

A Conceptual Model for Safety Management Systems (SMS) Practices among Employees in the Manufacturing Industry

Suzana Ab Rahman¹, *Roszi Naszariah Nasni Naseri², Nadiah Ishak¹

¹Faculty of Business, Hospitality and Technology, Universiti Islam Melaka, Malaysia

²Faculty of Business and Management, Universiti Teknologi MARA Melaka, Malaysia

*roszinaseri@uitm.edu.my

Abstract: The burgeoning manufacturing sector has been the primary driver of Malaysia's substantial and notable economic expansion. Notwithstanding these, the Malaysian manufacturing sector remains afflicted by concerning safety concerns. To enhance the situation, the Malaysian government has proposed the use of self-regulatory safety management systems (SMS). However, there are doubts about the employees' preparedness to adopt this measure. Implementing SMS has numerous complexities. Despite progress made in the SMS technique, failures continue to be prevalent. There is a lack of literature regarding the perspectives of the manufacturing industry regarding their concerns regarding the implementation of SMS. This study aimed to ascertain the presence of safety practices derived from SMS elements and identify the characteristics associated with the successful application of SMS. The anticipation is that the outcomes of this study will contribute to the successful implementation of SMS. The findings of this research will be of significant importance to the stakeholders and policymakers.

Keywords: *Conceptual Model, Safety Management Systems (SMS), Employees, Manufacturing Industry.*

1. Introduction and Background

In the contemporary era, Malaysia's economic landscape has experienced substantial and rapid growth, largely driven by the burgeoning manufacturing industry. This sector plays a pivotal role in propelling economic development, making significant contributions to Malaysia's Gross Domestic Product (GDP) and employment rates (Lim, 2022). However, amidst its economic prowess, the industry grapples with persistent safety challenges, posing threats to the well-being of its workforce. Despite numerous regulatory efforts and safety initiatives, the manufacturing industry in Malaysia continues to be plagued by alarming safety issues. The sector's contribution to the country's high fatal accident rate remains a matter of concern, underscoring a pressing need for more effective safety management strategies (DOSH, 2023). The Department of Occupational Safety and Health (DOSH) underscores this reality, as illustrated by Figure 1, depicting the sobering statistics of workplace accidents within the manufacturing domain.

Figure 1: Fatal Occupational Accidents by Sector in 2022

SECTOR	NPD	PD	DEATH	TOTAL
Hotel and Restaurant	118	1	0	119
Utilities (Electricity, Gas, Water and Sanitary Service)	178	2	9	189
Finance, Insurance, Real Estate and Business Services	345	4	24	373
Construction	87	2	59	148
Transport, Storage and Communication	234	4	10	248
Manufacturing	4273	183	58	4514
Wholesale and Retail Trade	114	3	2	119
Public Services and Statutory Authorities	74	3	0	77
Mining and Quarrying	27	2	8	37
Agriculture, Forestry and Fishery	856	23	16	895
TOTAL	6306	227	186	6719

Within the manufacturing sector, workers face a myriad of hazards ranging from machinery accidents to exposure to toxic substances. The fast-paced nature of production lines and the pressure to meet tight deadlines can further exacerbate these risks, leading to increased incidents of workplace injuries and fatalities.

Despite advancements in technology and automation, human error remains a significant factor contributing to safety incidents, highlighting the importance of comprehensive safety training and awareness programs. Some recent examples of fatal accidents involving employees are shown in Table 1.

Table 1: Recent Examples of Accidents Involving Employees (DOSH, 2023b)

No.	Date/location	Incident	Consequences
1.	16/06/23 Kuala Lumpur	Experienced a sudden and intense fire while lifting a stainless-steel container that contained the chemical hexane.	1 fatality
2.	15/06/23 Perak	The mixer machine, which was undergoing a cleaning process, abruptly commenced operation, leading to the victim becoming ensnared within the apparatus.	1 fatality
3.	30/05/23 Kelantan	The individual experienced a collision with a mobile beam loader while completing the task of fastening a T-beam onto the beam loader.	1 fatality
4.	11/05/23 Sabah	An air compressor equipment was used to inflate the shovel tyre, resulting in an explosion that caused the tyre rim ring to collide with the victim.	1 fatality
5.	20/04/23 Johor	The roll of tissue was hurled down when the wire rope of the overhead travelling crane (OTC) split during lifting operations, causing it to be struck by an iron holding.	1 fatality
6.	12/04/23 Sarawak	The individual was impacted by a fractured wire rope sling while performing the task of relocating a vessel from the river.	1 fatality

Against this backdrop, there is a compelling imperative to explore and understand the underlying factors contributing to safety lapses within the manufacturing sector. One crucial aspect deserving scholarly attention is the implementation and adherence to Safety Management Systems (SMS) among employees. SMS practices encompass a range of organizational policies, procedures, and protocols designed to mitigate workplace hazards and promote a culture of safety (Hale et al., 2021). However, despite the recognized importance of SMS practices, there remains a gap in the literature concerning the factors influencing their adoption and effectiveness within the manufacturing context. Hence, this study aims to address this gap by developing a comprehensive conceptual framework that elucidates the dynamics of SMS practices among employees in the manufacturing industry. By integrating theoretical insights and empirical evidence, this framework will provide valuable insights into enhancing safety performance and mitigating occupational risks in manufacturing environments (Tewari & Paiva, 2022).

2. Literature Review

Safety Management System: Ladewski and Al-Bayati (2019) claim that safety management methods encompass the various tasks employed to effectively oversee and regulate occupational health and safety performance inside an organization. Nevertheless, there has been an increased focus on safety management to mitigate the occurrence of accidents and injuries (Haslinda et al., 2016). Dyjack et al. (1998) assert that safety management has transitioned into its third phase after 1991. The United States of America (USA) implemented safety management, and Henrich was the first to conduct workplace safety audits to examine safety regulations and practices (Gilkey et al., 2003). Vinodkumar and Bhasi (2010) conducted a comprehensive analysis of several endeavors aimed at forecasting safety management techniques. However, it is important to only incorporate methods that are widely recognized as creating a safe atmosphere for both employees and employers (Razali et al., 2018). Nevertheless, prior research has indicated that organizations exhibiting accident rates and injury ratios are distinguished by factors such as staff safety training, management commitment to safety, and adherence to safety laws and procedures (Razali et al., 2018; Lee, 2018; Vinodkumar and Bhasi, 2010). According to Lee (2018), safety training, worker involvement, and management commitment are crucial factors in ensuring safety.

Hale and Borys (2013) and Ros and Gustafson (2015) assert that safety standards and feedback are key components of safety management, serving as a means to address management's dedication to ensuring safety inside the organization. According to Dov's (2008) study on safety atmosphere investigation, it was determined that the commitment of management to safety plays a significant influence in sustaining the safety performance of an organization. According to Fruhen et al. (2019), employees must exhibit adherence to safety regulations and procedures to exhibit proper safety behavior. Therefore, management must demonstrate a tangible commitment to safety to uphold safety performance (Lee, 2018). According to Mazzetti et al. (2020), it is imperative for personnel inside the organization to actively engage in occupational health and safety training programs. Furthermore, it has been seen that safety training enhances the knowledge and skills of employees in recognizing potential risks within the workplace (Teo et al., 2020). Furthermore, safety training plays a crucial role in reducing the likelihood of accidents and implementing appropriate safety measures to prevent workplace mishaps (Fruhen et al., 2019). Previous research has indicated that organizations characterized by a low incidence of accidents and injuries tend to possess robust safety training programs (Razali et al., 2018).

Vinodkumar and Bhasi (2010) argue that the implementation of systematic safety training programs is vital for organizations to enhance the health and safety standards of their personnel. Hence, safety training is widely recognized as a crucial component of safety management for recently hired personnel. This training encompasses many activities such as orientation sessions, buddy practice, and emergency action training practice, all aimed at enhancing occupational health and safety performance (Mearns et al., 2003). Effective management practices for enhancing workplace health and safety performance include regular communication between supervisors and the workforce (Kim and Scott, 2019). Previous research has indicated that safety performance is influenced by communication levels among management, supervisors, and coworkers, as evidenced by surveys conducted across different employee groups (Mukherji and Arora, 2017). Managers convey the actions that employees can and cannot take to uphold workplace safety (Reason et al., 1998). Therefore, it can be inferred that organizations that place a high priority on updating safety regulations and procedures demonstrate a commitment to minimizing the occurrence of accidents and injuries (Hale and Borys, 2013). Moreover, there exists a correlation between safety regulations and procedures and the incidence of accidents and injuries, as indicated by past research findings. However, according to Ajmal et al. (2020), incentives and incentive methods are deemed acceptable in overall quality management models to motivate personnel to operate safely inside the organization.

SMS Implementation and the Environment: Efficient execution is vital for every organization. Resource allocation and organizational structure adjustment are integral components of this process. Implementing plans is a difficult task, and more than 50% of the strategies devised by organizations are never executed (Mintzberg, 1994). The implementation process frequently encounters challenges stemming from factors such as stakeholder disengagement, insufficient awareness from upper-level management, ambiguous task definition, inadequate communication, limited understanding of progress, impatience, and a dearth of incentives (Tawse and Tabesh, 2021). The objective of this study is to examine the implementation of SMS (Strategic Management Systems) within organizations, drawing on the principles of contingency theory. The contingency hypothesis posits that there is no universally optimal approach to corporate organization, leadership, or decision-making. Contingency theory aims to identify the most effective kinds of control in various operating settings and explains the functioning of organizational control systems. Dealing with ambiguity is a key concern in this approach. The organization experiences uncertainty as a result of both its internal and external surroundings (Duncan, 1972). According to Duncan (1972), the external environment encompasses the pertinent physical and social aspects that exist beyond the confines of the organization or specialized decision unit and are immediately taken into account. According to Duncan (1972), Table 2 is a compilation of external environmental elements.

Table 2: Organizational External Environment (Duncan, 1972)

Key Area	Activities
Client Component	Distributors of products or services Actual users of product or service
Suppliers Component	New materials suppliers Equipment suppliers Product part suppliers Labor supply
Competitor Component	Competitors for suppliers Competitors for clients
Socio-Political Component	Government regulatory control over the industry National and local culture
Technological Component	Meeting new technological requirements of own industry and related industries in the production of product or service New technological advances in the industry
Physical Factors	Working location Weather/climate

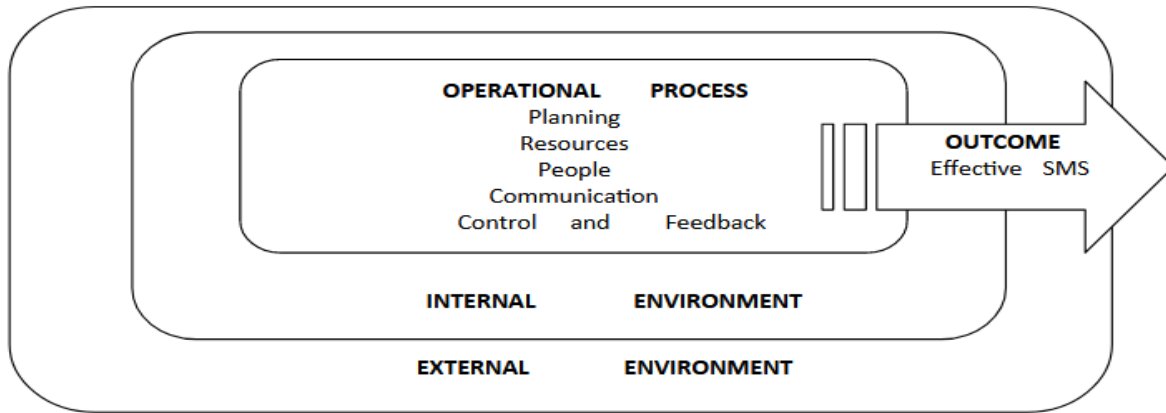
According to Mason (2007), organizations are perceived as open systems that engage in continuous interactions with their external circumstances. The external environment of an organization encompasses a comprehensive range of knowledge and information that must be assimilated and acted upon by its members to effectively accomplish the organization's objectives. According to Duncan (1972), the internal environment encompasses the pertinent physical and social elements that are situated within the confines of an organization or a single decision unit. These components are directly considered by individuals when making decisions within that system. Table 3 presents a compilation of instances pertaining to the internal environment as outlined by Duncan (1972).

Table 3: Organizational Internal Environment (Duncan, 1972)

Key Area	Activities
Organizational Component Personnel	Educational and technological background and skills Previous technological and managerial skills Individual member's involvement and commitment to attaining the system's goals. Interpersonal behavior styles Availability of manpower for utilization within the system
Organizational Component Structural	Characteristics of sub-units Interdependence of sub-units in carrying out their objectives Intra-unit conflict among organizational functional and staff units
Organizational Characteristics Component	Organizational objectives and goals Integrative process integrating individuals and groups into contributing maximally to attaining organizational goals. Nature of the organization's product service

The basic theme of contingency theory is that organizations have to deal with different situations in different ways. There is no single best way of management applicable to all situations. To be effective, the internal functioning of an organization should co-relate with the demands of the external environment. In addition, contingency theory has been seen as an appropriate approach to cope with the SMS implementation of employees due to the different characteristics of manufacturing companies, as described by Tenhiälä, (2009) and Vogel & Lasch (2016). Moreover, current industry practice needs a systemic implementation strategy, as suggested by Santos-Reyes and Beard (2008) and Khan et al. (2023). This is the underlying reason for bringing contingency theory into this research so that the impact of the internal and external environment of the organization can be easily determined.

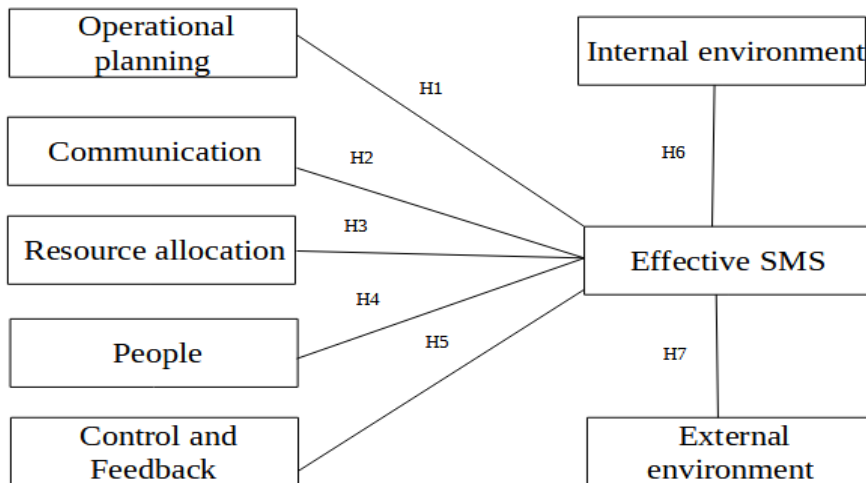
Figure 2: A Contingency Approach to Effective SMS (Okumus, 2003)



3. Conceptual Model of Purchase Intention of Cosmetic Products

For the purpose of this research, a framework from Okumus (2003), shown in Figure 2, was adapted as a basis. Okumus (2003) introduced a framework for strategy implementation, where there should be continuous interactions among the variables that make implementation possible. Seven important key variables chosen by Okumus (2003) are the internal environment, external environment, operational planning, communication, resource allocation, people, control and feedback. To achieve organizational effectiveness, the management system has to be appropriate for or 'fit' its environment and task (Okumus, 2003).

Figure 3: Conceptual Model for Safety Management Systems (SMS) Practices Among Employees in the Manufacturing Industry (Okumus, 2003)



4. Conclusion

In conclusion, this study has provided valuable insights into the dynamics of Safety Management Systems (SMS) practices among employees in the manufacturing industry in Malaysia. Through a comprehensive examination of relevant literature and theoretical frameworks, key determinants and moderators shaping the implementation and efficacy of SMS practices have been identified. The manufacturing sector in Malaysia, despite its significant contribution to economic development, continues to face serious safety challenges as evidenced by the high fatal accident rate. The findings underscore the critical need for more effective safety management strategies to safeguard the well-being of the workforce and mitigate occupational risks. By integrating theoretical insights from various disciplines such as human resource management, organizational

behavior, and occupational health and safety, this study has developed a robust conceptual framework for understanding SMS practices within manufacturing settings. This framework emphasizes the multi-dimensional nature of safety management, encompassing organizational, individual, and contextual factors. Furthermore, the study highlights the importance of fostering a safety culture within manufacturing organizations, wherein safety is prioritized at all levels and embedded in organizational norms and practices. Effective leadership, employee involvement, training and education, and continuous improvement initiatives emerge as key enablers of successful SMS implementation.

Policy Implications: The insights generated from this study have practical implications for policymakers, industry stakeholders, and organizational leaders in formulating targeted interventions and strategies to enhance safety culture and reduce occupational hazards within the manufacturing sector. By addressing the identified gaps and challenges, manufacturing organizations can create safer work environments, thereby protecting the well-being of their employees and sustaining their contribution to Malaysia's economic prosperity. In summary, this study contributes to the existing body of knowledge on safety management in the manufacturing industry and lays the foundation for future research endeavors aimed at further understanding and enhancing SMS practices for the benefit of employees, organizations, and society as a whole.

Acknowledgment: The researchers would like to extend the greatest appreciation to Universiti Islam Melaka (UNIMEL) for sponsoring the payment of this article through its Geran Penyelidikan Insentif (GPI 3.0) Phase 2 for the year 2024/2025, with Grant code: GPI/24/F3/21.

References

- Ajmal, M., Isha, A. S. N., Nordin, S. M., Kanwal, N., Al-Mekhlafi, A. B. A. & Naji, G. M. A. (2020). A conceptual framework for the determinants of organizational agility: does safety commitment matter? *Solid State Technol*, 63(6), 4112-4119.
- Department of Occupational Safety and Health. (2023). Occupational accidents and fatalities statistics. DOSM Website. <https://www.dosh.gov.my/index.php/statistic-v/occupational-accident-statistics/occupational-accident-statistic-2023>
- Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 313-327.
- Dyjack, D. T., Levine, S. P., Holtshouser, J. L. & Schork, M. A. (1998). Comparison of AIHA ISO 9001-based occupational health and safety management system guidance document with a manufacturer's occupational health and safety assessment instrument. *American Industrial Hygiene Association Journal*, 59(6), 419-429.
- Fruhen, L. S., Griffin, M. A. & Andrei, D. M. (2019). What does safety commitment mean to leaders? A multi-method investigation. *Journal of safety research*, 68, 203-214.
- Gilkey, D. P., Keefe, T. J., Hautaluoma, J. E., Bigelow, P. L., Herron, R. E. & Stanley, S. A. (2003). Management commitment to safety and health in residential construction: HomeSafe spending trends 1991-1999. *Work*, 20(1), 35-44.
- Hale, A. & Borys, D. (2013). Working to rule or working safely? Part 2: The management of safety rules and procedures. *Safety Science*, 55, 222-231.
- Hale, B., Van Bossuyt, D. L., Papakonstantinou, N. & O'Halloran, B. (2021, August). A zero-trust methodology for the security of complex systems with machine learning components. In *International design engineering technical conferences and computers and information in engineering conference* (Vol. 85376, p. V002T02A067). American Society of Mechanical Engineers.
- Haslinda, A., Saharudin, S., Roslan, N. H. & Mohamed, R. (2016). Safety training, company policy and communication for effective accident management. *International Journal of Academic Research in Business and Social Sciences*, 6(9), 141-158.
- Jiang, L. & Yu, X. (2023). Safety management systems and their influence on employee safety behavior in manufacturing industries: A meta-analysis. *Safety Science*, 145, 105493.
- Khan, S. A. R., Tabish, M. & Zhang, Y. (2023). Embracement of industry 4.0 and sustainable supply chain practices under the shadow of practice-based view theory: Ensuring environmental sustainability in the corporate sector. *Journal of Cleaner Production*, 398, 136609.
- Kim, H. & Scott, C. (2019). Change communication and the use of anonymous social media at work: Implications

- for employee engagement. *Corporate Communications: An International Journal*, 24(3), 410-424.
- Ladewski, B. J. & Al-Bayati, A. J. (2019). Quality and safety management practices: The theory of quality management approach. *Journal of safety research*, 69, 193-200.
- Lee, D. (2018). The effect of safety management and sustainable activities on sustainable performance: Focusing on suppliers. *Sustainability*, 10(12), 4796.
- Lim, S. L. (2022). The contribution of the manufacturing sector to Malaysia's economic growth. *Malaysian Journal of Economic Studies*, 59(1), 25-39.
- Mason, M. (2007). Critical thinking and learning. *Educational philosophy and theory*, 39(4), 339-349.
- Mazzetti, G., Valente, E., Guglielmi, D. & Vignoli, M. (2020). Safety doesn't happen by accident: a longitudinal investigation on the antecedents of safety behavior. *International journal of environmental research and public health*, 17(12), 4332.
- Mearns, K., Whitaker, S. M. & Flin, R. (2003). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science*, 41(8), 641-680.
- Mintzberg, H. (1994). Rethinking strategic planning part I: Pitfalls and fallacies. *Long range planning*, 27(3), 12-21.
- Mukherji, S. & Arora, N. (2017). Digital communication: easing operational outcomes in the workplace. *Procedia computer science*, 122, 1084-1091.
- Okumus, F. (2003). A framework to implement strategies in organizations. *Management decision*, 41(9), 871-882.
- Razali, N. A., Redzuan, N. I. N., Kamaruddin, A. N., Dahlan, A. D., Hanafi, S. N. M., Nobli, F. N. A. & Syahira Azlin Atan, N. (2018). A study on safety management practices and safety performance. *European Proceedings of Social and Behavioral Sciences*, 44.
- Reason, J., Parker, D. & Lawton, R. (1998). Organizational controls and safety: The varieties of rule-related behavior. *Journal of occupational and organizational psychology*, 71(4), 289-304.
- Ros, A. & Gustafson, P. (2015). Patient safety requires rules and procedures that are both followed and disregarded. *Lakartidningen*, 112, DFI4-DFI4.
- Santos-Reyes, J. & Beard, A. N. (2008). A systemic approach to managing safety. *Journal of Loss Prevention in the Process Industries*, 21(1), 15-28.
- Tawse, A. & Tabesh, P. (2021). Strategy implementation: A review and an introductory framework. *European Management Journal*, 39(1), 22-33.
- Tenhiälä, A. (2009). Contingency theories of order management, capacity planning, and exception processing in complex manufacturing environments [Doctoral dissertation, Helsinki University of Technology]. <https://chromeextension://efaidnbmninnibpcajpcglclefindmkaj/https://aaltodoc.aalto.fi/server/api/core/bitstreams/7a668e5e-9ebb-4e90-98c4-4b72949d280e/content>
- Teo, S. T., Bentley, T. & Nguyen, D. (2020). Psychosocial work environment, work engagement, and employee commitment: A moderated, mediation model. *International Journal of Hospitality Management*, 88, 102415.
- Tewari, A. & Paiva, A. R. (2022). Modeling and mitigation of occupational safety risks in dynamic industrial environments. arXiv preprint arXiv, 2205.00894, 1-32.
- Vinodkumar, M. N. & Bhasi, M. (2010). Safety management practices and safety behavior: Assessing the mediating role of safety knowledge and motivation. *Accident Analysis & Prevention*, 42(6), 2082-2093.
- Vinodkumar, M. N. & Bhasi, M. (2011). A study on the impact of management system certification on safety management. *Safety science*, 49(3), 498-507.
- Vogel, W. & Lasch, R. (2016). Complexity drivers in manufacturing companies: a literature review. *Logistics Research*, 9(1), 25.