)	•Omotayo et al. (2022)

This analysis underscores the complex and varied nature of cost overruns in rail projects across the globe, highlighting the necessity for tailored project management and cost control strategies. The research article indicates that the main reasons behind global cost overruns demand further examination. Additionally, there has been a lack of focused studies on Asian rail projects to validate these findings, even though each rail project presents its own unique conditions and technical demands.

2.3 Analyzing Literary Themes Using Theme Analysis

The literature theme analysis leverages study keywords to represent the subject matter (Hussain et al., 2023). The VOS (Visualization of Similarities) viewer utilizes text mining techniques to generate keyword networks from the abstracts and titles of these studies. This method establishes the foundation for creating the visualization of thematic research, as illustrated in Fig. 4, by identifying key phrases from the titles and abstracts of 23 papers. This phase with the VOS viewer is crucial in developing thematic research. Initially, 750 key terms are identified, but by applying a threshold criterion (requiring a term to appear at least five times), the number is narrowed down to 25.

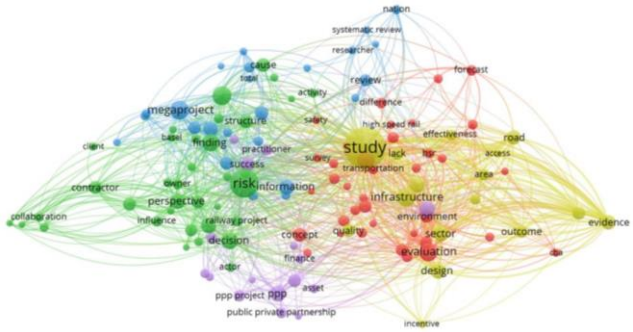

Figure 4 Keywords co-occurrence in the title and abstract of literature reviewed (network visualisation map)

The 25 terms are organized into five clusters representing the most frequently occurring keywords in the articles, as shown in Table 3. These keywords summarize the main obstacles to effective cost management in rail projects. The clusters are:

C1: Cost Performance - This cluster addresses issues related to budget overruns, delays, and overall cost performance.
C2: Cost Overrun and Demands - This category covers challenges associated with project cost management practices and project-specific characteristics.
C3: Critical Risk Factor - This cluster focuses on managing risks inherent to rail projects.
C4: Economic Growth and Sustainability - This category includes issues related to economic growth and the sustainability of rail projects.
C5: Project Integration, Improvements, Benefits, and Frameworks - This cluster encompasses factors such as stakeholder involvement, policy implications, and investment considerations.

Table 3. A study of literary themes

Cluster (Critical Challenge)	Color	References
• **C1**: Cost performance in infrastructure and railway	• Blue	• Love et al. (2017) • Beria et al. (2018) • Paraskevopoulou et al. (2022)
• **C2**: Cost overrun and demand	• Orange	• Huo et al. (2018) • Ismail et al. (2021) • Steininger et al. (2021) • Omotayo et al. (2022) • Rustandi et al. (2022) • Hussain et al. (2023) • Molinari et al. (2023)
• **C3**: Critical risk factor, and study of risk	• Grey	• Sharma and Newman (2017) • Yang (2018) • Shrivastava et al. (2019) • Ghosh and Sar (2020)

• **C4**: Economic growth and sustainability	• Yellow	• Sahrir (2018) • Dwiatmoko et al. (2020) • Mustafa et al. (2021) • Yusoff et al. (2021) • Matahir et al. (2022) • Bouraima et al. (2023)
• **C5**: Project integration, improvement, benefits, and framework	• Green	• Devi and Jegan (2017) • Ahmed et al. (2018) • Zhao et al. (2019) • Fentahun Kassa (2020)

Research suggests that fostering strong relationships among key individuals is essential for organizations to generate significant value (Wu et al., 2018). Additionally, enhancing cost management can be achieved by creating accessible documentation and adopting cooperative procurement techniques (Andrić, Wang, et al., 2019; Love et al., 2017). Fig. 5 further illustrates the various methodologies employed in the reviewed literature.

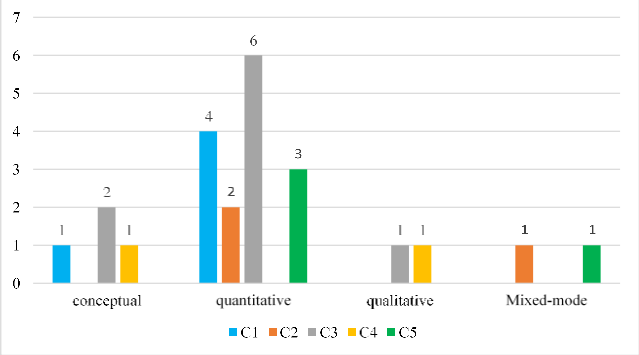

Figure 5 Differences between research methods in the reviewed literature

Fig. 5 shows that most of the literature employs a quantitative approach, indicating extensive research on rail construction cost management. The current trend emphasizes numerical data, which provides precise and reliable information to identify patterns, relationships, and trends, rather than exploring new knowledge (Schönbeck et al., 2020). Quantitative research also involves hypothesis testing and quantifying relationships through automated analysis (Vivek et al., 2023). This field has moved beyond conceptual and qualitative approaches, focusing more on quantitative methods, which are often used in policy and decision-making due to their provision of concrete evidence and measurable outcomes. The next section will delve deeper into current global research trends in research methodologies.

3. *Analysis of Outcomes*

The previous section has revealed that rail cost overruns remain a significant global issue. Research on rail cost management has been ongoing since 2003, with a notable increase in publications after 2016. The highest number of publications originate from China, the UK, and India, with cost overruns being particularly prevalent in Asia, primarily in China and India. The research methodology has shifted from qualitative to quantitative approaches, which are more suitable for policy and decision-making, as well as providing concrete and measurable outcomes. The VOS viewer identified five clusters of the main challenges in rail project cost management, offering directions for future research.

While the previous section provided an overview of the current state of research on rail project cost management, this section delves into a more detailed analysis aimed at achieving the three objectives stated in this study.

i. Global rail research trends from 2016 to 2023

The research trends can be generally presented by the annual publication of worldwide railway research from 2016 to 2023, as shown in Fig. 6.

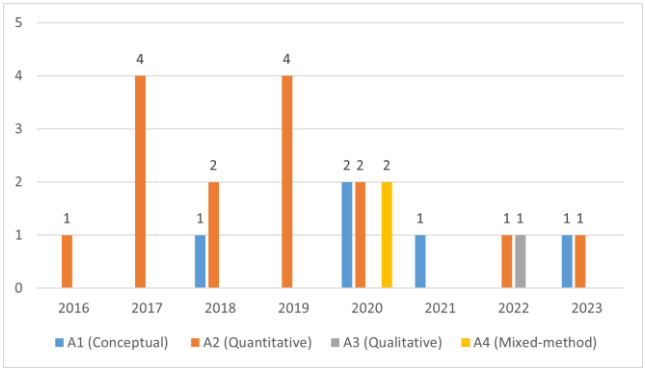

Figure 6 Annual publication trend of rail project cost management (2016 to 2023)

An analysis of relevant literature from various countries between 2016 and 2023 has provided several key insights:

a) Insight 1: Over the past three years, there has been a modest increase in the number of research publications. Multiple countries, including Germany, the Netherlands, and Ethiopia, among others, have highlighted the importance of effectively engaging key stakeholders and educators in rail project cost management. Conceptual paper analysis is commonly employed to explore these topics in relation to existing publications and to identify research gaps.

b) Insight 2: Fig. 6 illustrates a notable rise in research articles published from 2016 to 2023. According to Shrivastava et al. (2019), inadequate evaluation of total cost performance methods and insufficient stakeholder engagement are significant challenges in rail project management. Research indicates that quantitative analysis is particularly effective for examining the critical aspects of cost performance in rail projects.

c) Insight 3: This analysis sheds light on the key players and developments in railway project cost management from 2016 to 2023. Qualitative analysis serves as a suitable method for understanding the issue of project cost overruns, laying the groundwork for more detailed improvement strategies (Rustandi et al., 2022).

d) Insight 4: There has been minimal research collaboration on disparity analysis between developed and developing countries. At least six research papers involving the UK have been published. Promoting cooperation with developed countries may enhance railway project cost management. Fig. 6 indicates that only two articles employed a mixed-mode analysis, suggesting the need for further investigation.

Integrating a mixed-methods approach in research can also benefit researchers with different methodological preferences and areas of interest, as each method can yield insights that complement and build upon others (Taherdoost, 2022).

ii. The critical challenges that affect the efficiency of rail project cost management

The results of the analysis sparked an in-depth qualitative discussion focused on addressing the subject matter. This discussion was structured around the literary theme and the co-occurrence network of terms, aiming to summarize the key themes that emerged from the study. Notably, the research themes explored included the involvement of essential stakeholders in rail development, such as contractors, government entities, consultants, suppliers, and project managers. As depicted in Fig. 7, the literature analysis identified five distinct themes that underscore current practices in rail project cost management.

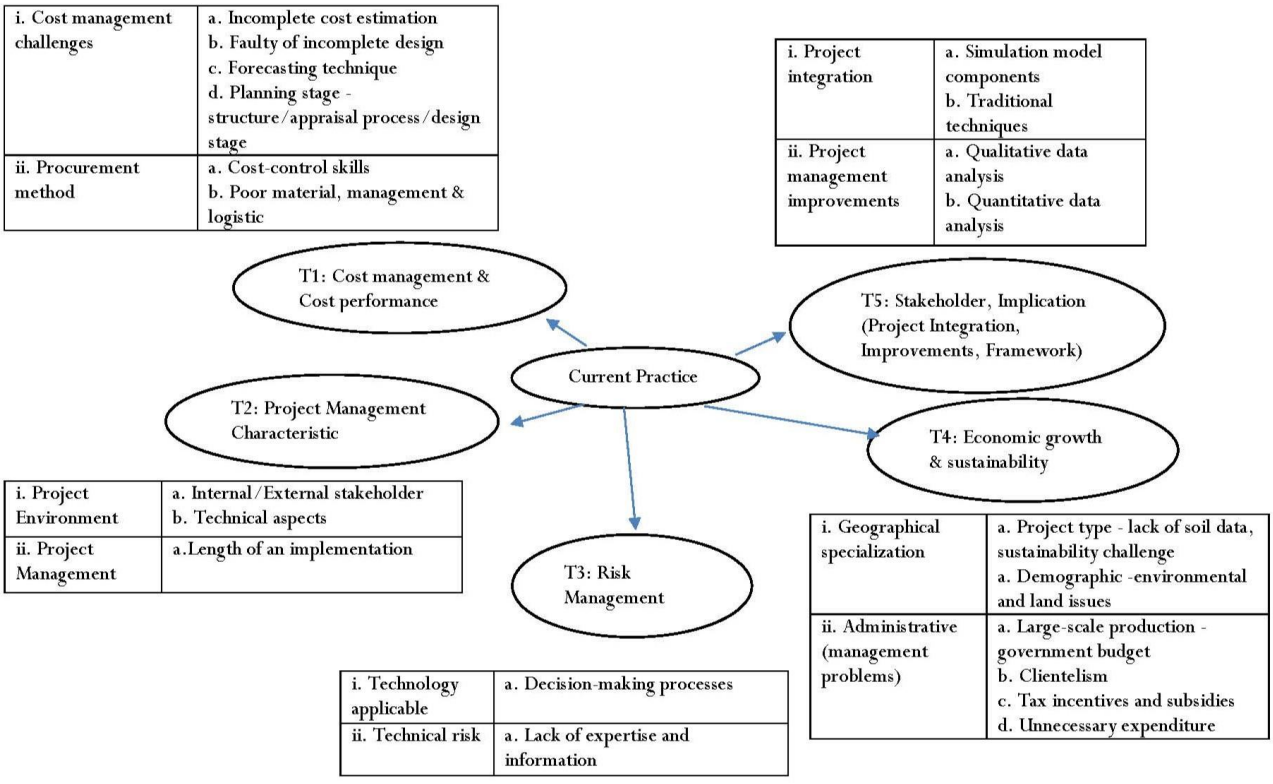

Figure 7 Current practice in rail project cost management

Theme 1 : Cost Management & Cost Performance

The research uncovered several challenges in cost management, such as incomplete cost estimation, flawed or incomplete design during the planning stage, and the need for appropriate forecasting methods that integrate rail project cost management with a coding system to record decision justifications. A lack of consistency and collaboration when using traditional project management techniques led to multiple violations identified in the database (Prabakaran, 2023).

Issues were also noted in material, logistical, and management delivery when employing procurement approaches for cost control (Ahmadabadi & Heravi, 2019). For example, compared to Europe and the US, which excel in aligning public investment expenses with budgets, less developed countries struggle with poorer procurement procedures, financing, control and governance, and accountability in managing public investments (Sarmento & Renneboog, 2017).

To bridge the knowledge-practice gap in rail project cost management, defining knowledge roles and creating practical training programs are essential. The literature review highlighted that many scholars agree on the critical importance of cooperation between project participants and other stakeholders for project success (Kassa, 2020).

Furthermore, incorporating green elements and sustainability initiatives is vital for the design and operation of rural roads to be considered sustainable. Sustainable practices and green design have been shown to reduce future project costs by using less energy, fuel, water, and raw materials (Mustafa et al., 2021).

Theme 2 : Project Management Characteristics

Project management is a critical technical skill that must be effectively implemented in rail project cost management (Aljohani, 2017). For example, the Stuttgart 21 Railroad Construction Project experienced delays and cost overruns due to changes in scope, price increases, geological conditions, and low stakeholder participation (Steininger et al., 2021). The three main technical issues identified by researchers are poor stakeholder communication, client payment delays, and project scope modifications (Ahmed et al., 2018).

The primary reasons for delays in Iranian construction projects include late client payments, client requests for changes during construction, incompetent site management, slow decision-making by clients, financial difficulties for contractors, delays in design review and approval, subcontractor issues, inadequate planning and scheduling, design document errors and discrepancies, and adverse weather conditions (Heravi & Mohammadian, 2021). A lack of coordination or oversight can cause the entire rail project construction process to fall behind schedule, hindering operational efficiency targets.

Enhancing project cost performance can be achieved by promoting information sharing and leveraging the expertise and professionalism of the professionals involved (Zhao et al., 2019).

Theme 3 : Risk Management

Effective planning for risk management enhances an organization's operational efficiency and is essential in developing rail projects. Risk is inherent to any construction project and can lead to significant time and cost overruns, jeopardizing the project's objectives (Shrivastava et al., 2019). Identifying risks involves a precise and comprehensive process that considers various risk factors throughout the project life cycle through interactions with individuals and professionals (Gashaw & Jilcha, 2022).

Sousa and Einstein (2012) found that inadequate work supervision and poor communication between project teams reflect technical risks in many construction projects, including railway projects (Fariq et al., 2020). Additionally, several risk factors related to contractor performance during the construction phase include design and quality, safety and security, financial risk, government approvals, and cash flow. Fariq et al. (2020) noted a correlation between risk and cost overruns, indicating that it's not just about delays; cost overruns can also occur.

Research confirms that project managers need immediate access to critical information during the construction phase (Locatelli et al., 2017). Utilizing technology that visualizes organizational schedule data in conjunction with actual on-site conditions facilitates easier decision-making and access to work environment data. The Analytic Hierarchy Process (AHP) is commonly applied in decision-making processes (Besiktepe et al., 2020). Another crucial success factor for projects is collaboration among project participants, stakeholders, and clients (Kumar et al., 2019). These approaches and tools help create clear and unbiased assessment methods, essential for stakeholders and clients, while remaining free from partiality and human influence.

Theme 4 : Economic Growth and Sustainability

Economic growth and sustainability are currently challenged by budget constraints and sustainability demands. Research indicates that the construction of large-scale projects is predominantly financed by government funding, leading to unnecessary administrative expenses. Literature addressing managerial concerns highlights tax incentives, subsidies, and clientelism. Client-related concerns, including variation orders and project scope modifications, are significantly affected by construction project costs (Akinradewo et al., 2022).

To promote financial stability and reduce organizational risk, the industry must implement effective project cost management. Investigations into current industry practices revealed that inadequate management training affects labor productivity, stakeholder satisfaction, cost-control quality, rail system planning, and the organization's sociopolitical climate. Emphasizing cost efficiency and improving client retention provides a framework for decision-making within organizations (Besiktepe et al., 2020).

Theme 5: Stakeholder Implication (Project Integration, Improvements, and Framework)

This topic explores the decision-making framework in managing rail project costs by discussing previous approaches and their implications. Research indicates that several factors, including the lack of continuous data integration and reliance on traditional decision-making techniques that depend on human intervention, present significant constraints, making it difficult to predict occurrences and processes.

Creating a simulation model involves three main components: model formalism, which defines how entities interact and function; model architecture, which outlines the assembly of model components to create complex simulations; and data representation, which describes how data is perceived and transferred between various simulation model components. Additionally, opinions on current project management practices

and suggestions for future improvements are considered. Informants identified three perception categories: positive, neutral, and negative (Andrić, Mahamadu, et al., 2019; Gao & Touran, 2020; Rustandi et al., 2022).

For qualitative data analysis, tools like Nvivo12 are used for coding and categorization, while the Miles & Huberman interactive model and PLS-SEM are also employed. A case study demonstrated that combining quantitative and qualitative analysis enhances cost management, especially in project management (Shrivastava et al., 2019).

Authors frequently use Exploratory Factor Analysis (EFA), FUZZY theory, Simple Additive Weighting (SAW), Multiplicative Exponential Weighting (MEW), SPSS tools, and PLS-SEM to conduct assessments in their field surveys. A quantitative approach to cost performance yields quick, targeted, scientific, and comprehensible results while ensuring the target compound's good solubility. Data availability in rail projects, such as questionnaire surveys, real project data, and interactive models, must be assessed using appropriate methods to enhance involvement and communication (Andrić et al., 2019; Fariq et al., 2020; Kumar Ghosh et al., 2020).

Moreover, the application of technologies like Artificial Intelligence (AI) and Statistical Tool Analysis in project management will advance traditional decision-making techniques by reducing reliance on human intervention, thereby obtaining accurate data and preventing information loss. Structural Equation Modelling (SEM) is widely used in research to model complex study designs, validate hypotheses, examine intricate relationships, and assess measurement validity.

The findings highlight the critical need to enhance stakeholder involvement in rail project cost control procedures, particularly during the initial phases. They stress the importance of conducting impartial and objective evaluations of cost management to thoroughly address issues and identify shortcomings. The study also points out the absence of a clear framework for stakeholder participation and a well-defined decision-making process. This could involve a traditional construction approach that compares completed projects with initial projections from project proposals (Hemanta Doloi, 2012; Memon and Rahman, 2014; Zhao et al., 2019).

To ensure that projects are completed on schedule and within budget, asset owners in both public and private sectors should strengthen procurement processes related to management and logistics. Rather than relying solely on Building Information Modelling (BIM) and Systems Information Modelling (SIM), this can be achieved through the adoption of collaborative procurement methods (Love et al., 2017).

iii. The identification gaps in previous research

This study utilizes regional time zone analytics and a review of frequently cited literature to pinpoint gaps in existing research on rail projects. The identified gaps are as follows:

1. **Regional Limitations:** The existing body of research predominantly focuses on specific regions within developing countries, potentially limiting the broader applicability of the findings.
2. **Lack of a Defined Framework:** There is a notable absence of a clear framework for stakeholder involvement during the early stages of rail projects. Additionally, there is insufficient research on the importance of engaging key stakeholders in the initial cost management phases, the appropriate level of their participation, and the methods for gathering client requirements.
3. **Documentation and Reporting Shortcomings:** The study highlights deficiencies in documentation and reporting practices, which are vital for improving client relationships. Furthermore, there is a gap in understanding how to enhance stakeholder interaction and adapt processes based on stakeholder feedback (Ismail et al., 2021).
4. **Procurement Methods and Cost Management:** The integration of new procurement laws and the revision of traditional procurement procedures could indicate that the private sector has managed cost overruns more effectively than the public sector (Sarmento & Renneboog, 2017).
5. **A need to develop effective mechanism for all parties to ensure effective rail cost management:** Further surveys or assessments is necessary to explore the roles of multiple parties and how every stakeholder can play a part in solidifying the cost management of rail projects.
6. **Disconnect between Research and Practice:** There exists a gap between research findings and their practical application due to insufficient support for clients and a lack of comprehensive knowledge about rail project costs (Sharma and Newman, 2016).

4 Conclusion

In summary, the research needs have been determined based on an in-depth review of global railway research trends from 2016 to 2023 and the significant challenges that have an impact on the effectiveness of rail project cost management. Through a methodical review of the literature, this study strives to enable significant participation of key stakeholders in rail project cost management. It provides a concise overview of previous publications related to current cost management practices in rail projects worldwide. The study incorporates lessons learned from current practices, emphasizing significant challenges and complex decision-making situations that might improve the effectiveness of project cost management's future development in rail projects.

Study Limitations: The study acknowledges certain limitations, including:

- Inclusion of only papers and reviews from journals.
- Reliance on publications exclusively from the Scopus database.

- Consideration of articles written solely in English.
- Focus on articles published between 2016 and 2023.

Future Research Directions: Based on the identified limitations and observed gaps, the study suggests several future research directions which are to explore the effectiveness of interactions between project parties and stakeholders involved in cost management. Other directions include developing procedures for gathering client demands and assessing the qualifications required for personnel involved in cost management, bridging knowledge and practice gaps by aligning client perspectives and expectations while regulating stakeholders' perceptions, and building a framework that fosters the active participation of key individuals and enhances satisfaction within project cost management processes.

Declaration of Interest

The authors affirm that they have no known financial or interpersonal conflicts that would have appeared to have an impact on the research reported in this study.

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