

## SAFETY KNOWLEDGE – A SYSTEMATIC LITERATURE REVIEW

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### ABSTRACT

Safety is an imperative element within organisations, including the manufacturing industry in Malaysia, and prioritising safety knowledge is essential for establishing a secure working environment. This paper provides a comprehensive review of current research on safety knowledge, specifically focusing on the influential factors, given that this predictor has received serious attention in the occupational safety literature in manufacturing organisations. The review discusses the concept of safety knowledge, factors influencing safety knowledge and gaps in the literature in previous studies. The final section of the paper offers a discussion on potential avenues for future research and concludes with insights pertinent to this study's findings.

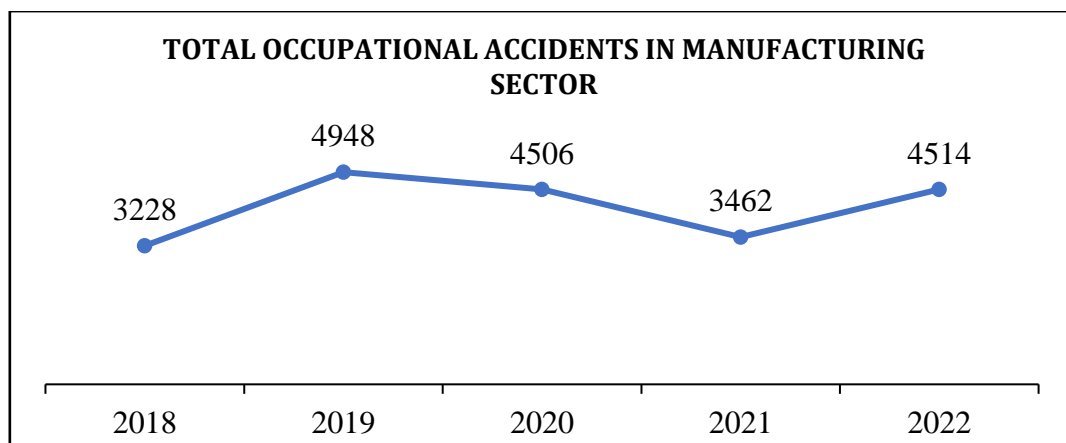
**Keywords:** Safety attitude, safety knowledge, safety rules and procedures, safety training.

### 1.0 INTRODUCTION

Occupational accidents in Malaysia keep increasing yearly, and most accidents end with deaths, serious injuries, and total loss of machinery. Department of Occupational Safety and Health (DOSH) (2018) defined accidents as unplanned occurrences which result in injuries, fatalities, loss of production, or damage to property and assets. Preventing accidents is extremely difficult without an understanding of the causes of accidents. The phenomena of occupational accidents have been haunting the public as they can cause permanent disability and post-traumatic stress disorder to the manufacturing workers.

Malaysia's manufacturing sector has grown dramatically since 2000 and is one of the largest employment sectors in Malaysia. This industry is also one of the enormous export contributions that help generate Malaysia's revenue. Therefore, it can be concluded that the manufacturing industry is the backbone of Malaysia's development and contributes to economic stability. The total number of employees engaged in the Manufacturing sector increases every year, and as of October 2022, it accounted for 2,321,179 workers, which increased by 3.6% compared to a year ago (October 2021: 2,241,048 persons). However, the rapid development of employment and exports in the manufacturing sector could mean that there will be a significant risk of workplace problems and accidents.

The Department of Occupational Safety and Health (DOSH) reported that about 20,658 occupational accidents in the manufacturing sector were recorded from 2018 to 2022. Figure 1 shows the number of manufacturing workers in occupational accidents in the last 5 years.



**Figure 1.** Total manufacturing accidents in Malaysia  
*Source: Department of Occupational Safety and Health (2022)*

Based on the figures in Figure 1, about 89.5% of accidents occurred due to the temporary employees because they did not have a sense of fitting in and obligation, and they lacked the required safety educational background, which means a lack of safety knowledge (Seo et al., 2015). In another context, the present research, which targets manufacturing workers, proves that safety knowledge impacts other safety factors such as safety attitude, motivation, and safety training on the safety of the work environment (Kwon et al., 2013). A study conducted by Cortada et al. (2000) can support this, mentioning that poor safety knowledge may result in rework, delays, mistakes, cost overruns, and injuries on construction sites.

Effective safety knowledge has been shown to enhance organisational success by improving productivity, customer service, and employee retention by encouraging the free flow of ideas (Carrillo et al., 2006). However, minimal research has been done to examine the safety management factors that contribute to safety knowledge in the manufacturing sectors in Malaysia. Therefore, the purpose of this paper is to provide a review of the literature on (1) the concept of safety knowledge among manufacturing workers, (2) safety management factors that influence safety knowledge among manufacturing workers, and (3) types of safety knowledge among manufacturing workers. Recommendations to minimise occupational accidents among manufacturing workers are provided in the discussion section of this paper.

## 2.0 LITERATURE REVIEW

### 2.1 Safety knowledge

Safety knowledge is understanding the theoretical or practical information or facts acquired via the learning process (Makransky et al., 2021). Safety knowledge increases awareness and creates a safe working environment (Makransky et al., 2021). Safety knowledge and skills were categorised as essential determinants of safety behaviour, and knowledge exchange was also known as a relevant instrument used among the employees (Tadesse, 2019). To ensure the effectiveness of the risk communication process between employers and employees, the knowledge and understanding related to perception immensely played a vital role among the employers and employees towards the risk in the workplace (Tadesse, 2019).

Safety knowledge is also defined as the contribution or receipt of task information, work methods, known and advice, or feedback on products and procedures, and it could take place using different formal and informal channels (Tadesse, 2019). A previous study held that employees and employers must have sufficient knowledge and awareness about safety to avoid occupational

accidents. Safety knowledge in terms of give-and-take may thus improve safety behaviour by reducing unintentional violations. Furthermore, in addition to the enhancement of the knowledge and skills of employees, gaining knowledge from the sample experiences of colleagues, such as challenges and complications that occurred during operations, might increase the emphasis on safe work conduct (Tadesse, 2019).

Even though this concept has been studied for years, there are still ambiguities in determining the critical factors that influence some workers not to apply their safety knowledge during the working period. Thus, this paper will discuss the factors associated with safety knowledge from the available literature.

## 2.2 Factors Influencing Safety Knowledge

### 2.2.1 Safety attitude

Safety attitudes, such as individuals' satisfaction with environmental safety work conditions, are related positively to safety motivation, individual safety performance and accident rates, and safety knowledge (Basahel,2021). Safety attitudes can be used as a predictor of safety performance (safety-related behaviours) and accident rates. Individuals in the workplace may not intend to become involved in incidents; however, the behaviour that leads to these incidents is intentional. Generally, individual safety satisfaction in the workplace is a result of high safety attitudes.

Safety attitude reflects employee beliefs and feelings about safety policies and measures( Ming et al., 2019). Safety attitudes have a significant influence on employee safety behaviour,which in turn is of vital importance in the prevention of accidents. Employees with a good safety attitude will reduce the incidence of unsafe behaviours, thus avoiding preventable accidents without supervision. Safety attitude can also be defined as the tendency to react positively or negatively toward an object ora person (Mazana et al., 2019). It is crucial in shaping behaviour, decision-making, and overall safety culture. Promoting and fostering a positive safety attitude is essential for creating a safe and secure environment in various settings, such as workplaces, communities, and everyday life.

This instrument has been developed to relate to the frequency and intensity of attitudes, beliefs, and safety knowledge. Moreover, the relationship between safety attitude and safety knowledge could predict safety knowledge outcomes such as accidents and property damages. Table 1 summarises the reviews of safety attitudes in influencing safety knowledge.

**Table 1** Summary of reviews on safety attitude

<b>Authors</b>	<b>Findings</b>
Basahel,2021	Safety attitudes, such as individuals' satisfaction with environmental safety work conditions, are related positively to safety motivation, individual safety performance, accident rates, and safety knowledge.
Ming et al., 2019	Safety attitude reflects employee beliefs and feelings about safety policies and measures.
Mazana et al., 2019	Safety attitude can also be defined as the tendency to react positively or negatively toward an object or a person.

### 2.2.2 Safety Training

Safety training is described as comprehending the activities of teaching the staff regarding hazards, how to use obtainable methods of defence, and how to deal with possible dangers (Aniah et al., 2021). Safety training comprehended the activities of apprising the workforce about known threats, using obtainable defence approaches, and teaching the labourers how to deal with possible threats (Aniah et al., 2021). To avoid the incident of accidents or to decrease their probability or severity as part of a safety and health program, there was a need for increased safety training in collaboration with other intermediation activities such as check-ups and safety assemblies, which were frequently applied at work sites.

Safety training aims to equip employees to behave safely during work and avoid accidents (Loosemore et al., 2019). In general, training refers to repeating activities and instruction to obtain skills and awareness of rules, notions, or attitudes needed to operate efficiently in specified job circumstances. Minimising workplace accidents by addressing training issues was essential (Handley et al., 2019).

On the other hand, safety training was more helpful in making accidents more predictable. The threats and dangerous activities recognised the outcomes that represented the two categories between those who were injured and those not injured (Haupt, 2021). There was a need for some complete training programs to be repeated or refresher programs must be delivered by specifying the frequency required under the workers' training in many occupational health and safety regulations. Safety training also assisted in detecting workplace risks and the precautions they must take to rectify or reduce these threats (Pamidimukkala et al., 2021). In conclusion, based on the reviews, safety training is expected to influence workers' safety knowledge during the working period. Table 2 summarises the reviews of safety training on safety knowledge.

**Table 2** Summary of reviews on safety training

<b>Authors</b>	<b>Findings</b>
Aniah et al., 2021	Safety training is described as comprehending the activities of teaching the staff regarding hazards, how to use obtainable methods of defence, and how to deal with possible dangers.
Loosemore et al., 2019	Safety training aims to equip employees to behave safely during work and avoid accidents.
Handley et al., 2019	Minimising workplace accidents via addressing the training issues was essential.
Haupt, 2021).	The threats and dangerous activities recognised the outcomes that represented the two categories between those who were injured and those not injured.
Pamidimukkala et al, 2021	Safety training also assisted in detecting risks at workplaces and the precautions they must take to rectify or reduce these threats.

### 2.2.3 Safety Rules and Procedure

Safety rules and procedures affect an organisation's safety (Hu et al., 2021). Specific rules were just about operating in an organisation safely, while many people had other main aims related to quality, sustainability, health, output, environmental control, and safety (Hu et al., 2021). In addition, safety work procedure is recognised as a method that the task must carry out safely and consistently. Safety policy refers to the firm's responsibilities and goals and formed a perfect

mission to set the standards of behaviour for workers and establish a safety scheme to correct the labours' safety behaviour. Organisational procedures are policies that are related to formal procedures and instructions. Meanwhile, group-level procedures are detailed instructions related to the work group functions. Meanwhile, individual-level procedures were those procedures and work instructions related to the tasks of an individual (Dhas, 2014).

Safety rules eliminate unsafe behaviour of employees by limiting the actions that they can perform while at work (Zhang et al., 2020). The safety policy created by the organisation should reflect well-organised safety management, zero accidents target, and achieve the safety objective required by the authorities (Subramaniam et al., 2014). If the employees fail to comply with safety rules, it could result in serious workplace accidents (Suriyenti et al., 2011). Safety policy will ensure a safe work environment that monitors employees' health and safety aspects on their on-going tasks and implements control measures to avoid unwanted occurrences (Subramaniam et al., 2014). The social control of written safety rules and procedures by the management could modify the safety behaviour of employees (Dhas, 2014).

Safety management practices were the rules, policies, procedures, and activities applied or trailed by the management aiming to safeguard their staff (Vinodkumar et al., 2010). Safety management practices must take into cognisance the safety rules and procedures to prevent accidents in the future. Hence, active rules and procedures of exertion included adequate safety division, supervisors, and managers to implement safety rules and consistent safety check-ups (Vinodkumar et al., 2010). Workers with higher levels of positive safety behaviour could conduct their job efficiently and professionally, possibly stopping accidents from happening at the workplace (Subramaniam et al., 2014). Table 3 summarises the reviews of safety rules and procedures toward safety knowledge.

**Table 3** Summary of reviews on safety rules and procedure

<b>Authors</b>	<b>Findings</b>
Hu et al., 2021	Safety rules and procedures represent the rules or procedures affecting an organisation's safety.
Dhas, 2014	Individual-level procedures were those procedures and work instructions related to the tasks of an individual.
Zhang et al., 2020	Safety rules eliminated unsafe behaviour of employees by limiting the actions that they could perform while at work.

### **2.3 Relationship between Safety Attitude and Safety Knowledge**

Based on research between attitudes and behaviour (Festinger, 1962), research has consistently found that employee attitudes are a strong predictor of workplace behaviours and performance (Harrison, Newman, & Roth, 2006; Riketta, 2008). Improving individuals' knowledge is the most promising approach to increase behaviour modification through influencing attitudes (Wu et al., 2011). Specifically, promoting awareness and understanding allows employees to evaluate the target and develop a consistent attitude, resulting in behavioural changes (Godin & Kok, 1996). People tend to develop a positive or negative evaluation (i.e., attitude) based on their information, and then they behave consistently with their attitude. For example, employees who participate in safety education likely experience increased awareness and understanding of safety issues (e.g., wearing protective equipment can avoid accidents and injuries). Subsequently, they tend to have a positive attitude towards wearing protective equipment, manifesting a relevant safety behaviour. Accordingly, previous findings explain why and how workers' safety knowledge is related to their safety behaviours. That is, workers' safety knowledge will influence safety attitudes, which may influence their safety behaviours.

## **2.4 Relationship between Safety Training and Safety Knowledge**

Safety knowledge in the manufacturing sector involves understanding the potential hazards and risks associated with specific machinery, equipment, materials, and processes (Shamsuddin et al., 2015). Safety training builds upon this knowledge by providing in-depth information about the identified hazards and how to mitigate them effectively. The training equips workers with the necessary skills and techniques to handle potential dangers safely (Shamsuddin et al., 2015). Moreover, safety training in the manufacturing sector focuses on teaching best practices, protocols, and procedures to ensure a safe working environment. Workers with prior safety knowledge can more readily grasp and apply these practices during training (Crowl et al., 2001).

Conversely, the training enhances their knowledge by introducing new and updated safety guidelines, regulations, and industry standards. Safety knowledge and training foster a strong safety culture within the manufacturing sector. Safety knowledge provides employees with a fundamental understanding of the importance of safety and encourages them to prioritise it in their work (Awolusi et al., 2018). Thus, safety training reinforces this culture by regularly updating workers on new safety protocols and reinforcing existing ones, promoting a collective commitment to maintaining a safe workplace.

## **2.5 Relationship between Safety Rules and Procedures and Safety Knowledge**

Safety rules and procedures are intrinsically linked to safety knowledge, forming a symbiotic relationship that fosters a secure environment (Pagell et al., 2014). Safety rules provide the framework and guidelines for carrying out tasks and activities to minimise risks and potential harm. These rules are derived from an extensive understanding of safety knowledge, encompassing best practices, industry standards, and lessons learned from past incidents. Moreover, safety knowledge is the foundation for building rules and procedures, enabling individuals to comprehend the underlying principles and rationale behind the safety measures (Hollnagel, 2018). By upholding safety rules and procedures, individuals demonstrate their application of safety knowledge, while adherence to these regulations reinforces and deepens their understanding of the underlying safety principles. Safety rules, procedures, and knowledge form a cohesive system that promotes a safety culture, mitigates hazards, and safeguards individuals and their surroundings (Carr, 2011).

## **3.0 GAPS IN LITERATURE**

Small and medium-sized enterprises (SMEs) are essential in both developed and emerging economies because they provide productive and efficient jobs. However, they often face competition from large-scale seed corporations and are overshadowed by national economic engines. Empirical data reveals a troubling trend: a substantial proportion of SMEs experience failure within their first five years of operation, with three out of every five ventures succumbing to this fate (Alkahtani et al., 2020). Additionally, a discouraging pattern emerges in many countries, with about eight out of ten aspiring entrepreneurs dissuaded from pursuing their entrepreneurial aspirations annually (Alkahtani et al., 2020).

The vulnerability of SMEs in many developing nations can be attributed to factors such as a lack of managerial expertise (Jabbour et al., 2020), inadequate market-related skills and experience (Ng et al., 2020), insufficient entrepreneurial drive (Chakraborty et al., 2019), subpar implementation of quality management practices (Hilman et al., 2020), limited resource availability, and the need for rapid technology adaptation and innovation (Yusr et al., 2021). Therefore, to ensure their survival, growth, and long-term performance, SMEs must possess robust capabilities in quality management, entrepreneurship, and innovativeness (Falahat et al., 2021).

While prior research has explored safety knowledge and its facets to a certain extent (Achtenhagen, 2020; Hunt, 2021), there exists a lack of consensus among scholars regarding the optimal number of dimensions or items for assessing safety knowledge (Al-Hakimi et al., 2021; Hoque, 2018). Previous studies have focused on specific aspects of safety knowledge, such as safety communication and participation, neglecting dimensions of safety management practices like safety attitude, training, safety rules and procedures, and overall safety knowledge (Bolton & Lane, 2012; Hoque, 2018).

The relationship between safety management practices and the safety knowledge of SMEs has been explored in existing literature, but certain studies fail to establish a direct connection (Rezaei and Ortt, 2018; Pulka et al., 2021). Further investigation is needed to understand the impact of safety management practices on safety knowledge and the underlying mechanisms of this influence (Kee & Rahman, 2020). Additionally, a gap in the literature exists regarding a comprehensive analysis of intermediary processes connecting safety management practices and operational outcomes of SMEs (Khodaei et al., 2021; Anwar et al., 2021). Future research should explore the role of safety management practices, as there is a limited understanding of how safety management practices influence other variables (Wales et al., 2020).

Scholarly literature highlights the importance of examining safety management practice variables to understand the relationship between safety attitude, training, safety rules and procedures, and safety knowledge. Notably, most safety knowledge research has occurred in affluent nations, with limited attention to developing countries (Sahoo, 2019). Therefore, empirical investigation is required to address this gap and determine contexts where safety knowledge holds value.

One prevailing practice in safety management practices is the implementation of safety regulations and procedures, gaining recognition from industry professionals and scholars (Vu et al., 2022; Newaz et al., 2019; Xinfeng et al., 2019). However, research lacks definitive evidence on the context-dependent nature of safety norms and procedural variables (Yu et al., 2020). Some argue that safety standards suit major organisations, while others find appropriateness in SMEs (Hendricks & Singhal, 2001; Mahmud & Hilmi, 2014; Sahoo & Yadav, 2020). The impact of safety laws and procedures on safety knowledge in SMEs remains underexplored, resulting in inconsistent findings (Hilman et al., 2020; Yusr et al., 2021).

SMEs are vital for economies worldwide, fostering innovation and growth. Ensuring worker safety optimises performance (Rajapathirana & Hui, 2018; Kuzma et al., 2020), yet safety training programs face low implementation due to challenges related to SME limitations (Auer & Jarmai, 2018; Ng et al., 2020). Challenges include financial, technical, and temporal constraints, impacting their ability to adapt and capitalise on opportunities (Ali & Johl, 2021; Hilman et al., 2020). Contradictory findings exist about the correlation between safety training and safety knowledge (Lee et al., 2019; Kee & Rahman, 2020).

Safety attitude, training, safety rules and procedures, and correlation with safety knowledge have been inadequately explored in the Malaysian context. Studies emphasise enhancing employee knowledge and abilities through training and communication (Ibrahim, 2012; Langford et al., 2000). Further exploration is needed in the context of developing nations like Malaysia. This study contributes to the existing literature by investigating the combined influence of safety attitudes, training, rules, and procedures on safety knowledge in SMEs. The role of safety knowledge as a mediator is emphasised, providing novelty to current research. Past studies often neglect resource integration (Ali et al., 2020; Jalilvand et al., 2018), making a simultaneous analysis necessary. This study aims to determine the integration relationship between safety management practices (e.g., safety attitude, training, safety rules, and procedures) and safety knowledge in a single framework in the context of Malaysia's manufacturing SMEs.

## 4.0 DISCUSSION

The literature regarding the concept of safety knowledge in the context of Malaysian manufacturing workers was reviewed. A synthesis of the reviews in the previous research has identified three factors that influence safety knowledge, such as safety attitude, safety training, and safety rules and procedure. However, it should be noted that a combination of several other factors could lead to the worker's knowledge about safety during the working period. The three main factors are safety attitude, training, and safety rules and procedures. Safety attitude and safety knowledge are interconnected and mutually influential (Syazwan et al., 2021). The literature review indicates that safety attitude can influence safety knowledge. When employees practice safety knowledge, they develop a good safety attitude, as Bhavani (2021) noted. By implementing a safety attitude on the production side, employees become more effective, saving time, increasing output, and contributing to the company's profitability. This positive attitude towards safety encourages employees to avoid negative behaviours such as taking shortcuts, which can compromise safety. Thus, attitude plays a crucial role in shaping employees' actions and behaviour in the workplace.

Furthermore, a positive attitude among employees promotes the effective implementation of safety knowledge provided by the company (Al-Kandari et al., 2019). When employees have a positive attitude towards safety, they are more likely to practice the safety knowledge imparted to them actively. This proactive approach to safety helps to reduce and prevent industrial accidents from occurring. It suggests that a positive safety attitude facilitates the acquisition and application of safety knowledge, leading to improved safety practices and reduced accidents in the workplace.

The discussion highlights that providing safety training to all employees helps reduce the accident rate and increase safety compliance behaviour. Safety knowledge plays a significant role in achieving these outcomes. Workers who possess safety knowledge are more likely to comprehend the importance of following safety protocols and guidelines. As a result, they are more motivated to comply with safety measures taught during training, leading to fewer accidents and improved safety compliance. The discussion states that the training helps employees become more cautious and encourages them to practice a safety attitude in the workplace. Safety knowledge is a crucial factor influencing this outcome. Workers with prior safety knowledge are more likely to understand the importance of being cautious and adopting a safety-conscious mindset. This understanding allows them to engage with the training actively, reinforcing and strengthening their safety attitudes. Workers with prior safety knowledge can grasp the importance of these activities more effectively and understand the relevance of self-defence methods, thereby enhancing their safety awareness and preparedness. Safety training is provided to teach workers how to handle specific machines, equipment, or tools used in their work processes.

Safety knowledge is the basis for developing effective safety rules and procedures. It enables identifying hazards, assessing risks, compliance with regulations, incorporating best practices, training, communication, and continuous improvement through incident investigation and analysis. Organisations can create a safer environment and prevent accidents and injuries by aligning safety knowledge with rules and procedures. Safety knowledge is utilised to investigate and analyse the causes and contributing factors. This knowledge helps identify gaps or weaknesses in existing safety rules and procedures, allowing organisations to revise and enhance them accordingly. The incident analysis also contributes to overall safety knowledge by adding new insights and lessons that can be applied to prevent future incidents.



## 5.0 CONCLUSION

In conclusion, this paper provides extensive knowledge of factors that influence safety knowledge in manufacturing companies in Malaysia. The literature indicated three factors influencing a driver to be aggressive while driving: safety attitude, safety training, and safety rules and procedure. Although these three factors have been shown to influence safety knowledge significantly, there are still considerable questions regarding the extent to which each is interrelated with other factors that have not been studied yet, such as lifestyle or economic background. As such, investigating these new factors is a promising research area.

Considering the review of research on safety knowledge and the limitations outlined above, this paper is expected to enhance understanding of the factors underpinning safety knowledge. Furthermore, the extensive literature review is expected to highlight the aspect to which intervention could be done to reduce occupational accidents involving manufacturing workers.

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