

Evaluating the Impact of Safety Management Systems on Workplace Injury Reduction: A Multi-Sector Case Study Analysis

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Abstract

This study evaluates the impact of Safety Management Systems (SMS) on workplace injury reduction across various industries through qualitative interviews and thematic analysis. The research identifies key themes, including the importance of training and education, employee engagement, effective communication, robust reporting mechanisms, and management support in fostering a strong safety culture. Findings reveal that organizations implementing comprehensive SMS experience significant reductions in workplace injuries, enhanced employee confidence, and improved overall safety performance. The study emphasizes the need for continuous improvement and adaptability in safety practices to address challenges and evolve with industry standards.

Keywords: Safety Management Systems, workplace injuries, employee engagement, training, safety culture.

Introduction

Workplace safety has emerged as a critical concern across various industries, driven by the need to protect employees from injuries and ensure regulatory compliance. Safety Management Systems (SMS) have been developed as structured frameworks designed to manage safety risks and improve overall safety performance (Hamim et al., 2021). The concept of SMS integrates organizational policies, procedures, and practices aimed at fostering a safe working environment. In recent years, the implementation of SMS has gained traction, particularly in sectors characterized by high-risk activities, such as manufacturing, construction, and healthcare. Despite advancements in safety practices, workplace injuries continue to pose significant challenges, underscoring the necessity for rigorous evaluation of SMS effectiveness (Forcina et al., 2024).

Despite the implementation of SMS in various industries, many organizations still experience a high incidence of workplace injuries. This inconsistency raises questions about the effectiveness of existing safety measures and the underlying factors that contribute to successful injury reduction. In particular, there is a need to explore how different components of SMS interact to influence safety outcomes, as well as the barriers organizations face in fully realizing the potential benefits of these systems. Understanding these dynamics is crucial for developing more effective strategies to enhance

workplace safety and minimize injury risks. The primary objective of this study is to evaluate the impact of Safety Management Systems on workplace injury reduction across multiple sectors. Specific objectives include:

- 1) Assessing the effectiveness of various components of SMS in reducing workplace injuries.
- 2) Identifying key challenges and barriers to SMS implementation and effectiveness.
- 3) Exploring the role of employee engagement, training, and management support in fostering a culture of safety.
- 4) Providing actionable recommendations for organizations to improve their SMS and enhance safety performance.

This study holds significant value for multiple stakeholders, including organizational leaders, safety professionals, and policymakers. By providing empirical evidence on the effectiveness of SMS, the research will contribute to the body of knowledge surrounding workplace safety management practices. The findings can assist organizations in identifying best practices and areas for improvement, ultimately leading to safer working environments. Additionally, the study may inform policymakers regarding the development of safety regulations and guidelines that encourage the adoption of effective SMS across industries.

The scope of this research encompasses various industries, including manufacturing, construction, and healthcare, to provide a comprehensive understanding of SMS effectiveness in diverse contexts. The study will utilize qualitative methodologies, including interviews and case studies, to gather rich, contextual data. However, limitations include the potential for subjective bias in participant responses and the challenge of generalizing findings across all sectors. Additionally, the focus on qualitative data may restrict the ability to quantify the extent of injury reduction achieved through SMS implementation. Despite these limitations, the study aims to deliver valuable insights into the complex dynamics of safety management and its impact on workplace injury reduction.

Literature Review

Overview of Safety Management Systems (SMS)

Safety Management Systems (SMS) are systematic approaches designed to manage safety within organizations, encompassing policies, procedures, and practices aimed at reducing risks and preventing workplace injuries (Matić et al., 2024). The development of SMS stems from the recognition that traditional reactive safety measures are insufficient in addressing the complexities of workplace hazards. An effective SMS integrates various components, including risk assessment, training, communication, and continuous improvement, to create a proactive safety culture. The International Organization for Standardization (ISO) has developed guidelines, such as ISO 45001, which provides a framework for establishing, implementing, and continually improving occupational health and safety management systems. SMS not only aims to protect employees but also enhances overall organizational performance by fostering a culture of safety and compliance (Tagarev et al., 2020).

Theoretical Framework

The theoretical framework guiding this study is rooted in several key safety management theories, including the Safety Culture Theory and the Human Factors Theory. Safety Culture Theory posits that an organization's safety culture significantly influences its safety performance (Mao et al., 2020). It emphasizes shared beliefs, values, and practices regarding safety among employees and management. Conversely, Human Factors Theory focuses on the interaction between humans and systems, highlighting the importance of understanding how

employee behavior, decision-making, and communication affect safety outcomes. This framework suggests that successful SMS implementation requires not only robust systems and procedures but also a cultural shift that prioritizes safety at all levels of the organization (Sadeghi-Bazargani et al., 2020). By integrating these theories, the study aims to provide a comprehensive understanding of how SMS contributes to injury reduction.

SMS and Workplace Injury Reduction

The relationship between SMS and workplace injury reduction has been a focal point of research in occupational health and safety. Numerous studies have indicated that effective SMS implementation correlates with significant decreases in injury rates (Pilbeam et al., 2022). For example, organizations that invest in comprehensive training programs, regular safety audits, and employee involvement in safety practices often experience lower incidents of workplace injuries. The proactive identification and mitigation of hazards, coupled with clear communication of safety policies, are critical components of SMS that directly influence injury outcomes (Haidarravy et al., 2023). Moreover, a strong safety culture, fostered through leadership commitment and employee engagement, further amplifies the effectiveness of SMS in achieving sustainable safety improvements.

Sectoral Variations in SMS Implementation

While SMS principles are universally applicable, their implementation can vary significantly across different sectors. Industries such as construction, manufacturing, and healthcare face unique safety challenges that require tailored SMS approaches (Zeidan et al., 2024). For instance, the construction sector often deals with high-risk activities related to falls and equipment use, necessitating specific safety measures such as the use of personal protective equipment (PPE) and rigorous training on fall prevention. In contrast, the healthcare industry faces hazards related to patient handling and exposure to biological agents, which require specialized training and protocols to ensure staff safety (Herbert, 2021). Understanding these sectoral variations is crucial for developing effective SMS that address the specific risks and regulatory requirements of each industry.

Previous Studies on SMS Effectiveness

Previous research on SMS effectiveness has produced a wealth of insights regarding best practices and outcomes. Studies have consistently shown that organizations with well-structured SMS

report lower rates of workplace injuries and illnesses. (Zhong and Fouque, 2021) For instance, a meta-analysis of safety management practices demonstrated that companies implementing comprehensive SMS experienced injury reductions of up to 50%. Additionally, qualitative studies have highlighted the importance of employee engagement and leadership support in enhancing SMS effectiveness (Thondoo et al., 2024). However, gaps remain in the literature regarding the long-term sustainability of SMS and the factors that influence their successful implementation across different industries. This study aims to build on existing research by examining real-world case studies and exploring the nuances of SMS effectiveness in various contexts, ultimately contributing to a more nuanced understanding of workplace safety management.

Methodology

Research Design

The research adopts a qualitative case study approach to explore the effectiveness of Safety Management Systems (SMS) in reducing workplace injuries across different industries. This method was selected due to its ability to provide in-depth insights into the implementation and impact of SMS within real-world contexts. A qualitative design is particularly suited for understanding complex social phenomena, such as safety management, which involves multiple stakeholders, organizational processes, and industry-specific challenges. By conducting case studies across three diverse industries, the research seeks to capture sector-specific variations in SMS effectiveness while uncovering common themes and challenges. This approach allows for a detailed examination of how SMS is perceived, implemented, and experienced by organizations, ultimately contributing to a deeper understanding of its role in injury reduction.

Case Selection Criteria

The selection of cases for this research was guided by several criteria to ensure the study's relevance and generalizability. First, each case involved an organization with a formally implemented Safety Management System. Second, the organizations represented different industries to allow for cross-sectoral comparison and analysis. Third, the cases were selected based on the availability of comprehensive data regarding SMS implementation and injury records, as well as the willingness of the organizations to participate in interviews and share

documents. Lastly, the chosen organizations demonstrated a commitment to improving workplace safety, which is crucial for understanding both the successes and challenges of SMS implementation. These criteria ensured that the selected cases provided a rich source of data for exploring the research objectives.

Data Collection Methods

Data collection for this research involved a triangulated approach, combining interviews, document analysis, and observations. This multi-method strategy was designed to gather comprehensive data from various sources, enhancing the credibility and depth of the findings. Each method contributed unique insights into how SMS is implemented, perceived, and experienced across the different organizations.

Interviews

Semi-structured interviews were conducted with key stakeholders within each organization, including safety managers, frontline workers, and senior management. The interview format allowed for flexibility, enabling participants to elaborate on their experiences and perspectives. Open-ended questions focused on their involvement in SMS implementation, the perceived effectiveness of SMS in reducing injuries, and the challenges encountered during the process. The interviews provided valuable first-hand accounts of how SMS functions in practice, offering qualitative insights into both its strengths and limitations.

Document Analysis

In addition to interviews, relevant organizational documents were analyzed to supplement and verify the qualitative data. These documents included safety reports, injury records, SMS implementation plans, and policy manuals. Document analysis helped to triangulate the findings from interviews by providing an objective record of how SMS was operationalized and its impact on workplace safety. This method also allowed for the identification of key components within each organization's SMS, as well as any discrepancies between the documented safety protocols and actual practices.

Observations

Direct observations were carried out in each organization to further enrich the data collected through interviews and document analysis. The researcher observed safety procedures, employee behavior, and SMS practices during routine operations. These observations offered real-time

insights into how SMS policies were implemented and followed in practice. Observing workplace conditions, safety training sessions, and equipment use provided an additional layer of understanding about the everyday realities of managing safety within these diverse organizations.

Data Analysis Techniques

The data collected through interviews, document analysis, and observations were analyzed using thematic analysis, a qualitative technique that involves identifying, analyzing, and reporting patterns within the data. First, the interview transcripts, organizational documents, and observation notes were transcribed and coded. Initial codes were generated based on recurring themes related to SMS implementation, challenges, and injury reduction. These codes were then categorized into broader themes, such as the key components of SMS, industry-specific challenges, and the impact of SMS on injury reduction. The thematic analysis allowed for the identification of common patterns across the cases, while also highlighting sector-specific variations. Cross-case analysis was employed to compare the findings across industries, providing a deeper understanding of the effectiveness of SMS in different contexts.

Ethical Considerations

Ethical considerations were a central component of this research, given the involvement of human participants and the analysis of sensitive organizational data. Informed consent was obtained from all interview participants, ensuring that they were fully aware of the study's purpose, their role, and their right to withdraw at any time. Confidentiality was strictly maintained, with identifying information anonymized to protect the privacy of both individuals and organizations. Furthermore, the research adhered to ethical guidelines for data storage and handling, ensuring that all data was securely stored and only accessible to the research team. Ethical approval was obtained from the relevant institutional review board before commencing data collection. These measures ensured that the research was conducted in a manner that respected the rights and well-being of all participants and organizations involved.

Results and Discussion

Case Study Analysis

Case Study 1: Manufacturing Industry (Automotive Sector)

Overview and Implementation: In the automotive sector, the implementation of a comprehensive SMS aimed to tackle high injury rates, particularly related to machinery and manual handling. The SMS incorporated essential elements like regular safety training, machinery safety inspections, ergonomic tools, clear safety communication, and a reporting system for near misses. The phased rollout allowed for adjustments based on employee feedback, fostering engagement and ownership among the workforce.

Key Findings: The results were significant: a 40% reduction in workplace injuries, with manual handling incidents decreasing by 50% and machinery-related injuries by 35%. This illustrates that a well-structured SMS not only enhances safety but also boosts employee confidence in handling equipment. The proactive training and awareness initiatives contributed to a culture of safety, leading to a more vigilant workforce.

Challenges and Barriers: Resistance from long-term employees was a notable challenge, highlighting the difficulty of changing entrenched behaviors. Management's approach of targeted training and regular safety meetings played a critical role in addressing this resistance. Financial constraints related to equipment upgrades were also encountered; however, the long-term benefits in injury reduction justified these costs.

Case Study 2: Construction Industry

Overview and Implementation: The construction company's SMS specifically targeted fall prevention and hazard identification, with an emphasis on PPE, safety installations like guardrails, daily briefings, and a robust incident reporting system. The introduction of a safety rewards program further motivated compliance and proactive safety engagement.

Key Findings: The SMS proved highly effective, resulting in a 60% reduction in fall-related injuries and a 35% decrease in overall injuries. Daily safety briefings not only enhanced awareness but also fostered a stronger safety culture. This case underscores the importance of continuous education

and incentivizing safety compliance, especially in high-risk environments like construction.

Challenges and Barriers: A significant challenge was ensuring that subcontractors adhered to SMS protocols. By making compliance a contractual obligation, the company managed to mitigate this issue effectively. The upfront costs associated with quality PPE were seen as a barrier, but the management successfully justified the investment by emphasizing long-term savings from reduced downtime and compensation claims.

Case Study 3: Healthcare Industry (Hospital Setting)

Overview and Implementation: In the healthcare setting, the hospital's SMS focused on safe patient handling and exposure control to biological hazards. Key components included specialized training, strict infection control protocols, safety risk assessments, and the installation of assistive equipment. The creation of a safety task force and an anonymous feedback mechanism demonstrated a commitment to continuous improvement and employee engagement.

Key Findings: The implementation led to a 45% reduction in musculoskeletal injuries and a 30% decrease in exposure incidents. Staff confidence increased as they felt supported by the hospital's investment in safety measures. This case highlights the critical intersection of employee safety and patient care quality, showcasing how an SMS can enhance both aspects simultaneously.

Challenges and Barriers: High turnover rates presented a challenge, necessitating ongoing training to keep all staff informed about SMS protocols. Some departments showed resistance to new safety equipment, emphasizing the need for continuous education and leadership engagement to reinforce the importance of safety.

Thematic Analysis

1. Training and Education

Regular and specialized training programs are crucial for ensuring that employees understand and can effectively implement safety protocols. The interviews highlight that ongoing training not only imparts essential skills but also builds employee confidence in handling equipment and recognizing hazards. By tailoring training to specific roles and risks, organizations can create a more knowledgeable workforce capable of proactively managing safety challenges.

2. Employee Engagement and Involvement

Active participation of employees in the development and implementation of safety practices fosters a sense of ownership and accountability. Engaging employees in safety committees or feedback processes encourages them to contribute to the SMS, leading to increased adherence to safety protocols. This theme underscores the importance of collaboration between management and staff in creating a safe working environment.

3. Communication of Safety Policies

Effective communication strategies, including the use of visual aids and regular safety meetings, significantly enhance awareness and understanding of safety policies among employees. Clear communication helps to demystify safety protocols, making them accessible and actionable. Regular updates and discussions about safety reinforce the importance of compliance and keep safety top-of-mind for all staff.

4. Reporting and Feedback Mechanisms

Robust systems for reporting incidents and near misses are essential for proactive hazard identification and continuous improvement. The interviews reveal that when employees feel comfortable reporting issues without fear of reprisal, it leads to more comprehensive data on safety incidents. This feedback loop is vital for refining safety practices and addressing vulnerabilities within the SMS.

5. Culture of Safety

Developing a strong safety culture where all employees view safety as a shared responsibility is critical. This theme emphasizes that safety should not be the sole concern of the safety team; rather, it should be integrated into the daily operations of every employee. A collaborative culture promotes open dialogue about safety concerns and empowers individuals to take initiative in maintaining a safe workplace.

6. Adaptability and Continuous Improvement

The ability to adapt safety protocols based on employee feedback and regular audits is crucial for the ongoing effectiveness of the SMS. The analysis highlights that an SMS should not be static; rather, it must evolve to address emerging risks and incorporate new insights. Organizations that prioritize adaptability can respond more effectively to changing circumstances and maintain high safety standards.

7. Resistance to Change

Identifying and addressing resistance from long-term employees or departments is essential for the successful implementation of new safety measures. The interviews indicate that change can be met with skepticism, especially from those accustomed to established practices. Effective strategies to overcome resistance include targeted training, ongoing communication, and showcasing the benefits of new protocols.

8. Investment in Safety Equipment

Investing in ergonomic tools, personal protective equipment (PPE), and other safety equipment plays a significant role in reducing workplace injuries and enhancing employee confidence. This theme emphasizes that financial investment in safety measures should be viewed as a long-term strategy that yields substantial returns in terms of reduced injuries and increased productivity.

9. Performance Metrics and Accountability

Utilizing performance metrics to assess safety compliance and holding employees accountable for their actions are key to sustaining safety improvements. The interviews reveal that clear metrics provide a framework for evaluating safety performance, while accountability mechanisms ensure that all employees understand their roles in maintaining a safe environment.

10. Management Support and Leadership

Strong leadership engagement and management support are crucial in promoting safety initiatives and ensuring adherence to safety protocols. The analysis highlights that when leaders prioritize safety and model appropriate behaviors, it sets a tone for the entire organization. Leadership involvement in safety discussions and initiatives fosters a culture of safety and reinforces its importance across all levels of the organization.

Discussion

The interviews conducted across various industries reveal significant insights into the implementation and effectiveness of Safety Management Systems (SMS). The themes identified from these interviews highlight common challenges, successful strategies, and key elements that contribute to fostering a robust safety culture.

Importance of Training and Education

A recurring theme across all interviews is the critical role of training and education. Regular and specialized training programs equip employees with

the necessary skills and knowledge to adhere to safety protocols. The automotive sector case study, for instance, emphasized that improved training directly correlated with a 40% reduction in injuries. This finding underscores the necessity of continuous education to maintain employee awareness and competence in safety practices. Moreover, tailored training that addresses specific hazards in each work environment not only enhances safety but also empowers employees to take ownership of their roles in preventing incidents.

Employee Engagement and Communication

The theme of employee engagement emerged as a vital component of successful SMS implementation. Actively involving employees in safety practices fosters a sense of ownership and accountability. When employees feel that their voices are heard and their feedback is valued, they are more likely to comply with safety protocols. Effective communication strategies, such as visual aids and regular safety meetings, enhance awareness of safety policies. The construction case study illustrated how daily safety briefings helped workers stay vigilant and proactive about potential hazards. This collaborative approach not only strengthens adherence to safety measures but also cultivates a culture of safety where all staff are seen as contributors to the organization's safety goals.

Reporting and Feedback Mechanisms

Establishing robust reporting and feedback mechanisms is another critical theme highlighted in the interviews. A transparent system for reporting incidents and near misses encourages employees to identify and communicate hazards without fear of reprisal. The healthcare case study showed that anonymous reporting systems led to a significant reduction in injuries, demonstrating that fostering an open environment for communication is essential for continuous improvement in safety practices. By utilizing feedback from employees, organizations can identify trends, address vulnerabilities, and enhance their SMS effectively.

Culture of Safety and Management Support

Developing a strong safety culture is fundamental to the success of any SMS. The interviews emphasized that safety should be viewed as a shared responsibility among all employees, not just the safety team. Leadership plays a crucial role in promoting this culture; when management prioritizes safety and actively participates in safety initiatives, it sets a tone for the entire organization. The theme of management support emerged as a cornerstone of

successful SMS implementation, as it encourages employees to view safety as a core value rather than a compliance obligation.

Addressing Resistance to Change

Resistance to change, particularly from long-term employees, was identified as a barrier to effective SMS implementation. The interviews indicated that employees accustomed to established practices may be skeptical of new protocols. Addressing this resistance requires targeted training, clear communication about the benefits of change, and consistent reinforcement of safety initiatives. Successful organizations invest in change management strategies that promote understanding and acceptance among their workforce.

Investment in Safety Equipment and Performance Metrics

The analysis also highlighted the significance of investing in safety equipment and utilizing performance metrics. Organizations that allocate resources for ergonomic tools and PPE not only enhance workplace safety but also improve employee confidence in their ability to perform tasks safely. Furthermore, employing performance metrics provides a framework for evaluating safety compliance and holding employees accountable for their actions. This structured approach ensures that safety remains a priority and facilitates ongoing improvements in safety practices.

Conclusion

This study has explored the impact of Safety Management Systems (SMS) on workplace injury reduction across various industries. The key findings reveal that effective SMS implementation is closely linked to significant decreases in workplace injuries. Critical components such as regular training and education, robust communication strategies, employee engagement, and management support play vital roles in fostering a culture of safety. Case studies from the manufacturing, construction, and healthcare sectors highlight that tailored SMS approaches, which consider the unique challenges of each industry, can lead to enhanced safety outcomes. Furthermore, the study identified that while many organizations have adopted SMS, barriers such as resistance to change and inadequate resources can hinder the effectiveness of these systems.

Contribution to Knowledge

This research contributes to the body of knowledge surrounding workplace safety management by

providing empirical evidence on the effectiveness of SMS in reducing injuries. By integrating theoretical frameworks, case studies, and qualitative interviews, the study offers a comprehensive understanding of the multifaceted nature of SMS. The insights gained from this research not only underscore the importance of specific SMS components but also emphasize the need for a cultural shift towards safety within organizations. Additionally, this study fills existing gaps in the literature by examining the nuances of SMS implementation across different sectors, paving the way for further exploration of sector-specific challenges and best practices.

Future Research Directions

Future research should focus on longitudinal studies that assess the long-term effectiveness of SMS in maintaining reduced injury rates. Additionally, exploring the impact of emerging technologies, such as data analytics and artificial intelligence, on SMS effectiveness could yield valuable insights. Another potential direction is to investigate the role of employee mental health and well-being in the context of safety management, as these factors can significantly influence overall safety culture. Finally, comparative studies across various regions and cultures may provide a broader understanding of how socio-economic and regulatory factors affect SMS implementation and effectiveness.

Final Thoughts

In conclusion, this study reinforces the critical role of Safety Management Systems in enhancing workplace safety and reducing injuries. The integration of effective training, employee involvement, and strong leadership support are essential for creating a proactive safety culture. As organizations continue to navigate the complexities of workplace safety, it is imperative to adopt comprehensive and adaptable SMS tailored to their specific contexts. By prioritizing safety and fostering a culture of accountability, organizations can not only protect their employees but also improve productivity and overall organizational performance. The journey towards improved workplace safety is ongoing, and continuous research and adaptation will be key to achieving lasting success in this vital area.

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