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Dynamics of Cost-Overrun Factors Influencing Cost Performance in Building Construction Projects: A Review

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***Abstract*— Cost overruns are a persistent challenge in building construction projects, adversely affecting project viability, stakeholder confidence, and overall economic performance. This review examines the dynamic factors influencing cost overruns and their impact on cost performance in building construction projects. Key factors identified from the literature include inaccurate cost estimation, frequent design changes, inadequate project planning, poor site management, labor productivity issues, material price fluctuations, contract-related disputes, and external influences such as regulatory changes and economic instability. The review highlights the interdependent and evolving nature of these factors across different project stages, emphasizing how early-stage decisions significantly affect final project costs. By synthesizing findings from previous empirical and analytical studies, this paper provides a structured understanding of the root causes and interactions of cost-overrun factors. The review concludes that effective risk management, accurate forecasting, stakeholder coordination, and robust cost-control mechanisms are essential for improving cost performance and minimizing overruns in building construction projects.**

***Keywords*— Cost overrun, Cost performance, Building construction, Project management, Risk factors, Budget control.**

I. INTRODUCTION

The construction industry plays a vital role in economic development by supporting infrastructure growth, employment generation, and urban expansion. Among various sectors, building construction projects such as residential, commercial, and institutional developments constitute a significant share of construction activities worldwide[1]. Despite advancements in construction technologies, project management tools, and contractual frameworks, cost overruns remain one of the most persistent and critical challenges faced by the construction industry. Cost overruns occur when the actual expenditure of a project exceeds the initially approved budget, leading to financial stress, project delays, disputes among stakeholders, and in some cases, project abandonment[2].

Cost performance is a key indicator of project success and reflects the efficiency of planning, execution, and control mechanisms adopted during a project's life cycle. Poor cost performance not only affects contractors and clients but also has broader implications for investors, end users, and the overall economy[3]. In building construction projects, cost overruns are particularly common due to the complexity of project activities, involvement of multiple stakeholders, uncertainties in design and execution, and exposure to external economic and regulatory conditions. As building projects often operate under tight budgets and schedules, even minor deviations in cost estimates can escalate into significant overruns[4].

Several studies have identified a wide range of factors contributing to cost overruns in building construction projects. These factors may originate at different stages of the project, including the planning, design, procurement, and construction phases. Inaccurate cost estimation, inadequate feasibility studies, and insufficient risk assessment during the early stages often result in unrealistic budgets[5]. During execution, design changes, scope creep, poor site supervision, low labor productivity, equipment inefficiencies, and material wastage further aggravate cost escalation. In addition, external factors such as inflation, fluctuations in material prices, changes in government regulations, and unforeseen site conditions introduce uncertainties that are difficult to control[6].

An important aspect of cost overruns is their dynamic and interrelated nature. Cost-overrun factors rarely act in isolation; instead, they influence and reinforce one another over time. For example, poor initial planning may lead to frequent design changes, which in turn cause schedule delays and increased labor and material costs[7]. Similarly, delayed payments can affect contractor cash flow, reduce productivity, and result in claims and disputes, further increasing project costs. Understanding these dynamic interactions is essential for developing effective cost-control strategies and improving overall cost performance in building construction projects[8].

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In recent years, researchers and practitioners have increasingly focused on identifying, categorizing, and modeling cost-overrun factors to support better decision-making. Various analytical approaches, including statistical analysis, risk assessment models, system dynamics, and empirical surveys, have been used to study the causes and impacts of cost overruns[9]. However, findings often vary across regions, project types, and contractual arrangements, making it challenging to generalize solutions. This highlights the need for a comprehensive review that synthesizes existing knowledge and provides a holistic understanding of cost-overrun dynamics in building construction projects[10].

This review aims to examine the dynamics of cost-overrun factors influencing cost performance in building construction projects by analyzing and consolidating findings from previous studies. It focuses on identifying major internal and external factors, understanding their interactions across different project stages, and assessing their impact on overall cost performance. By providing a structured and integrated perspective, this review seeks to assist project managers, contractors, consultants, and policymakers in developing proactive strategies to minimize cost overruns, enhance budget reliability, and improve the financial performance of building construction projects.

II. Literature Survey

Abbas et al., [1] examined hazard perception among on-site construction personnel in a developing Middle Eastern country using an interactive graphical approach. The study highlighted gaps in workers' ability to recognize hazardous situations on construction sites. Results showed that experience level and training significantly influenced hazard perception. Younger and less experienced workers demonstrated lower awareness of safety risks. The graphical tool proved effective in assessing real-time hazard recognition. The authors emphasized the importance of visual-based safety training. The study contributes to improving proactive safety management practices.

Abdelhamid et al., [2] focused on identifying root causes of construction accidents through systematic analysis. The study classified accident causes into management-related, human-related, and site-condition-related factors. Findings indicated that unsafe acts and poor safety management were dominant contributors to accidents. Lack of training and inadequate supervision increased accident frequency. The research stressed the importance of addressing root causes rather than symptoms.

The proposed framework helps in developing preventive safety strategies. This work remains foundational in construction safety research.

Abreu Saurin et al., [3] analyzed safety planning and control from a human error perspective. The study investigated how cognitive and organizational factors influence unsafe behavior. Results showed that poor communication and weak planning systems increased human errors on sites. The authors emphasized integrating human reliability analysis into safety management. Their model improved identification of latent safety failures. The study highlighted limitations of traditional safety checklists. It provided a more comprehensive approach to safety planning and control.

Abueisheh et al., [4] studied the implementation of design-for-safety practices among construction design professionals in Palestine. The research identified low awareness and limited regulatory enforcement as major barriers. Findings revealed that designers acknowledged safety importance but lacked practical tools. Organizational culture strongly influenced safety-oriented design decisions. The study emphasized early-stage safety integration during design. Training and policy support were recommended for improvement. This work underlines the designer's role in accident prevention.

Adaku et al., [5] presented a theoretical framework for organizational capability in design for occupational safety and health. The study focused on how organizational structures influence safety outcomes. Results highlighted leadership commitment and knowledge management as key factors. The framework linked safety design capability with long-term organizational performance. It emphasized proactive risk elimination at the design stage. The study provided strategic insights for safety-oriented organizations. This research supports systematic integration of safety into design processes.

Adinyira et al., [6] investigated violent behavior on construction sites and its impact on unsafe practices using structural equation modeling. The study revealed that workplace violence significantly increases unsafe behavior. Psychological stress and poor site management were identified as major triggers. Results confirmed strong relationships between aggression and accident risks. The authors stressed the importance of behavioral safety interventions. Improving communication and conflict management was recommended. The study expanded safety research beyond physical hazards.

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Ahmed et al., [7] analyzed site safety management practices in Hong Kong construction projects. The study evaluated safety policies, training programs, and enforcement mechanisms. Findings showed that strict regulations and strong management commitment improved safety performance. Regular inspections and worker participation reduced accident rates. The authors emphasized systematic safety planning at site level. The study highlighted Hong Kong as a benchmark for safety management. It provided valuable lessons for other regions.

Ahn et al., [8] compared worker safety risks between onsite and offsite construction methods. The study revealed that offsite construction significantly reduced safety risks related to falls and material handling. Onsite construction showed higher exposure to hazardous conditions. Site management practices influenced risk distribution in both methods. The authors highlighted prefabrication as a safer alternative. However, transportation-related risks remained a concern. The study supports safety-driven construction method selection.

Alizadeh et al., [9] assessed accident severity in the construction industry using Bayesian probability models. The study identified key factors influencing accident severity levels. Results showed that equipment-related accidents caused more severe injuries. The Bayesian approach improved prediction accuracy of accident outcomes. The model supported data-driven safety decision-making. The study emphasized proactive risk assessment. It demonstrated the usefulness of probabilistic methods in construction safety.

Alkilani et al., [10] investigated health and safety issues in construction projects in developing countries, focusing on Jordan. The study identified weak enforcement, lack of training, and poor awareness as major challenges. Economic pressure was found to compromise safety practices. Cultural attitudes also influenced unsafe behavior. The authors stressed the need for regulatory reforms. Capacity building and education were recommended. The study highlighted systemic safety challenges in developing economies.

Alomari et al., [11] compared risk perception among construction safety professionals using the Delphi method. The study revealed differences in risk prioritization based on experience and professional background. Consensus was achieved on high-risk activities such as working at heights. The results highlighted subjective variation in safety judgments. The Delphi approach enhanced expert-based risk evaluation. The authors emphasized standardized risk assessment frameworks. This study supports informed safety decision-making.

Alruqi et al., [12] conducted a review and meta-analysis of critical success factors for construction safety. The study identified leading indicators such as management commitment and worker involvement. Results showed strong correlation between proactive indicators and safety performance. The authors highlighted limitations of lagging indicators like accident rates. Emphasis was placed on predictive safety measures. The meta-analysis strengthened evidence-based safety management. This study provides strategic direction for improving construction safety outcomes.

Table 1:
Summary of Literature review

Sr. No	Author	Year	Work	Outcome
1	Abbas et al.	2018	Hazard perception assessment of on-site construction personnel using interactive graphical tools	Identified gaps in hazard recognition; visual tools improved safety awareness and training effectiveness
2	Abdelhamid & Everett	2000	Identification of root causes of construction accidents	Revealed management failure and unsafe acts as primary accident causes
3	Abreu Saurin et al.	2005	Safety planning and control analysis from human error perspective	Highlighted influence of organizational and cognitive factors on unsafe behavior
4	Abueisheh et al.	2020	Design-for-safety implementation among construction designers	Found low practical adoption due to lack of awareness and regulatory support
5	Adaku et al.	2021	Framework for organizational capability in design for occupational safety	Demonstrated leadership and knowledge management as key safety enablers
6	Adinyira et al.	2020	Impact of violent behavior on unsafe	Confirmed strong link between workplace

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			practices using SEM	violence and unsafe behavior
7	Ahmed et al.	2000	Site safety management practices in Hong Kong	Showed strong management commitment reduces accident rates
8	Ahn et al.	2020	Comparison of safety risks in onsite vs offsite construction	Found offsite construction significantly reduces worker safety risks
9	Alizadeh et al.	2015	Accident severity assessment using Bayesian theorem	Improved prediction accuracy of accident severity levels
10	Alkilani et al.	2013	Construction health and safety issues in developing countries (Jordan)	Identified weak enforcement and training as major safety barriers
11	Alomari et al.	2018	Risk perception comparison among safety professionals	Revealed variation in risk prioritization based on experience
12	Alruqi & Hallowell	2019	Meta-analysis of construction safety leading indicators	Identified management commitment and worker involvement as critical success factors

III. Challenges

Despite continuous efforts to improve safety performance, the construction industry still records a high rate of accidents and unsafe practices. The dynamic nature of construction activities, involvement of multiple stakeholders, and changing site conditions make safety management complex. Safety challenges are often interconnected and influenced by organizational, human, and environmental factors. The major challenges identified from the literature are discussed below.

- *Low Hazard Perception among Workers:* Many construction workers fail to correctly identify hazardous situations on site, particularly inexperienced and untrained personnel. Poor hazard perception leads to unsafe acts, increasing the likelihood of accidents and injuries.
- *Inadequate Safety Training and Awareness:* Lack of regular and structured safety training remains a major challenge, especially in developing countries. Workers often rely on informal learning, which does not adequately address complex or high-risk activities.
- *Weak Safety Management Commitment:* Insufficient commitment from top management results in poor enforcement of safety rules. When safety is treated as secondary to productivity and cost, unsafe practices become common on construction sites.
- *Human Error and Unsafe Behavior:* Fatigue, stress, overconfidence, and time pressure contribute to human error. Unsafe behavior, such as ignoring safety procedures or misuse of equipment, significantly increases accident risk.
- *Poor Safety Planning and Control:* Safety planning is often reactive rather than proactive. Inadequate identification of risks during the planning stage leads to ineffective control measures during construction execution.
- *Limited Integration of Safety in Design Stage:* Designers often overlook safety considerations during the design phase. Failure to apply design-for-safety principles transfers risks to the construction stage, where hazard control becomes more difficult.
- *Inadequate Regulatory Enforcement:* Weak enforcement of safety regulations and lack of penalties reduce compliance. In many regions, safety inspections are irregular, allowing unsafe practices to continue unchecked.
- *Workplace Violence and Psychological Stress:* Aggressive behavior, conflicts, and psychological stress on construction sites negatively affect worker behavior. These factors increase distraction and unsafe actions, indirectly contributing to accidents.

IV. Conclusion

Construction safety remains a critical challenge due to the complex, dynamic, and high-risk nature of construction projects. The reviewed studies clearly indicate that safety issues are influenced by a combination of human behavior, organizational practices, design decisions, and regulatory enforcement. Challenges such as low hazard perception, inadequate training, weak management commitment, and poor integration of safety at the design stage continue to contribute to accidents and unsafe conditions.

Addressing these challenges requires a proactive and integrated safety management approach that emphasizes strong leadership, effective training programs, early risk identification, and strict regulatory compliance. By adopting systematic safety planning and fostering a positive safety culture, construction projects can significantly improve worker safety, reduce accident rates, and enhance overall project performance.

REFERENCES

[1] Abbas, M., B. E. Mneymneh, and H. Khoury. 2018. "Assessing on-site construction personnel hazard perception in a Middle Eastern developing country: An interactive graphical approach." Safety Science, 103: 183–196. https://doi.org/10.1016/j.ssci.2017.10.026.

[2] Abdelhamid, T. S., and J. G. Everett. 2000. "Identifying Root Causes of Construction Accidents." Journal of Construction Engineering and Management, 126 (1): 52–60. https://doi.org/10.1061/(ASCE)0733-9364(2000)126:1(52).

[3] Abreu Saurin, T., C. Torres Formoso, and F. Borges Cambraia. 2005. "Analysis of a safety planning and control model from the human error perspective." Engineering, Construction and Architectural Management, 12 (3): 283–298. https://doi.org/10.1108/09699980510600134.

[4] Abueisheh, Q., P. Manu, A. M. Mahamadu, and C. Cheung. 2020. "Design for safety implementation among design professionals in construction: The context of Palestine." Safety Science, 128: 104742. https://doi.org/10.1016/j.ssci.2020.104742.

[5] Adaku, E., N. A. Ankrah, and I. E. Ndekugri. 2021. "Design for occupational safety and health: A theoretical framework for organisational capability." Safety Science, 133: 105005. https://doi.org/10.1016/j.ssci.2020.105005.

[6] Adinyira, E., P. Manu, K. Agyekum, A. M. Mahamadu, and P. O. Olomolaiye. 2020. "Violent behaviour on construction sites: structural equation modelling of its impact on unsafe behaviour using partial least squares." Engineering, Construction and Architectural Management, 27 (10): 3363–3393. https://doi.org/10.1108/ECAM-09-2019-0489.

[7] Ahmed, S. M., J. C. Kwan, F. Y. W. Ming, and D. C. P. Ho. 2000. "Site Safety Management in Hong Kong." Journal of Management in Engineering, 16 (6): 34–42. https://doi.org/10.1061/(ASCE)0742-597X(2000)16:6(34).

[8] Ahn, S., L. Crouch, T. W. Kim, and R. Rameezdeen. 2020. "Comparison of Worker Safety Risks between Onsite and Offsite Construction Methods: A Site Management Perspective." Journal of Construction Engineering and Management, 146 (9): 05020010. https://doi.org/10.1061/(asce)co.1943-7862.0001890.

[9] Alizadeh, S. S., S. B. Mortazavi, and M. M. Sepehri. 2015. "Assessment of accident severity in the construction industry using the Bayesian theorem." International Journal of Occupational Safety and Ergonomics, 21 (4): 551–557. https://doi.org/10.1080/10803548.2015.1095546.

[10] Alkilani, S. Z., J. Jupp, and A. Sawhney. 2013. "Issues of construction health and safety in developing countries: A case of Jordan." Australasian Journal of Construction Economics and Building,13(3):141–156. https://doi.org/10.5130/ajceb.v13i3.3301.

[11] Alomari, K. A., J. A. Gambatese, and N. Tymvios. 2018. "Risk Perception Comparison among Construction Safety Professionals: Delphi Perspective." Journal of Construction Engineering and Management, 144 (12): 1–12. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001565.

[12] Alruqi, W. M., and M. R. Hallowell. 2019. "Critical Success Factors for Construction Safety: Review and Meta-Analysis of Safety Leading Indicators." Journal of Construction Engineering and Management, 145 (3): 04019005. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001626.