

Safe Culture, Safe Workers: Analyzing the Link Between Safety Management Practices and Operators Safety Performance in a Manufacturing Plant

Muhamad Nur Haziq Salim¹, Shah Rollah Abdul Wahab², Irza Hanie Abu Samah², Nur Syafiqah A. Rahim², Song Mi-Ja³, Yong Jin Nho⁴

¹Venture Corporation Limited, 81400 Senai, Johor Malaysia

²School of Human Resource Development and Psychology, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

³Department of Industrial and Information System Engineering, Seoul National University of Science and Technology, Seoul 01811, The Republic of Korea

⁴Department of Business Administration, Seoul National University of Science and Technology, Seoul 01811, The Republic of Korea

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ABSTRACT

This study examines the relationship between safety management practices and safety performance among operators at a manufacturing company located at the southern region of Malaysia. The manufacturing industry is one of the highest contributors to occupational accidents and injuries in Malaysia. Therefore, understanding the effectiveness of safety management practices is essential for reducing workplace hazards. This research adopts a quantitative approach, utilizing a structured self-administered questionnaire to collect data from 350 operators. The questionnaire assessed safety management practices that consist of six dimensions (35 items), including management commitment, safety training, safety communication, and safety rules and procedures. Safety performance was measured four dimensions (24 items), focusing on indicators such as safety knowledge, safety motivation, safety compliance and safety participation. The scales used were adapted from Vinodkumar and Bhasi (2010). The findings revealed that there is a significant positive relationship between safety management practices and safety performance underscores the importance of robust safety management practices in fostering a safer workplace. Despite these positive findings, the study acknowledges certain limitations, including the cross-sectional nature of the research and the reliance on self-reported data, which may introduce bias. The paper concludes by recommending that organizations integrate safety management practices more thoroughly into their operational strategies to achieve long-term safety performance improvements.

Keywords: Safety Management Practices, Safety Performance, Operator.

INTRODUCTION

Safety management practices are essential for minimizing risks and protecting workers' well-being, particularly in high-risk environments such as the manufacturing industry. These practices include a range of initiatives, such as the implementation of safety policies, regular safety training sessions, use of personal protective equipment (PPE), hazard identification and control, and fostering a safety-conscious culture within the workplace (Goh Pui Teck *et al.*, 2015). Effective safety management relies not only on the adoption of these practices but also on consistent enforcement and monitoring. Research indicates that organizations with strong safety management systems experience reduced incidents of workplace accidents, fewer lost workdays, and higher levels of employee satisfaction and engagement (Otitolaiye *et al.*, 2021). However, despite the increasing emphasis on safety management practices, many manufacturing organizations face challenges such as insufficient resources, inadequate safety training, and poor safety communication (Kassim *et al.*, 2021). These challenges may hinder

the full implementation of safety initiatives and compromise the effectiveness of safety management practices in reducing workplace hazards.

One of the key outcomes used to measure the effectiveness of safety management practices is safety performance, which encompasses the frequency and severity of accidents, near misses, and occupational injuries (Mohammadfam *et al.*, 2016). Safety performance is widely recognized as a critical indicator of an organization's safety culture and its commitment to employee well-being. High safety performance reflects fewer workplace accidents, greater compliance with safety regulations, and enhanced operational efficiency (Sajithkumar, 2023). In Malaysia, the manufacturing sector remains one of the highest contributors to workplace injuries, with alarming figures reported by the Department of Occupational Safety and Health (DOSH). In 2023 alone, there were 4,181 reported workplace injuries and 45 fatalities, representing a 2.6% increase in injuries compared to the 4,073 injuries recorded from January to October 2022, while fatalities decreased by 16.7% from 54 in 2022 to 45 in 2023 (Department of Occupational Safety and Health, 2022; Department of Occupational Safety and Health, 2023). This persistent trend underscores the importance of evaluating and enhancing safety performance as a key objective for organizations, especially in high-risk sectors like manufacturing.

There is a direct relationship between safety management practices and safety performance, as the former lays the foundation for improving the latter (Razali *et al.*, 2018). However, despite the establishment of regulatory frameworks like the Occupational Safety and Health Act 1994 (OSHA), the manufacturing industry continues to grapple with poor safety performance. Factors such as insufficient management commitment, lack of worker involvement in safety initiatives, and inconsistent enforcement of safety regulations have been identified as major barriers to improving safety performance (Sarjudin, 2024). Additionally, the occurrence of high-profile accidents, such as incidents involving major industrial fires, equipment failures, or hazardous material spills across various sectors, indicates a gap between the safety measures in place and their practical application (Department of Occupational Safety and Health, 2023). As such, there is a need to explore the underlying issues that contribute to this gap and examine the specific aspects of safety management practices that can lead to enhanced safety performance. The ongoing challenges in achieving safer workplaces, despite existing safety regulations, indicate a critical problem that needs to be addressed through further investigation into the relationship between safety management practices and safety performance.

Therefore, this study aims to investigate the possible relationship between safety management practices and safety performance among operators at a manufacturing company located at the southern region of Malaysia..

LITERATURE REVIEW

The First Line of Defense: Unpacking Safety Management Practices

Safety management practices represent a structured and systematic approach that organizations adopt to identify, assess, and mitigate workplace hazards. These practices aim to safeguard the health and well-being of employees while ensuring the organization's compliance with occupational safety and health regulations (Subramaniam *et al.*, 2016). At their core, safety management practices are designed to minimize workplace accidents, injuries, and occupational illnesses through proactive measures that emphasize prevention rather than reaction (Saleem & Malik, 2022). Beyond compliance, these practices help organizations maintain operational continuity, protect their reputation, and demonstrate corporate responsibility toward employee welfare. They also contribute to building trust and engagement among employees by ensuring their safety is a top priority, ultimately fostering a workplace culture rooted in accountability and care.

Historically, the concept of safety management practices emerged as a response to the increasing frequency and severity of industrial accidents in the early 20th century (Karanikas *et al.*, 2021). These incidents led to heightened awareness of workplace safety issues and the introduction of occupational safety legislation, which laid the foundation for modern safety management systems (Ajmal *et al.*, 2022). Over time, organizations began shifting their focus from reactive measures, which involve responding to accidents after they occurred, to preventive strategies aimed at eliminating hazards before they pose risks (Obloh *et al.*, 2023). This evolution has resulted in a holistic approach that integrates safety into all organizational processes, promoting continuous

improvement and accountability at every level. Today, safety management practices are recognized as critical to achieving operational excellence, enhancing employee trust, and maintaining organizational sustainability.

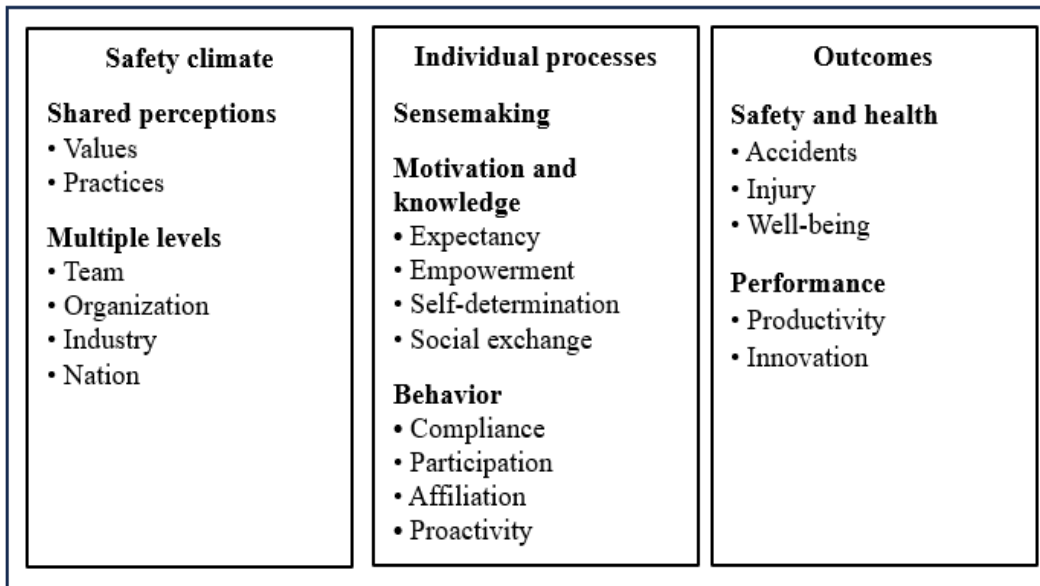


Figure 1: Overview of Safety Climate Theory (Source: Griffin & Curcuruto, 2016: 193)

Figure 1 show that the theoretical foundation for safety management practices is largely derived from Safety Climate Theory, which explores how employees' shared perceptions of organizational safety efforts influence their behavior and attitudes toward safety (Griffin & Curcuruto, 2016). This theory posits that organizations with well-established safety management practices create a positive safety climate, where employees recognize safety as a priority and align their actions accordingly (Luo, 2020). When safety management practices are consistently applied, they reinforce the safety culture, promoting proactive safety behaviors that help reduce workplace incidents. As study have shown, a strong safety climate, driven by clear communication and active management commitment to safety, leads to better safety outcomes and improved organizational performance (Schwatka *et al.*, 2016).

Effective safety management practices can be broken down into several key dimensions: management commitment, safety training, worker involvement, safety communication, and safety rules and procedures (Vinodkumar & Bhasi, 2010). Management commitment reflects the active support of safety initiatives by leadership, while safety training equips workers with the skills necessary to identify and mitigate risks (Razali *et al.*, 2018; Bayram, 2019). Worker involvement emphasizes employee participation in safety decision-making, enhancing engagement and ownership of safety practices (Kinyanjui Njogu *et al.*, 2019). Safety communication ensures that safety-related information is shared effectively, and safety rules and procedures provide clear guidelines for safe work practices (Berliana *et al.*, 2022). These dimensions work together to create a comprehensive safety management framework, leading to improved safety performance and reduced workplace accidents.

Effective safety management practices serve as the foundation for enhancing safety performance within organizations (Subramaniam *et al.*, 2016). By implementing structured safety guidelines, fostering a culture of safety, and ensuring active involvement from both management and employees, organizations can create an environment where safety performance thrives (Radu, 2023). The alignment of robust safety practices with key dimensions of safety performance, such as safety knowledge, compliance, and participation, underscores the direct relationship that comprehensive safety management has on reducing workplace incidents and improving overall safety outcomes.

Safety Performance: Beyond Lagging Indicators

Safety performance refers to the extent to which safety-related actions, behaviors, and outcomes align with the goal of maintaining a secure and hazard-free work environment (Ooshaksaraie & Azadehdell, 2014). It encompasses the proactive measures taken by individuals and organizations to reduce workplace accidents,

injuries, and illnesses. At its core, safety performance is not limited to compliance with regulations but extends to fostering a culture where safety is an integral part of daily operations. This includes evaluating how effectively employees follow safety protocols, participate in safety initiatives, and exhibit behaviors that promote a safe working environment. High levels of safety performance reflect an organization's commitment to employee well-being and its ability to adapt and improve safety practices in response to emerging risks (Vinodkumar & Bhasi, 2010).

Over time, the concept of safety performance has evolved from merely tracking accident metrics to incorporating a broader perspective that includes human factors and behavioral components. While accident rates and injury logs provide quantitative insights into safety outcomes (Vinodkumar & Bhasi, 2010), modern approaches emphasize the psychological and social elements that influence safety behaviors, such as employee attitudes, communication, and collaboration (Cooper, 2015; Curcuruto *et al.*, 2015; Rodriguez *et al.*, 2017). Organizations increasingly recognize that enhancing safety performance is not just about avoiding incidents but also about creating a positive work environment that values and prioritizes safety. This shift underscores the importance of safety performance as a critical factor in improving employee morale, fostering trust, and ensuring organizational resilience against safety challenges (Naji *et al.*, 2021; Kassim *et al.*, 2021).

The Swiss Cheese Model, introduced by James Reason (1990), provides a theoretical framework for understanding safety performance in organizations. Figure 2 illustrates how various layers of safety measures can fail when their weaknesses align, resulting in accidents (Reason, 2000). Each layer represents a defense mechanism against potential failures, while the "holes" symbolize vulnerabilities that, when aligned, can lead to catastrophic outcomes. The model distinguishes between active failures, which are immediate unsafe acts that contribute to incidents, and latent conditions, which are underlying factors that may not surface until they coincide with active failures (Khan *et al.*, 2021). This dual focus on both immediate actions and systemic issues is essential for organizations aiming to cultivate effective safety management practices and improve overall safety performance (Ledic Neto *et al.*, 2024). By recognizing and addressing both active and latent failures, organizations can develop more robust safety protocols that minimize risk and enhance overall safety performance.

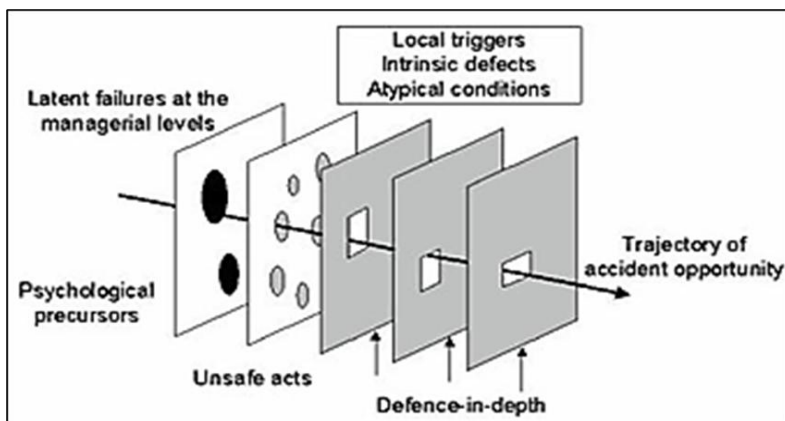


Figure 2: Swiss Cheese Model (Source: Larouzée & Guarnieri, 2015: 6)

Safety performance encompasses four key dimensions: safety knowledge, safety motivation, safety compliance, and safety participation, which collectively define an organization's approach to maintaining workplace safety. Safety knowledge serves as the foundation, equipping employees with the understanding of protocols and hazards needed to identify and mitigate risks effectively (Kao *et al.*, 2019). Safety motivation drives employees to internalize safety objectives, enhancing their willingness to engage in safe behaviors and prioritize safety in daily tasks (Mariani *et al.*, 2015). Safety compliance represents the adherence to established protocols, ensuring regulatory standards are met, while safety participation reflects proactive involvement in safety initiatives and collaborative efforts to foster a safety-conscious culture (Obiekwe *et al.*, 2019). Together, these dimensions interact dynamically, emphasizing that effective safety performance requires not only compliance but also active employee engagement and motivation, creating a resilient and safety-oriented organizational environment. Hence, this overview of safety management practices provides the foundation for understanding their relationship on safety performance, a critical aspect in achieving positive safety outcomes.

Connecting Control and Compliance: How Safety Management System Shape Employees' Safety Performance

Empirical studies have extensively explored the relationship between safety management practices and safety performance across various industries, consistently demonstrating that effective safety management practices implementation is crucial for achieving positive safety outcomes. For example, Razali *et al.* (2018) conducted a study in the Malaysian port industry and found a strong positive relationship between management commitment, safety training, and worker involvement with enhanced safety performance. Their findings indicated that organizations with higher levels of management commitment to safety experienced fewer workplace accidents and improved safety compliance among employees. Similarly, Ajmal *et al.* (2021) investigated the impact of safety management practices in high-risk industries such as oil and gas. The study highlighted that safety training and safety communication were pivotal in reducing incident rates and promoting safety participation among workers. In addition, the research revealed that worker involvement, when combined with effective safety communication, led to a more proactive safety culture, ultimately enhancing overall safety performance.

In the context of the Chinese mining sector, Lu *et al.* (2020) examined how specific safety management practices influenced safety performance outcomes. The study demonstrated that management's active participation in safety initiatives, regular safety training, and clear communication of safety procedures were significantly correlated with reduced accident rates. The research emphasized that management commitment, as a key component of safety management practices, not only improved compliance but also motivated employees to engage in safer work practices. The construction industry also provides valuable insights into the relationship between safety management practices and safety outcomes. Nguyen and Vu (2023) explored the role of safety management practices in improving safety performance, specifically focusing on safety training and safety rules and procedures. Their findings suggested that safety training contributed to a greater understanding of safety procedures, while structured safety rules reinforced compliance and created a disciplined safety environment. These results indicate that comprehensive safety management practices are essential for maintaining high safety performance in complex and hazardous environments.

Other than that, Kassim *et al.* (2021) studied the impact of safety management practices in the Malaysian manufacturing sector and found that while management commitment and safety training had a significant positive relationship on safety performance, the effect of safety communication was moderate. This suggests that the influence of specific safety management practices may vary depending on the organizational context and the way these practices are implemented. Factors such as employee attitudes, organizational culture, and consistency in safety protocols can significantly affect the effectiveness of safety management practices. Additionally, a study by Abdul Rahim *et al.* (2023) explored how the integration of safety management practices, safety culture, and safety performance interacted in the manufacturing sector. Their findings indicated that the presence of a positive safety culture mediated the relationship between safety management practices and safety performance, suggesting that the successful implementation of safety management practices is highly dependent on the broader organizational culture. This highlights the complexity of the relationship and the need for organizations to adopt a holistic approach that not only focuses on implementing safety management practices but also cultivates a safety-oriented mindset among employees.

Overall, empirical evidence from various industries consistently supports the positive relationship between safety management practices and safety performance. When implemented systematically, safety management practices such as management commitment, safety training, safety communication, and worker involvement contribute to improved safety outcomes, reduced accident rates, and the establishment of a strong safety culture within organizations. However, while numerous studies have examined this relationship in global contexts (e.g., Razali *et al.*, 2018; Ajmal *et al.*, 2021; Lu *et al.*, 2020), there is limited research focusing specifically on the manufacturing sector located at the southern region of Malaysia. or Malaysia more broadly. Given the unique operational challenges, regulatory frameworks, and cultural factors in this setting, it is critical to explore how safety management practices influence safety performance within this specific context. This study, therefore, seeks to fill this gap by examining the relationship between these variables located at the southern region of Malaysia's manufacturing industry, providing insights that are both locally relevant and practically significant for enhancing workplace safety in the region. To guide this research, the following hypothesis is proposed:

H¹: There is a relationship between safety management practices and safety performance among operators in a manufacturing company located at the southern region of Malaysia.

This study examines the relationship between safety management practices and safety performance, particularly within the manufacturing industry in Malaysia, where occupational injuries remain prevalent. Despite the regulatory framework provided by OSHA (1994), gaps in literature persist regarding the relationship of safety management practices on safety performance in this sector. Figure 3 illustrates the research framework, which identifies safety management practices as the independent variable. Safety management practices encompass key dimensions such as management commitment, safety training, worker involvement, communication, safety rules, and promotion policies. These practices are anticipated to influence safety performance, which serves as the dependent variable. Safety performance is measured through safety knowledge, safety motivation, safety compliance, and safety participation. Figure 3 provides a visual representation of this relationship, outlining how the dimensions of safety management practices will correlate to safety performance. The goal is to shed light on how improved safety management practices can enhance safety performance. This improvement is expected to contribute to a safer workplace and reduce occupational injury rates.



Figure 3: Conceptual Framework

RESEARCH METHODOLOGY

This study employed a quantitative research design to investigate the relationship between safety management practices and safety performance among operators at a manufacturing company located at the southern region of Malaysia.. A cross-sectional survey method was adopted, as it allows for the collection of data at a single point in time, enabling the assessment of relationships between variables without manipulating any conditions. The study targeted operators working in a manufacturing company located at the southern region of Malaysia. with the population of 3,500 operators, using a probability sampling method to ensure that each member of the population had an equal chance of being selected. Although the suitable sample size for this study was initially calculated as 346 employees, 350 questionnaires were distributed to minimize sampling errors and account for potential non-responses (Cochran, 1977). Of these, about 339 valid responses were received, yielding a high response rate of approximately 97.4%. The safety management practices variable was measured by the Safety Management Practices Scale from Vinodkumar and Bhasi (2010). There are 35 items of six dimensions named management commitment, safety training, workers' involvement, safety communication and feedback, safety rules and procedures, and safety promotion policies measured in this section using the 5-point Likert scale (1-strongly disagree, 2-disagree, 3-natural, 4-agree, 5-strongly agree). The Cronbach's alpha value for this variable is 0.865 indicating very strong reliability.

The Safety Performance Scale developed by Vinodkumar and Bhasi (2010) was used to measure the safety performance variable. This instrument comprises four dimensions which are safety knowledge, safety motivation, safety compliance, and safety involvement. The section contained a total of 24 items. All items were measured using a 5-point Likert scale (1- strongly disagree, 2-disagree, 3-natural, 4-agree, 5-strongly agree). This variable recorded a value of Cronbach's alpha 0.734 indicating that the items have high reliability. The collected data were analyzed using Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics such as mean scores and standard deviations were computed to summarize the characteristics of the sample and the distribution of responses. Correlation analysis was conducted to examine the strength and direction of relationships between safety management practices and safety performance indicators.

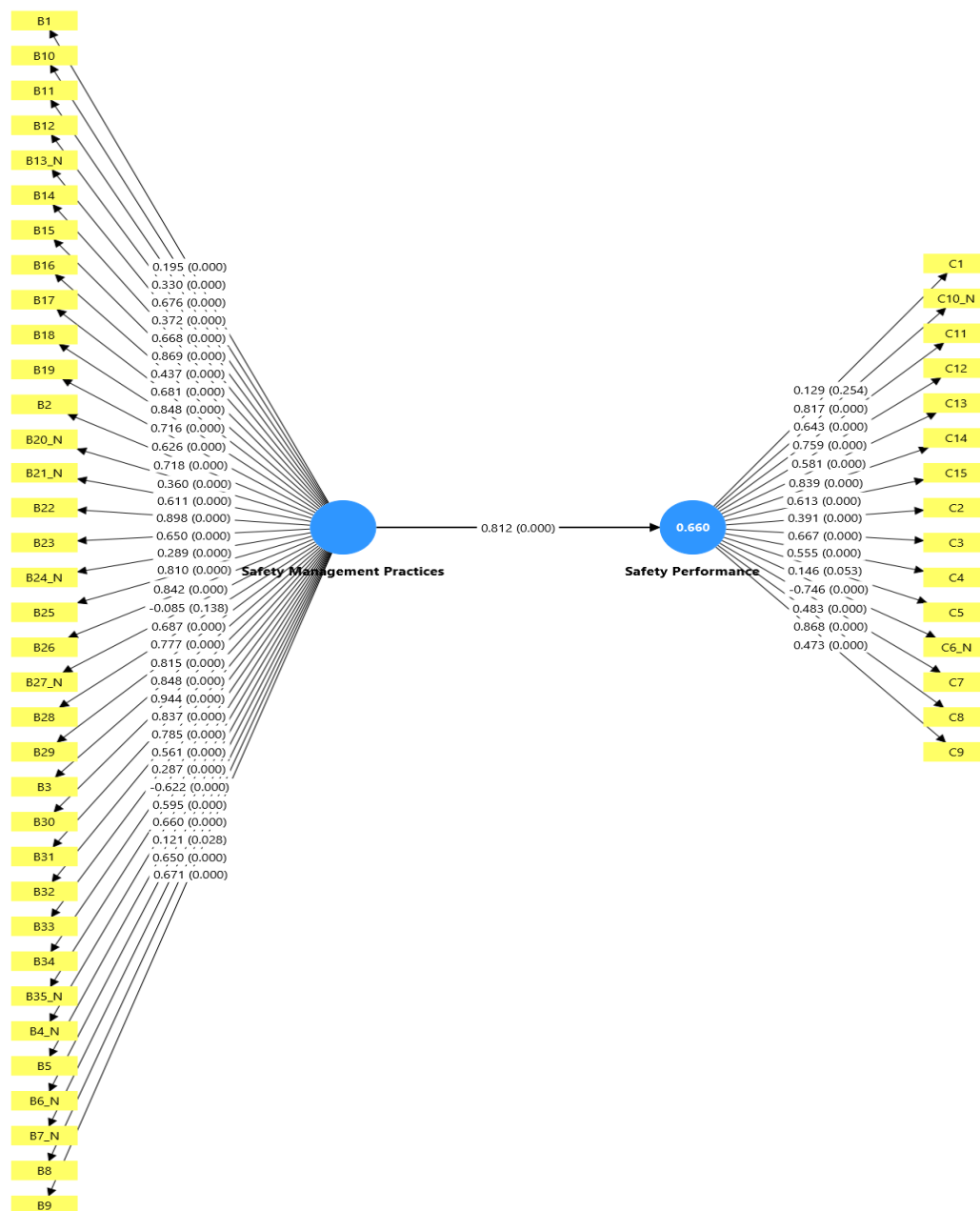
FINDINGS AND DISCUSSION

Data analysis for this study was conducted using SPSS version 23.0 and SmartPLS version 4.0.9.5. Specifically, SmartPLS was utilized to perform partial least squares structural equation modeling (PLS-SEM) due to its ability to simultaneously evaluate all constructs within the model (Thaker et al., 2020). As highlighted by Haenlein and

Kaplan (2004), structural equation modeling represents a second-generation multivariate analysis technique widely applied in social science research to test linear and complex causal models. Table 1 and Figure 1 present the structural model assessing the impact of safety management practices on safety performance. Evaluated against the guidelines outlined by Ramayah et al. (2018), the resulting coefficient of determination (R^2) of 0.660 confirms that safety management practices account for 66% of the variance in safety performance. Furthermore, a statistically significant relationship was established ($t = 56.891$), while the path coefficient ($\beta = 0.812$) confirms a strong positive effect. This positive relationship indicates that higher implementation of safety management practices within the organization directly enhances safety performance among the studied population, thereby supporting the study's hypothesis.

Table 1: Summary Of Analysis Findings on the Effect of Safety Management Practices on Safety Performance

Hypothesis	Relationship	Path Coefficient	Standard Error	t-value	Decision	R ²
H1	Safety Management Practices → Safety Performance	0.812	0.014	56.891	Accept	0.660



B = Safety Management Practices, C = Safety Performance

Figure 1: Analysis of the Model to Measure the Effect of Safety Management Practices on Safety Performance

Consistent with the study's hypotheses, the Pearson correlation analysis revealed a significant positive relationship between safety management practices and safety performance, indicating that enhanced safety practices are closely associated with improved safety outcomes among operators. This finding aligns with Au Yong *et al.* (2020), who emphasizes the critical role of robust safety management practices in enhancing safety outcomes. These practices fostered an organizational culture that prioritized safety, leading to higher compliance rates among employees. Additionally, the results corroborate the work of Hofmann *et al.* (2017) and Berliana *et al.* (2022), highlighting the importance of effective safety management practices such as management commitment, safety training, and promotion in fostering a safety-conscious environment. Hofmann *et al.* (2017) found that when management demonstrates a visible commitment to safety, through actions such as participating in safety audits and allocating resources for safety initiatives, employees are more likely to embrace safety behaviors and comply with safety protocols.

Similarly, Berliana *et al.* (2022) reinforced the idea that safety training equips employees with the necessary knowledge and skills to handle risks effectively, while safety promotion activities such as safety campaigns and recognition of safe behaviors motivate employees to engage in and prioritize safety practices. Management commitment is particularly crucial when management visibly dedicates itself to safety initiatives, employees are more likely to comply with safety regulations, which enhances overall safety performance. The study also aligns with Vinodkumar and Bhasi (2010), indicating that strong safety management practices are associated with elevated levels of safety motivation and participation, even though safety compliance was rated at a moderate level. Their findings revealed that organizations implementing robust safety protocols, consistent safety training, and visible management support tend to create an environment where employees feel motivated to adhere to safety standards and voluntarily participate in safety-related activities, such as hazard reporting and safety committee involvement.

In conclusion, the findings underscore the significant positive relationship between safety management practices and safety performance among operators in the manufacturing industry. Effective safety management practices, including management commitment, safety training, and safety promotion, play a critical role in cultivating a safety-conscious organizational culture. This culture encourages employees to adopt safety behaviors, comply with safety protocols, and actively participate in safety initiatives, as evidenced by previous studies. While the overall safety performance was high, the moderate level of safety compliance highlights the need for addressing challenges such as time constraints and production pressures that may hinder full adherence to safety rules. By strengthening management support, enhancing training programs, and fostering active employee participation, organizations can further optimize safety performance and sustain a safe working environment.

RECOMMENDATION AND LIMITATION

Based on the research findings, several recommendations can be provided to the organization to strengthen safety management practices and enhance overall safety performance. The study revealed that a small portion of employees felt hesitant to report unsafe conditions due to concerns over potential negative reactions from supervisors, which correlates with the organization's moderate performance in the Safety Communication and Feedback dimension. To address this, the organization should enhance its safety communication by fostering a more open and non-punitive reporting culture. Implementing an anonymous reporting system could encourage employees to voice their concerns without fear of retaliation, while management should actively promote the importance of safety feedback. Strengthening these communication channels will ensure that employees feel valued and supported in reporting hazards, providing management with a clearer understanding of safety risks, and facilitating prompt corrective actions.

To enhance safety performance, particularly in the area of safety compliance, it is essential for the organization to focus on improving hazard identification and emergency response mechanisms. The research indicates a moderate level of safety compliance among employees, which underscores the need for more robust training and preparedness measures. By implementing regular and comprehensive safety drills that simulate high-risk scenarios, such as equipment malfunctions and hazardous material handling, employees will gain the practical experience necessary to respond effectively in emergencies. Additionally, enhancing hazard identification processes through continuous training can empower employees to recognize and report potential risks

proactively. This proactive approach not only reinforces the importance of compliance with safety protocols but also cultivates a culture of vigilance and accountability.

This research has several limitations to acknowledge. The primary limitation is the reliance on a quantitative approach using self-administered questionnaires, which may introduce biases like social desirability bias, leading respondents to report more favorable safety behaviors than they actually practice. Future studies could benefit from a mixed-method approach that includes qualitative interviews to gain deeper insights into safety behaviors and attitudes. Additionally, the study's focus on manufacturing operators located at the southern region of Malaysia may limit the generalizability of the findings to other industries or regions. Broader geographical locations and various high-risk industries should be considered in future research for a more comprehensive understanding of safety management practices. The cross-sectional design also restricts the exploration of how safety practices and performance evolve over time; employing a longitudinal approach could provide insights into the sustainability of safety improvements. Lastly, external factors such as economic conditions and regulatory changes, which significantly impact safety management, were not accounted for. Addressing these limitations in future research will enhance our understanding of safety performance across different contexts.

CONCLUSION

This study examined the relationship between safety management practices and safety performance among operators in the manufacturing industry located at the southern region of Malaysia. Safety management practices refer to the structured efforts implemented by an organization to ensure a safe working environment, including elements like safety training, worker involvement, and safety communication. While, safety performance refers to the overall effectiveness of an organization's safety policies and employee actions in preventing workplace hazards and accidents. It is primarily evaluated through safety compliance (adhering to mandatory procedures and using protective equipment) and safety participation (proactively reporting risks and supporting a safe working environment). Findings of the study revealed a significant positive correlation between safety management practices and safety performance, reinforcing the importance of effective safety management systems in achieving better safety outcomes. Even though the overall safety performance among operators is commendable, continuous improvement is essential. Organizations should prioritize integrating safety management practices into their operational strategies, reinforcing safety training, fostering open communication, and linking safety performance to career advancement. By addressing the identified gaps and enhancing the effectiveness of safety management practices, organizations can further elevate safety performance, reduce workplace accidents, and cultivate a safer working environment for all employees. Future research should aim to explore broader contexts and employ varied methodologies to deepen the understanding of safety management practices and their impact on safety performance.

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