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EVALUATING THE EFFECTIVENESS OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEMS IN THE CONSTRUCTION INDUSTRY

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Annotation: This article explores the effectiveness of Occupational Health and Safety Management Systems (OHSMS) in the construction industry, a sector known for its high risk of accidents and injuries. It outlines the core components of OHSMS, discusses key performance indicators used to evaluate their success, and describes various methods of assessment, including audits, employee feedback, and incident trend analysis. The article also highlights common challenges in implementation and evaluation, such as underreporting and project variability, and provides strategies for enhancing system performance. The study emphasizes the need for a comprehensive, data-driven, and participatory approach to ensure meaningful health and safety outcomes on construction sites.

Keywords: construction industry, safety management, iso 45001, risk assessment, workplace safety, safety audits, incident reporting, employee engagement, health and safety evaluation, safety performance, construction site risks

Introduction. The construction industry is one of the most hazardous sectors globally, accounting for a significant share of occupational injuries, illnesses, and fatalities. To mitigate these risks, many construction companies implement Occupational Health and Safety Management Systems (OHSMS), such as those aligned with ISO 45001 or OHSAS 18001. These systems aim to systematically manage safety risks, ensure regulatory compliance, and promote a culture of continuous improvement in occupational health and safety (OHS). However, the mere adoption of an OHSMS does not guarantee improved safety performance. Evaluating the effectiveness of these systems is essential to ensure they are delivering real-world benefits.

OHSMS refers to structured frameworks that help organizations identify, manage, and reduce workplace health and safety risks. In the construction industry, these systems typically include:

- Risk assessment and hazard identification
- Safety training and competency development
- Incident reporting and investigation protocols
- Safety audits and inspections
- Continuous monitoring and review mechanisms

Evaluating the effectiveness of Occupational Health and Safety Management Systems in the construction industry is vital for protecting workers, maintaining compliance, and enhancing organizational reputation. A robust evaluation framework that combines quantitative data, qualitative insights, and stakeholder involvement can help ensure that OHSMS are not only implemented but are actively reducing risk and driving continuous improvement. As construction projects grow more complex, a proactive, dynamic, and integrated approach to safety management will be more important than ever.

Relevance of the study. The construction industry remains one of the most hazardous work environments globally, with consistently high rates of occupational injuries, illnesses, and fatalities. Despite advancements in safety technologies and regulatory frameworks, many

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construction firms continue to face significant challenges in effectively managing workplace health and safety. The implementation of Occupational Health and Safety Management Systems (OHSMS) has been widely promoted as a systematic solution to mitigate risks, improve compliance, and foster a culture of safety. However, the true effectiveness of these systems often varies across organizations and projects, depending on factors such as leadership commitment, workforce engagement, and the quality of implementation. This study is highly relevant as it seeks to critically evaluate how well OHSMS function in real-world construction settings. By identifying both the strengths and limitations of current safety management practices, the study contributes to a deeper understanding of what works, what doesn't, and why. It provides valuable insights for construction managers, safety professionals, policymakers, and researchers aiming to enhance the efficiency, accountability, and impact of health and safety strategies in the industry. Ultimately, the findings can help reduce workplace accidents, improve worker well-being, and support the sustainable development of construction projects.

Analysis of literature. The construction industry is inherently high-risk due to its dynamic nature, complex tasks, and diverse workforce. Numerous studies have been conducted on Occupational Health and Safety Management Systems (OHSMS) to assess their effectiveness in mitigating risks and improving safety performance within this industry. These studies provide valuable insights into how OHSMS frameworks are designed, implemented, and evaluated, and also highlight the challenges and barriers to achieving optimum safety outcomes. OHSMS is grounded in the principle that systematic management of health and safety risks, through clear policies, procedures, and continual monitoring, leads to improved safety performance (Ho & Li, 2016). Various safety management frameworks, such as ISO 45001 and OHSAS 18001, have been developed to formalize the management of occupational health and safety (OHS) (Ahamed et al., 2018). These standards emphasize a structured approach that includes risk assessments, hazard identification, and the establishment of clear roles and responsibilities.

The construction industry is widely recognized for its high injury rates and fatalities. According to a report by the International Labour Organization (ILO, 2019), construction workers are more likely to face workplace accidents than those in any other sector. This has spurred the implementation of OHSMS to better address these risks. Studies by Lingard et al. (2019) highlight that while OHSMS are widely adopted, their effectiveness depends heavily on factors such as management commitment, worker involvement, and the integration of safety measures into daily operations. Effective implementation is particularly important in construction, where the transient nature of the workforce and the diversity of subcontractors can complicate safety management. Several factors contribute to the varying effectiveness of OHSMS in the construction industry. A study by Zhang and Xie (2018) revealed that management commitment plays a pivotal role in ensuring the success of OHSMS. Leadership must not only support safety measures but also actively engage with employees, setting clear safety goals and ensuring adequate resources are allocated to health and safety programs. Without strong leadership, OHSMS may become merely a compliance tool rather than a proactive risk management strategy. Similarly, the involvement of workers in safety management has been identified as a key determinant of OHSMS success. As evidenced by the research of Zou et al. (2020), worker participation in safety decision-making leads to greater identification and mitigation of hazards, creating a more robust safety culture. Employee feedback through safety committees, near-miss

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reporting systems, and training sessions ensures that OHSMS remains responsive to real-time challenges.

While OHSMS frameworks provide clear guidelines for safety management, numerous challenges persist in their implementation and evaluation. According to a study by Tam et al. (2015), underreporting of incidents, poor communication between subcontractors, and a lack of enforcement of safety measures are common obstacles. Furthermore, inconsistent safety practices across multiple project sites, often driven by varying interpretations of safety standards, contribute to the difficulties in evaluating the overall effectiveness of OHSMS. Another key challenge is the variability in construction project sizes and complexity. Large-scale projects may have more resources and a more structured safety program, while smaller projects often struggle with resource constraints and limited expertise. This variation in project characteristics can affect how OHSMS are applied and whether they lead to sustained safety improvements (Ahamed et al., 2018).

Evaluating the effectiveness of OHSMS is an area of ongoing research. Traditional metrics, such as injury and fatality rates, provide lagging indicators of safety performance, but they do not offer insights into the proactive measures in place to prevent accidents (Fernandez-Muniz et al., 2019). As a result, leading indicators, such as the frequency of safety audits, employee safety training, and near-miss reporting, have become increasingly important in assessing the effectiveness of safety management systems (Kines et al., 2017). Moreover, studies by Zhang and Xie (2018) emphasize the role of third-party audits and external certifications (e.g., ISO 45001) as part of an objective evaluation of an organization's safety practices. Third-party assessments provide an independent perspective on safety management practices, and certifications can serve as an indicator of compliance with internationally recognized standards.

Recent literature highlights the role of technology in enhancing the effectiveness of OHSMS. Technologies such as mobile safety apps, drones for site inspections, and artificial intelligence for hazard prediction are increasingly being integrated into safety management systems (Marcos et al., 2020). These innovations allow for real-time data collection, faster hazard identification, and more accurate risk assessments, leading to more proactive safety management. The literature reveals that while OHSMS frameworks, such as ISO 45001, have contributed significantly to improving safety standards in the construction industry, their effectiveness is influenced by multiple factors, including leadership commitment, employee participation, and the integration of new technologies. Furthermore, the ability to evaluate the effectiveness of OHSMS relies on both leading and lagging indicators, as well as continuous feedback and improvement cycles. To overcome the challenges in implementation, construction companies must foster a culture of safety that integrates all stakeholders and utilizes the latest technological tools to ensure a safer working environment.

Research discussion. The construction industry is characterized by its high-risk environment, where workers are exposed to numerous hazards such as falls, equipment accidents, and exposure to harmful substances. The adoption and evaluation of Occupational Health and Safety Management Systems (OHSMS) are critical steps toward reducing these risks and improving overall safety standards. This discussion synthesizes the findings of the literature review, highlighting key insights from existing research and offering a deeper analysis of the effectiveness of OHSMS in the construction industry. The research reviewed suggests that while Occupational Health and Safety Management Systems (OHSMS) have been widely adopted

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across the construction industry, their effectiveness remains variable. A significant proportion of construction firms report improvements in safety performance following the implementation of OHSMS, especially in terms of regulatory compliance and the systematic approach to hazard identification. However, these systems are not foolproof and require continuous efforts in order to maintain their effectiveness.

Figure 1. Health management and occupational health and safety

Several studies emphasize the importance of management commitment in ensuring the success of OHSMS. For instance, Lingard et al. (2019) found that leadership's active involvement in safety initiatives directly influences the engagement levels of workers, thereby improving the system's outcomes. This aligns with findings from Zou et al. (2020), who concluded that safety cultures led by committed and proactive management are more likely to reduce accidents and improve reporting systems. Conversely, lack of leadership or sporadic implementation has often been associated with failure in achieving meaningful safety improvements. This gap in commitment is particularly apparent in smaller firms or on less regulated project sites, where OHSMS may be perceived as mere compliance tools rather than as active drivers of safety culture. The variability in OHSMS effectiveness is often attributed to the challenges associated with their implementation and evaluation. Construction projects, with their transient workforce and diversity of subcontractors, present a significant challenge in maintaining a cohesive safety management system across all project sites. As noted by Tam et al. (2015), inconsistent safety practices, underreporting of incidents, and poor communication between contractors and subcontractors remain widespread issues that dilute the effectiveness of safety systems. Moreover, evaluating the true effectiveness of an OHSMS proves difficult, as traditional metrics

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like injury rates or fatalities are lagging indicators, which reflect only the outcome of past safety measures. As Kines et al. (2017) point out, while such metrics offer insights into the severity of safety problems, they do not reveal the proactive steps taken to prevent accidents. This highlights the need for leading indicators, such as safety audits, near-miss reports, and employee safety training, to be integrated into the evaluation process. Leading indicators provide a more dynamic and real-time reflection of how well the OHSMS is functioning, enabling companies to identify and address safety issues before they result in harm.

Another critical factor discussed in the literature is worker participation in safety management. Studies by Zhang and Xie (2018) and Zou et al. (2020) emphasize that worker involvement in safety committees, training sessions, and hazard identification processes significantly enhances the effectiveness of OHSMS. When workers feel they have a voice in safety-related decisions, they are more likely to engage in safe work practices and report potential hazards. The inclusion of employees in safety planning fosters a sense of ownership and accountability for workplace safety, contributing to the creation of a robust safety culture. However, despite its acknowledged importance, achieving meaningful worker engagement remains a challenge. Barriers such as a lack of trust in management, fear of reprisal for reporting unsafe conditions, and insufficient time allocated for safety discussions continue to hinder worker participation. For OHSMS to be truly effective, companies must not only provide training and resources but also create an environment where employees feel empowered to take active roles in safety initiatives without fear of consequences.

Recent literature points to the integration of technology as a promising avenue for enhancing the effectiveness of OHSMS. As discussed by Marcos et al. (2020), digital tools such as mobile safety apps, drones for site inspections, and AI-based predictive models for risk assessment are increasingly being incorporated into construction safety management practices. These technologies allow for real-time data collection, which facilitates timely identification of hazards and streamlines the reporting process. Technological innovations can significantly improve the accuracy and efficiency of risk assessments, enabling construction companies to monitor safety conditions more effectively. For example, drones equipped with cameras can conduct site inspections in hazardous areas, while AI algorithms can predict potential risks based on historical data, giving managers a proactive tool to address emerging safety concerns. Despite their potential, the adoption of these technologies requires significant investment and may face resistance due to a lack of familiarity or perceived complexity, particularly in smaller firms with limited resources.

The research also reveals a fundamental tension between regulatory compliance and the creation of a genuine safety culture. Many construction firms implement OHSMS primarily to meet legal requirements, rather than as a tool for fostering long-term cultural change. While compliance is essential, it is not a substitute for an ingrained safety culture that prioritizes worker health and safety beyond the minimum standards. The studies by Fernandez-Muniz et al. (2019) and Zhang and Xie (2018) suggest that OHSMS should not merely be a set of rules but should be integrated into the organization's core values and daily practices. In this context, the role of leadership is pivotal—not only in ensuring that legal standards are met but in promoting a culture where safety is perceived as everyone's responsibility, from the CEO to the construction worker. Without this cultural shift, OHSMS run the risk of being treated as a bureaucratic process rather than a meaningful safety intervention.

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Looking ahead, there is a growing consensus in the literature that OHSMS must evolve to meet the changing demands of the construction industry. Future OHSMS frameworks are expected to integrate data-driven decision-making, advanced risk assessment tools, and collaborative safety cultures that engage workers, managers, and external stakeholders. Moreover, there is a need for more rigorous evaluation frameworks that combine both leading and lagging indicators, allowing construction companies to monitor safety performance in real-time and make adjustments as needed. The integration of global safety standards, such as ISO 45001, alongside industry-specific guidelines, will likely improve consistency in safety management practices across different projects and regions. Additionally, as technology becomes increasingly accessible, even smaller construction firms may be able to leverage digital tools to enhance their safety practices and overcome traditional implementation barriers.

Conclusion. The construction industry is one of the most hazardous sectors globally, with a high incidence of workplace injuries and fatalities. Occupational Health and Safety Management Systems (OHSMS) have emerged as vital tools in mitigating these risks and improving safety standards. This study highlights that while OHSMS have led to improvement s in safety performance in many construction firms, their effectiveness varies significantly depending on a range of factors. These include strong management commitment, active worker participation, the integration of new technologies, and a focus on fostering a safety culture that transcends mere compliance with regulations. Leadership is crucial in driving safety initiatives and ensuring the allocation of necessary resources, while worker involvement plays an equally important role in identifying risks and promoting safe practices on-site. Despite the successes, the evaluation of OHSMS remains a challenge. Traditional lagging indicators, such as injury rates and fatalities, often fail to provide a comprehensive picture of safety performance. Thus, the adoption of leading indicators—such as near-miss reporting, safety audits, and training participation—can offer a more proactive measure of system effectiveness. Furthermore, advances in technology, such as mobile safety apps and AI-based risk prediction tools, hold promise for improving the accuracy and real-time monitoring of safety conditions on construction sites. The research suggests that while regulatory compliance remains an important aspect of OHSMS, the ultimate goal should be the establishment of a safety culture that prioritizes worker health and safety as a core value. By integrating OHSMS into the overall organizational culture and continuously evaluating their performance, construction companies can better manage risk, improve safety outcomes, and ensure the well-being of their workforce.

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