Enhancing Safety Management in Construction Projects: A Review

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Abstract – Safety management in construction projects requires systematic identification and control of risks that may compromise worker health and safety. Given its dynamic work environments and labour-intensive nature, the construction sector remains one of the most hazardous industries, often reporting high rates of accidents, severe injuries, and fatalities. At the same time, the industry is a cornerstone of national infrastructure development and economic growth, which underscores the need to prioritize worker well-being. A review of the literature reveals that poor safety outcomes frequently stem from multiple factors, including inadequate training, lack of awareness in handling equipment, weak enforcement of safety regulations, limited adherence to site rules, and managerial shortcomings. These issues collectively hinder the development of a strong safety culture within construction organizations. Addressing such challenges through comprehensive safety programs, behavioural interventions, and stricter compliance measures is vital to reducing accident rates and sustaining safer construction practices.

Keywords: Construction safety, Safety Management, Safety performance, Safety culture, Construction, Projects

1. Introduction

The construction industry is a critical driver of economic growth and national development, contributing significantly to infrastructure expansion and employment generation. Unlike industrial sectors in many developed regions, construction in developing economies remains predominantly labour-intensive, presenting unique challenges to the effective management of occupational health and safety. The sector is consistently identified as one of the most hazardous work environments due to the complexity of its activities, variability in site conditions, and reliance on manual labour. These characteristics expose workers to elevated risks of accidents, injuries, and in some instances, fatalities, thereby making safety management an essential component of project delivery.

In recent decades, the concept of safety culture has emerged as a pivotal tool for addressing these concerns. A positive safety culture characterized by strong leadership commitment, worker engagement, and organizational learning has been shown to reduce the likelihood of unsafe practices while fostering a climate of trust and accountability. Frameworks developed within safety science, such as Reason's model of organizational accidents and Hale's safety management systems approach, emphasize the role of proactive safety governance in minimizing workplace risk. These foundations underscore the importance of embedding safety values within construction organizations to improve both performance and employee well-being.

Growing scholarly interest in occupational safety within the construction sector reflects the urgency of strengthening safety practices through systematic evaluation and continuous improvement. This review study

applies descriptive analysis to benchmark safety performance across contractors and clients, with the aim of identifying critical gaps and proposing strategies for enhancing safety management in construction projects.

1.1 Importance of safety management with contributing factors

The following are the importance of safety management across the six main cause categories with contributing factors.

1. Management: Strong management commitment ensures the integration of safety into planning and decision-making. Without clear policies, proper supervision, and strategic planning, safety practices remain ineffective.
2. Workers: Trained and aware workers are central to maintaining safe operations. Low awareness or unsafe behavior increases accident risks, making education and motivation vital.
3. Equipment: Well-maintained tools and protective gear reduce technical failures. Neglect in equipment upkeep or use of faulty tools can directly endanger lives.
4. Methods: Standardized work procedures and effective monitoring help prevent unsafe practices. Poor methods often result in inconsistencies and higher risk exposure.
5. Environment: Site conditions, weather, and housekeeping practices significantly affect safety. A well-organized and hazard-free environment minimizes accidents.
6. Regulations: Compliance with legal standards and regular inspections enforce accountability. Weak enforcement or non-compliance undermines overall safety performance.

The figure 1 shows fishbone diagram for safety management in construction projects.

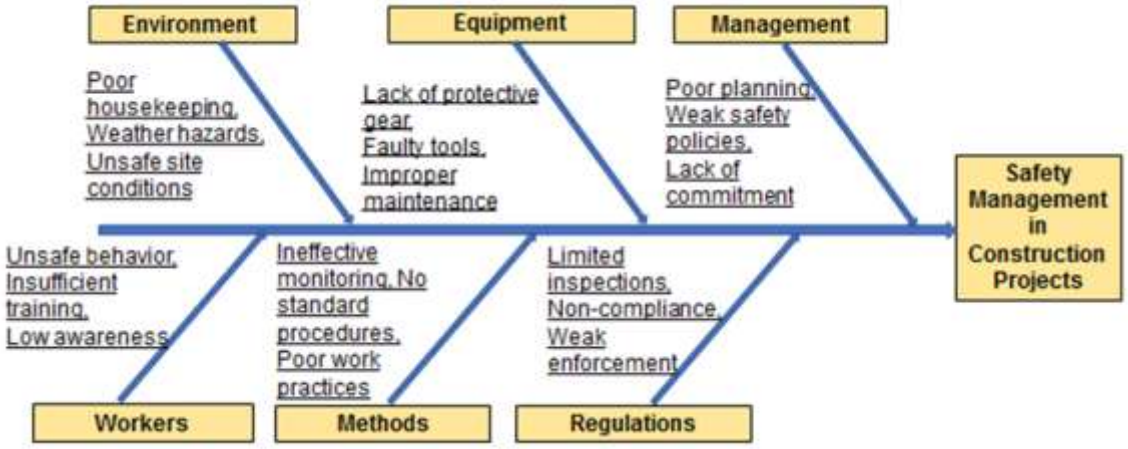

Figure 1: Fishbone diagram for safety management in construction projects

1.2 Factors Affecting Safety Management in Construction Projects

The Table 1 shows factors affecting safety management with main criteria and sub-criteria in construction projects.

Table 1: Factors affecting safety management with main criteria and sub-criteria in construction projects

Main Criteria	Sub-Criteria
Management	1. Commitment of top management 2. Clear safety policies and objectives 3. Adequate resource allocation 4. Supervision and leadership quality
Workers	1. Awareness of hazards 2. Safety training and education 3. Motivation and attitude 4. Compliance with safety rules
Equipment	1. Proper maintenance of tools and machinery 2. Availability of protective equipment (PPE)

	3. Use of certified and safe tools 4. Inspection and replacement schedules
Methods	1. Standard operating procedures (SOPs) 2. Effective work planning 3. Regular monitoring and reporting 4. Implementation of corrective actions
Environment	1. Site housekeeping and cleanliness 2. Control of physical hazards (dust, noise, lighting) 3. Weather-related risks 4. Site layout and accessibility
Regulations	1. Compliance with statutory requirements 2. Enforcement of safety laws 3. Regular inspections and audits 4. Penalties for non-compliance

1.3 Safety Management Methods

The Table 2 shows safety management methods in construction projects.

Table 2: Safety management methods in construction projects

Safety Management Methods	Definition	Key Approaches / Techniques
Safety Planning	Systematic identification of potential hazards before work.	1. Job Safety Analysis (JSA) 2. Hazard Identification & Risk Assessment (HIRA) 3. Safety Checklists
Safety Training & Education	Ensuring workers understand safety rules and practices.	1. Induction Training 2. Toolbox Talks 3. Skill Development Programs
Safety Policies & Procedures	Formal documentation and enforcement of safety rules.	1. Standard Operating Procedures (SOPs) 2. Work Permits & Authorizations 3. Disciplinary Actions
Safety Monitoring & Inspections	Regular observation and auditing to maintain safety standards.	1. Routine Inspections 2. Safety Audits 3. Near-Miss Reporting
Safety Technology & Equipment	Use of protective gear and technology to reduce accidents.	1. Personal Protective Equipment (PPE) 2. Safety Signage & Alerts 3. Automation & Sensors
Safety Culture & Communication	Promoting a workplace culture that prioritizes safety.	1. Leadership Commitment 2. Safety Committees 3. Open Communication
Emergency Preparedness & Response	Readiness to handle accidents or emergencies effectively.	1. Emergency Drills 2. First-Aid & Medical Facilities 3. Contingency Plans

1.4 Benefits of safety management in the construction industry

The construction industry remains one of the most hazardous sectors globally, contributing significantly to workplace injuries and fatalities. Effective implementation of safety management systems (SMS) offers numerous benefits that extend beyond injury prevention, influencing financial performance, legal compliance, and workforce wellbeing.

1. Reduction in Accidents and Injuries: A primary benefit of safety management is the significant decrease in work-related accidents. By systematically identifying hazards, enforcing protective measures, and promoting safety culture, construction companies can reduce incidents that often result in injury or death. This not only protects workers but also avoids costly disruptions and investigations.
2. Cost Efficiency and Financial Savings: Accidents incur direct costs (medical expenses, legal fees) and indirect costs (delays, retraining, damaged reputation). Safety programs, while requiring initial investment, yield long-term financial savings. A report by the National Safety Council (India) highlights that for every rupee invested in workplace safety, organizations can potentially save four to six rupees through reduced accident costs, improved productivity, and better workforce well-being.
3. Legal and Regulatory Compliance: Compliance with occupational safety and health regulations (such as OSHA or ISO 45001) is both a legal requirement and a risk mitigation strategy. Robust safety management ensures adherence to these standards, reducing the likelihood of penalties, lawsuits, or project shutdowns due to violations.
4. Improved Productivity and Operational Efficiency: Safe work environments foster uninterrupted operations. When workers feel secure, they are more engaged and productive. Moreover, safety procedures often go hand-in-hand with better organization and planning, which translates into more efficient project execution.
5. Enhanced Corporate Image and Stakeholder Confidence: Safety-conscious organizations are viewed more favourably by clients, investors, and regulators. Demonstrating a commitment to worker welfare can enhance reputation, attract new business, and foster trust among stakeholders. This is particularly important in competitive tendering environments.
6. Workforce Morale and Retention: Employees are more likely to remain with employers who prioritize their safety. A strong safety culture promotes job satisfaction, reduces absenteeism, and boosts morale. This also contributes to lower turnover and recruitment costs in the long term.
7. Environmental and Social Responsibility: Construction safety measures often include protocols for handling hazardous substances and protecting surrounding communities. Thus, safety management also contributes to environmental protection and fulfills aspects of corporate social responsibility (CSR).
8. Risk Management and Emergency Preparedness: Safety management facilitates proactive identification of risks and the implementation of contingency plans. This readiness is essential for mitigating the impact of unforeseen events and maintaining project continuity.

2. Literature Review

The following are the previous research review based on safety management in construction projects.

Li et al. (2012) despite growing awareness, the construction industry continues to struggle with implementing effective health and safety practices capable of achieving zero-accident outcomes. Poor safety performance leads to substantial financial losses through injuries, equipment damage, schedule delays, and increased insurance costs. A study conducted in China assessed current safety management practices and identified serious shortcomings, including insufficient use of personal protective equipment, lack of routine safety meetings, and inadequate training. These deficiencies highlight the need for stronger safety enforcement. The study advocates for a more active governmental role in legal regulation and the facilitation of structured safety training programs [1].

Patel et al. (2017) highlight safety as a critical element in construction projects, directly impacting worker well-being and project outcomes. Their study aimed to identify the critical success factors influencing safety management in the Indian construction industry. Findings revealed persistent challenges, including poor awareness about equipment grounding, inadequate cable protection, and limited knowledge of hazards and precautions. They argue that safety management is necessary to improve work practices, attitudes, and overall safety culture. They recommend proactive measures to address these issues, stressing that effective safety practices can reduce losses and promote a safer construction environment [2].

Chen et al. (2017) safety performance in the construction industry has reached a plateau, prompting interest in factors such as safety climate and individual resilience. Research suggests that safety climate, a leading indicator of safety outcomes, may vary by region, yet remains underexplored in Canada. A study involving 837 construction workers in Ontario revealed that safety climate influences both physical safety and psychological stress. Furthermore, individual resilience was found to reduce stress but had no direct effect on

physical safety. These findings underscore the importance of addressing both organizational and psychological dimensions to enhance worker safety and well-being in the construction sector [3].

Saeed (2017) explored health and safety (H&S) management in construction projects to reduce occupational risks and fatalities. Using a questionnaire targeting experienced professionals, the study identified major shortcomings in construction safety practices. High accident rates were attributed to poor construction planning, lack of safety considerations in design, insufficient safety training, and inadequate understanding of site regulations. The research highlights the inefficiency caused by injuries and the loss of workdays, suggesting that better safety knowledge and practices are essential. It concludes that a structured safety framework is necessary to address recurring hazards and to support a more efficient industry [4].

According to **Mohammed et al. (2017)**, safety management is concerned with the structure, goals, methods, plans, components and resources used to manage risk and hazard in socio-technical systems. The perception and awareness of the workers towards safety, wellbeing and their workplace are the important factors to improve the construction of the building to a better condition to the workers. Knowledge or awareness of safety management framework is an important concept for effective safety management framework at site as high safety and wellbeing performance will increase the association image through less accidents, less absent workers from work, less doctor visit costs, etc [5].

Othman et al. (2018) effective safety management remains a major challenge in the construction industry, particularly in large-scale projects. Despite improvements in injury rates over recent decades, construction continues to be a high-risk sector. A study conducted in Malaysia emphasized that poor implementation of safety management can lead to accidents, negatively impacting project performance and national economic growth. Key factors influencing site safety include worker attitudes, training and awareness, availability of safety equipment, safety inspections, and organizational policies. Addressing these elements is essential to minimizing site incidents. The findings reinforce the need for a systemic safety approach across all organizational levels [6].

Patel et al. (2018) emphasize the importance of safety management in construction projects, noting its role in protecting workers and improving performance. The study highlights India's poor safety record, which has led to significant human and financial losses. Safety management is seen as essential for fostering awareness of hazards, preventive measures, and positive changes in work practices and attitudes. Common issues include lack of knowledge about grounding of power tools and inadequate cable protection. Although many firms have safety policies, awareness remains low. However, some major contractors actively implement procedures, training, and safety personnel to enhance workplace safety [7].

Golaviya et al. (2018) collected data on safety management from general contractors of multiple projects, including information on organization safety policy, training, meetings, equipment, inspections, safety incentives and penalties, and workers attitudes toward safety legislation, among other criteria that indicate poor safety management, and they found workers to be untrained, inexperienced, and unaware of the safety precautions and equipment used [8].

M. Samuel Thanaraj et al. (2019) conducted an empirical investigation into safety management practices within construction projects, aiming to reduce health and safety (H&S) risks among workers. Employing a survey-based methodology informed by an extensive literature review, the authors utilized a structured questionnaire, which was statistically analyzed using IBM SPSS software. Their data revealed that falls from heights (56%) are the predominant cause of fatalities, followed by entrapment (21%), vehicle strikes (10%), electrocution (5%), and other less frequent hazards. The study highlighted the emerging role of sensor-based technologies, such as Ultra-Wideband (UWB) wireless positioning, in accident prevention. Survey responses from multiple stakeholder groups in Coimbatore indicated that injuries primarily resulted from inadequate safety knowledge (46.7%) and poor working conditions (33.1%), with lesser contributions from insufficient personal protective equipment (PPE) (15.5%). The authors underscored the need for performance-oriented safety programs encompassing PPE guidance, safety policies, hazard awareness, equipment use, and clear worker responsibilities. Training and management commitment were identified as critical components to cultivating a safe work environment, supported by ready access to first aid and adherence to OSHA accident prevention protocols. This study contributes to the broader discourse on construction safety by integrating technological solutions with established safety management principles, emphasizing comprehensive education, effective policy implementation, and organizational safety culture in accident reduction strategies. This aligns with prevailing literature trends emphasizing proactive safety climates, multidisciplinary safety

leadership, and technological integration in safety management to enhance construction workers' protection and minimize accidents [9].

Sing-Sing Wong et al. (2019) The Malaysian construction industry contributes significantly to national development, but it remains high-risk due to hazardous activities. A study conducted in Sibu, Sarawak, used a quantitative survey to identify key factors affecting safety performance across Grade 5, 6, and 7 construction firms. Out of 48 distributed questionnaires, 27 were returned. The analysis revealed five primary factors impacting safety: availability of personal protective equipment, roles of government and professional bodies, proper signage and barricades, safety education and training, and emergency preparedness. The study also emphasizes the importance of employing qualified safety professionals to enhance overall safety performance on construction sites [10].

The most common fatal accidents in the construction industry were examined by **Prabakar et al. (2019)** who found that the local construction industry has not adapted to safety measures, and fatalities are caused by four types of accidents: falls, being struck by an object, electrocutions, and being caught between two objects. Falling is one of the leading causes of fatal accidents at the workplace, with falling from a height responsible for one-third of all fatal accidents in the construction industry [11].

Rakul P et al. (2020) studied critical factors that affect construction project safety and quality management. In this study, they used a qualitative and quantitative approach to collect data. This research demonstrated that management commitment, safety knowledge of top management practices/procedures/reviews, and errors in judgement or carelessness are significant safety issues, while the most significant quality elements affecting safety and quality management are project supervision, staff involvement/attitude, and expertise knowledge/training. Their research revealed that PPE is an important aspect of construction industry safety [12].

In their research, **Priyanka M K et al. (2020)** identified the safety factors influencing local construction projects and analyzed them. They found that the safety management system in the construction project must be improved and monitored on a regular basis to maintain its effectiveness. The eight aspects of safety management are safety policy and standards, safety organization, safety training, inspecting hazardous conditions, personal protective programs, plant and equipment, safety promotion, and management behavior. Government should treat small construction companies differently to set up a construction safety management system, and free Green Book training should be provided to workers [13].

Chukkaluru Rukmunnisa Sulthana et al. (2020) conducted a comprehensive investigation to assess safety management practices aimed at improving health and safety among construction workers. The research gathered insights from a diverse group of professionals involved in building projects, including contractors (50%), site engineers (55%), project managers (20%), designers, and principal designers. Respondents exhibited varied experience levels, predominantly between 5 and 10 years. Findings indicated a high awareness of safety management, with 83% confirming health and safety measures were implemented on sites. The study identified contractors and project managers as pivotal in mitigating health and safety risks, emphasizing that deficiencies in safety awareness among these groups contribute significantly to workplace hazards. This underscores the necessity for targeted safety education and management commitment to improve construction site safety outcomes [14].

Nour Eldeen M. A. Abo Nassar (2021) the construction industry plays a vital role in economic development but remains one of the most hazardous sectors. Frequent exposure to high-risk activities has led to numerous accidents, often resulting in project delays, increased costs, and reputational damage. A key contributor to these incidents is poor safety performance among workers, driven by multiple underlying factors. Improving safety requires identifying root causes and addressing influencing variables through thorough investigation. Despite advancements, the industry still lags behind others in safety standards. Continuous safety training is essential, as it enhances workers' knowledge, shapes positive safety behaviour, and ultimately reduces accident frequency [15].

Buniya et al. (2021) investigated the barriers to effective safety program implementation in Iraq's construction industry. Through literature review, interviews, and surveys, the study identified 12 key barriers, which were grouped into four categories using exploratory factor analysis: non-conductive work climate, poor governance, low safety awareness, and unsupportive industry norms. The Partial Least Squares Structural Equation Modeling (PLS-SEM) confirmed the relationships among these factors. The research emphasizes the need for improved national-level governance and regulatory frameworks to overcome institutional and

cultural obstacles, proposing systemic reforms to enhance construction safety performance and reduce accident rates in the industry [16].

In their study of the assessment of several parameters like accident analysis, accident causes, and types of accidents in a construction working environment, **Bhatuk et al. (2021)** identified 19 unsafe acts, conditions, and 22 reasons for the accidents and injuries that impact projects in India. Using the questionnaire through the relative importance index technique, they determined the critical factors and identified how to address them through the mitigation technique [17].

Saibabu et al. (2022) examined persistent safety issues in the construction sector, emphasizing worker unawareness, lack of training, and employer negligence. Unsafe practices, such as inadequate supervision and insufficient use of personal protective equipment (PPE), often lead to severe accidents, especially falls from height. The study advocates for continuous training, proper equipment use, on-site safety engineers, and safety supervisors to enforce regulations. It recommends that government support small contractors by offering free safety training programs. Additionally, it calls for comprehensive planning, safe scaffolding, protective measures at elevated worksites, and improved emergency response to ensure safer construction environments [18].

Ranjith PK et al. (2024) the construction industry significantly contributes to national economic and social progress. Despite its importance, safety often takes a backseat to cost, time, and quality objectives in profit-oriented projects. This tendency among stakeholders has contributed to the industry's poor safety performance. Effective safety management is vital for ensuring employee welfare, asset protection, and operational reliability. Literature highlights several critical components, including risk assessment, safety training, clear policies, communication, leadership commitment, inspections, and technology integration to improve safety standards [19].

After identifying these factors, an integrated framework shown in Table 3 for assessing the factors affecting safety performance was developed.

Table 3: Factors affecting safety performance

Main Factor	Sub-Factor	Detailed Explanation (with examples)
Worker Factors	Historical Factors	Past accidents, injuries, or unsafe practices can influence current worker attitudes. Workers with negative safety history may either be more cautious or negligent if no corrective measures are taken. Example: A worker who experienced a fall may follow harness rules strictly.
	Human Behavior	Individual attitudes, carelessness, fatigue, and risk-taking behavior directly affect safety. Poor discipline or ignoring rules can increase accident risks. Example: Workers bypassing PPE use to save time.
	Psychological Factors	Stress, mental health, job satisfaction, and motivation influence performance. Unsafe conditions may arise from distraction, overconfidence, or pressure. Example: A stressed worker handling heavy machinery is more prone to errors.
Environmental Factors	Natural Environment	Weather, temperature, lighting, noise, and natural hazards can affect safety. Example: Heat stress, monsoon flooding, or dust storms can increase accident probability on-site.
	Working Environment	Site conditions like housekeeping, ventilation, noise, and crowding impact worker safety. Example: Poorly lit scaffolding areas can cause falls.
Organizational Factors	Management Practices on Site	Strong site-level safety management ensures accident prevention. It includes: 1. Plan: Preparing safety plans in line with project

		requirements. 2. Inspection, Records, and Audits: Ensuring compliance and continuous monitoring. 3. Training and Education Factors: Regular safety training builds awareness and competency. 4. Management Commitment: Leadership's dedication to safety motivates compliance. 5. Safety Communication: Clear channels for hazard reporting and safety updates. 6. Employee Involvement: Engaging workers in decision-making improves ownership of safety culture.
	Policy and Procedural Factors	Safety policies, SOPs, rules, and procedures form the backbone of safety management. They define accountability, work permits, and disciplinary actions. Example: Lockout-tagout (LOTO) procedure to prevent accidental equipment start-up.
Other Factors	Incentives and Project Budget	Safety investment is essential. Adequate budget for PPE, training, inspections, and incentives for safe work behavior improves performance. Example: Rewarding workers for reporting hazards encourages proactive safety culture.

The following Table 4 shows the representative references and factors affecting safety performance.

Table 4: Representative References and factors affecting safety performance

Reference	Key Findings / Factors Affecting Safety Performance
Li et al. (2012) [1]	Poor safety practices in China due to inadequate PPE usage, lack of safety meetings, insufficient training; need for stronger government regulation and structured training programs.
Patel et al. (2017) [2]	Safety as a critical success factor in India; issues with grounding equipment, cable protection, and hazard awareness; need for improved practices, culture, and proactive safety management.
Chen et al. (2017) [3]	Safety climate influences both physical safety and psychological stress; resilience reduces stress but does not directly impact physical safety; highlights organizational and psychological dimensions.
Saeed (2017) [4]	High accident rates caused by poor planning, lack of safety in design, insufficient training, and weak knowledge of site regulations; need for structured safety frameworks.
Mohammed et al. (2017) [5]	Safety perception and awareness of workers are key; strong safety management framework reduces accidents, absenteeism, and medical costs, improving organizational image.
Othman et al. (2018) [6]	Poor safety implementation in Malaysia; critical factors include worker attitudes, training, availability of PPE, safety inspections, and organizational policies.
Patel et al. (2018) [7]	India's poor safety record; key issues: lack of grounding knowledge, poor cable protection, low awareness despite safety policies; major contractors adopting training and safety officers.
Golaviya et al. (2018) [8]	Safety management gaps due to uneducated and inexperienced workers, lack of awareness of safety precautions, inspections, and incentive systems.
M. Samuel Thanaraj et al. (2019) [9]	Fatalities mainly from falls, entrapment, vehicle strikes, and electrocution; inadequate safety knowledge and poor conditions major causes; role of technology (UWB sensors) highlighted.
Sing-Sing	Malaysian firms face hazards due to poor PPE availability, weak role of

Wong et al. (2019) [10]	authorities, lack of signage, insufficient training, and emergency preparedness.
Prabakar et al. (2019) [11]	Four main accident causes: falls, struck-by, electrocution, caught-in-between; unsafe acts, poor site conditions, and communication barriers as root causes.
Rakul P et al. (2020) [12]	Critical issues: management commitment, errors in judgment, lack of supervision, limited training; PPE and safety knowledge of top management crucial for safety and quality.
Priyanka M. K. et al. (2020) [13]	Eight safety management aspects: policy, organization, training, hazard inspection, PPE programs, equipment management, safety promotion, and management behavior; special focus on small firms.
Chukkaluru R. S. et al. (2020) [14]	Contractors and project managers play key roles; gaps in awareness contribute to hazards; need for targeted training and stronger management commitment.
Nour Eldeen M.A.A. Nassar (2021) [15]	Poor safety performance in high-risk activities; causes project delays, costs, reputational damage; emphasizes continuous safety training for positive worker behavior.
Bhatuk et al. (2021) [16]	Identified 19 unsafe acts and 22 unsafe conditions; critical accident causes identified through Relative Importance Index (RII) and suggested mitigation strategies.
Buniya et al. (2021) [17]	Barriers in Iraq: poor governance, low safety awareness, weak regulations, unsupportive norms; systemic reforms and governance improvement needed.
Saibabu et al. (2022) [18]	Persistent issues: lack of worker training, unsafe practices, weak supervision, poor PPE use; need for on-site safety engineers, scaffolding safety, and emergency response systems.
Ranjith P.K. et al. (2024) [19]	Safety overlooked due to focus on cost/time/quality; critical components: risk assessment, training, inspections, leadership, safety culture, and technology integration.

3. Conclusions

Based on the reviewed literature, several key insights can be drawn regarding the challenges and opportunities in enhancing safety management within the construction sector:

1. A noticeable gap persists in the understanding and proper utilization of construction equipment on-site, compounded by deficiencies in overall site management practices.
2. Active involvement of project owners in safety management is essential across all stages of project delivery. Their role should extend beyond financial oversight to include adoption of safe design principles, careful contractor selection, integration of safety clauses in contracts, promotion of safety culture through structured training, and implementation of recognition programs that incentivize safe practices.
3. Employee attitudes, perceptions, and behaviors towards safety, as well as environmental and situational factors, can be systematically evaluated through diagnostic tools such as safety climate surveys, peer observations, structured audits, and formal inspections.
4. Effective site-level safety management requires the establishment of comprehensive and well-structured practices, including formal safety policies, periodic training and education, site inspections, safety audits, regular safety meetings, well-defined organizational safety structures, provision of personal protective equipment (PPE), emergency response systems, protective devices for fall prevention, and ongoing promotional activities to reinforce safe behavior.
5. Visible and strategically placed safety signs, warning indicators, reflective guides, and other visual aids must be deployed to reduce onsite hazards and improve worker awareness.
6. Construction firms should continuously refine their operational policies and project designs to mitigate risks arising from changing environmental and contextual factors.

7. Adoption of behavior-based safety management programs can play a critical role in addressing human error by encouraging safe behavior and preventing unsafe actions.
8. Project management personnel should contribute to strengthening the safety climate by enhancing their conceptual and managerial competencies, ensuring that safety remains a core consideration in each decision they make.
9. Continuous improvement in safety management should follow a structured six-step process: (i) formulation of safety regulations, (ii) identification of hazards, (iii) risk assessment and evaluation, (iv) determination of appropriate precautions, (v) documentation of findings, and (vi) ongoing review and updates to ensure alignment with evolving site conditions.

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