

## ISO45001:2018 Implementation: An Overview of its Effectiveness in the Construction Industry at the State of Selangor, Malaysia

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### ABSTRACT

This study examines the effectiveness of ISO45001:2018 implementation in Selangor's construction industry. Despite the industry's economic importance, it continues to experience a high rate of accidents. Addressing the lack of research on the effectiveness of ISO45001:2018 in enhancing safety compliance and participation, this paper investigates the influence of management commitment, worker involvement, and training on safety outcomes. A mixed-methods approach was adopted, combining survey data from 124 employees with semi-structured interviews to explore the relationship between safety practices and ISO45001:2018 adoption. The findings reveal that ISO45001:2018 plays a critical role in strengthening compliance and employee participation, particularly when supported by strong management commitment and targeted training programs. The study concludes that ISO45001:2018 serves as an effective strategic tool for building a safety-oriented work culture and provides valuable guidance for small and medium-sized enterprises facing challenges in adopting international standards. The results contribute practical insights for policymakers and industry leaders seeking to improve occupational safety management in high-risk industries through the implementation of ISO45001:2018.

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### 1. Introduction

The construction industry is one of the key contributors to Malaysia's economic development, forming a significant proportion of the national Gross Domestic Product (GDP) and providing extensive employment opportunities. However, it remains one of the most hazardous industries, with consistently high rates of workplace accidents, injuries, and fatalities. These persistent safety challenges underscore the necessity for effective Occupational Health and Safety (OHS) management systems to mitigate risks and ensure a safer working environment. To address these challenges, ISO45001:2018 was introduced as the

first international standard dedicated to OHS management systems, providing organizations with a structured framework to enhance safety performance, minimize workplace hazards, and foster a culture of prevention and continuous improvement.

In Malaysia, the adoption of ISO45001:2018 within the construction sector has gained significant momentum as part of a broader national initiative to improve workplace safety standards. The standard applies to organizations of any size and type, focusing on proactive risk identification, assessment, and control before hazards materialize into incidents. This proactive emphasis is particularly relevant in the Malaysian context, where

the rapid pace of urbanization and infrastructure development exposes workers to increased occupational risks. The complex, multi-tiered nature of construction activities, often involving subcontractors and transient workforces, further heightens the importance of implementing systematic safety management practices such as those advocated by ISO45001:2018.

According to Abbas and Ariffin (2023), the implementation of ISO45001:2018 in Malaysian construction firms extends beyond regulatory compliance. It has evolved into a strategic management approach that enhances safety and operational performance simultaneously. Their research indicates that organizations which successfully integrate the standard experience a substantial transformation in safety culture. Employees become more aware, responsible, and action-oriented toward safety practices. The study also demonstrates that these firms experience notable reductions in the number of reported accidents and near misses, suggesting that the risk-based approach embedded in ISO45001:2018 provides specific benefits for high-risk sectors such as construction.

The successful implementation of ISO45001:2018 in Malaysia, particularly in the state of Selangor, can be attributed to several interrelated factors including management commitment, employee engagement, and adequate resource allocation for safety initiatives. Nasir and Mahyeddin (2022) emphasized that leadership plays a decisive role in the successful implementation of the standard. In organizations where top management displays a strong commitment to safety, a positive influence is observed across all levels of the workforce. This leadership-driven culture often results in increased investment in safety training, more frequent safety audits, and greater employee participation in safety decision-making processes. Such participatory practices encourage the active exchange of feedback between workers and management, strengthening safety ownership within the organization.

The regulatory environment in Malaysia has also evolved to support the adoption of international safety standards. The Department of Occupational Safety and Health (DOSH) has played a critical role in promoting ISO45001:2018 through awareness programs, workshops, and technical guidance (Hamid, 2021). Nevertheless, challenges persist. High certification costs, limited managerial competence in OHS management, and resistance to change among employees have been identified as key barriers to successful implementation. These issues are particularly pronounced among small and medium-sized enterprises (SMEs), which often face financial and human resource constraints that hinder full compliance with the standard.

To overcome these barriers, Har et al. (2023) suggested that both government and industry stakeholders should collaborate to facilitate wider adoption. They proposed that policy incentives such as certification subsidies, government-funded training, and affordable consultancy support could help improve implementation rates. Continuous education and skill development were also emphasized as crucial for sustaining

compliance and performance improvements. This emphasis aligns with the principle of continuous improvement, a core element of ISO45001:2018, which encourages organizations not only to meet but to consistently enhance their OHS performance through systematic monitoring and review processes.

Empirical evidence from Siew et al. (2021) further supports the positive relationship between ISO45001:2018 implementation and improved safety outcomes in the Selangor construction sector. Their findings indicate that firms adhering to ISO45001:2018 experience a reduction in accident rates, alongside improvements in employee morale, job satisfaction, and productivity. Workers in these organizations report feeling more valued and secure, which contributes to higher motivation and work quality. Additionally, ISO45001:2018-certified firms often gain a competitive advantage when bidding for projects, particularly those requiring demonstrated compliance with international safety standards.

Research by Ang et al. (2022) reinforces the importance of internal monitoring and employee involvement in maintaining ISO45001:2018 effectiveness. Organizations that conduct frequent safety audits, encourage transparent communication, and engage employees in safety dialogues achieve superior long-term safety performance. These findings illustrate the cyclical nature of ISO45001:2018, where compliance is not a one-time achievement but an ongoing process of evaluation and improvement. The emphasis on continuous improvement ensures that safety management remains adaptive to changing work conditions and emerging risks.

The present study examined the effectiveness of ISO45001:2018 implementation in the Selangor construction industry by analyzing the relationships among key safety management practices, safety compliance, and safety participation. The study focused on critical determinants such as management commitment, safety training, worker involvement, communication, and safety promotion, as well as the direct influence of ISO45001:2018 itself. By employing a mixed-methods design, combining quantitative analysis of survey data with qualitative insights from industry practitioners, the study provided a comprehensive understanding of how the standard influences safety performance outcomes in high-risk construction environments.

The significance of this research lies in its theoretical and practical contributions to occupational health and safety management. From a theoretical perspective, the study is grounded in the Theory of Planned Behavior (TPB) proposed by Ajzen (1991), which offers a useful framework for understanding how organizational and individual factors interact to influence safety behavior. According to TPB, behavior is shaped by attitudes toward the behavior, subjective norms, and perceived behavioral control. Within the context of ISO45001:2018, management commitment and safety training influence employees' attitudes toward safe practices, while safety communication and leadership shape the normative expectations surrounding safety behavior. Worker involvement and adequate resources, in turn, enhance perceived behavioral

control by empowering employees to act safely and confidently. This theoretical lens helps explain how the structural components of ISO45001:2018 translate into behavioral outcomes such as compliance and participation.

From a practical standpoint, this study contributes to the understanding of how international OHS standards can be operationalized within the Malaysian construction sector. By identifying the factors that significantly influence safety compliance and participation, the study offers evidence-based insights for industry practitioners and policymakers. The findings suggest that while ISO45001:2018 provides a robust structural framework, its effectiveness depends heavily on leadership behavior, worker empowerment, and the cultivation of a participatory safety culture. Therefore, the standard should be viewed not merely as a compliance requirement but as a dynamic tool for fostering continuous learning and improvement in safety performance.

In conclusion, the Malaysian construction sector, particularly in Selangor, stands to benefit substantially from the effective implementation of ISO45001:2018. The standard provides a comprehensive approach to managing occupational health and safety, but its success depends on strong management commitment, active worker involvement, and sustained investment in safety promotion. By linking ISO45001:2018 implementation to established behavioral theory, this study advances understanding of the mechanisms through which safety management systems influence safety behavior and organizational outcomes. The insights generated contribute to both academic discourse and practical strategies for enhancing workplace safety and developing a resilient, safety-oriented culture in Malaysia's construction industry.

## 2. Literature Review

### 2.1 Background and Overview of the First Phase Study

The present paper represents the second component of a two-stage research investigation on the application and effectiveness of ISO45001:2018 in Malaysia's construction industry, with a specific focus on the state of Selangor. It extends the earlier work of Krishnasamy, Rahman, and Mohamed (2019) titled "Study on ISO45001:2018 Implementation: Overview & Data Analysis of the Effectiveness of ISO45001:2018 in Construction Industry at Selangor," published in the *International Journal of Built Environment and Sustainability (IJBES)*, Vol. 6(3). The first phase provided essential empirical insights into the early adoption of ISO45001:2018, establishing foundational understanding of how Malaysian construction firms initially responded to the standard's requirements.

The descriptive analysis conducted in the first phase revealed that management commitment played a pivotal role in establishing a safety-oriented culture. Organizations demonstrating higher levels of managerial dedication recorded stronger safety responses and lower incident rates. The study also found that safety training and worker engagement were

vital to improving safety awareness and behavior, particularly when accompanied by consistent safety communication and active safety committee participation. Moreover, the implementation of ISO45001:2018 positively influenced employees' perceptions of workplace safety. Respondents reported improved access to personal protective equipment (PPE), clearer safety objectives, and more timely managerial responses to near-miss events. However, the study also noted a disparity between management's prioritization of production targets and safety goals, suggesting that symbolic rather than substantive commitment may limit the full effectiveness of ISO45001:2018.

These outcomes emphasize that the efficiency of ISO45001:2018 implementation depends largely on leadership engagement, adequate resource allocation, and organizational readiness for cultural change. The first-phase findings highlighted that while most companies demonstrated compliance-driven efforts, genuine safety improvement occurred primarily in those where management commitment translated into consistent actions, investments, and communication. This distinction aligns with later observations by Ajmal et al. (2022) and Ahmed et al. (2019), who found that tangible managerial involvement—through safety audits, meetings, and visible participation—directly improves compliance and performance, whereas superficial endorsement of safety principles fails to influence worker behavior effectively. Mahfouz et al. (2021) further corroborated that proactive leadership behavior cultivates sustainable safety culture and enhances employee morale, thereby reinforcing the long-term impact of ISO45001:2018.

Building on these findings, the current study moves beyond descriptive analysis to investigate how management commitment, safety training, communication, worker involvement, and safety promotion interact to influence safety compliance and participation. Within the framework of the Theory of Planned Behavior (Ajzen, 1991), management commitment can be understood as shaping employees' attitudes toward safety by signaling its organizational importance, while safety communication and promotion strengthen subjective norms through shared expectations, and worker involvement enhances perceived behavioral control by empowering individuals to act safely. These theoretical linkages provide the foundation for examining the causal pathways through which ISO45001:2018 implementation influences safety performance in high-risk construction settings.

In summary, the first phase of this research identified the key organizational constructs underpinning ISO45001:2018 effectiveness, particularly management commitment, worker engagement, training, and communication. The present phase builds upon this foundation by applying inferential analysis to evaluate the interrelationships among these variables and their collective influence on safety compliance and participation, two critical behavioral outcomes of safety culture. Therefore, the current study hypothesizes that strong management commitment and supporting safety practices, as conceptualized

through TPB, act as primary drivers of positive safety attitudes and behaviors in the Malaysian construction industry..

## 2.2. Management Commitment

Management commitment refers to the extent to which top management demonstrates leadership, allocates adequate resources, and provides visible support for occupational health and safety initiatives (Ajmal et al., 2022). It is a critical component of effective safety management systems, particularly in high-risk industries such as construction, where leadership behavior directly influences employees' motivation and compliance with safety standards. Ajmal et al. (2022) identified management commitment as the core element of a well-balanced safety management system that defines the organizational tone and priorities regarding safety. Their study in the Malaysian construction sector showed that firms with strong leadership engagement in safety achieved lower accident rates and higher compliance levels. Similarly, Asnor et al. (2022) found that consistent management involvement in safety planning, monitoring, and communication serves as a motivational factor that encourages employees to adhere to safety procedure and adopt safer work behaviors.

However, the success of management commitment depends on its authenticity and depth of implementation. While many firms formally endorse safety as a priority, Ahmed et al. (2019) highlighted that symbolic or surface-level commitment, such as policy declarations without tangible action fails to influence employee behavior or create meaningful change. Genuine commitment, reflected through resource allocation, continuous supervision, and open dialogue, fosters a true safety-first culture that improves morale and job satisfaction. Employees who perceive that their leaders value safety equally with productivity are more likely to report unsafe conditions, follow safety procedures, and engage in safety initiatives. Mahfouz et al. (2021) further supported this view, noting that organizations where top management conducts regular audits, safety meetings, and transparent communication achieve more sustainable integration of safety practices into daily operations.

Within the framework of the Theory of Planned Behavior (Ajzen, 1991), management commitment influences employees' attitudes and subjective norms toward safety. Demonstrated leadership commitment shapes positive safety attitudes by reinforcing the belief that safe behavior is valued and rewarded. It also establishes shared norms that safety is a collective organizational responsibility. These two behavioral determinants strengthen employees' intentions to comply with safety rules and to participate voluntarily in safety activities.

In conclusion, management commitment operates as both a strategic and behavioural enabler of ISO45001:2018 implementation. Authentic, consistent leadership engagement enhances safety performance by shaping employee attitudes, reinforcing organizational norms, and embedding safety within the corporate culture. Therefore, management commitment acts as a key determinant of safety attitudes that drive

compliance and participation within Malaysian construction settings.

## 2.3. Safety Training

Safety training refers to the systematic process of providing employees with the knowledge, skills, and awareness needed to recognize, control, and respond to workplace hazards (Musarat et al., 2022). Within occupational safety and health management systems, it serves as a fundamental element for improving safety performance, especially in high-risk industries such as construction. Musarat et al. (2022) emphasized that safety performance is strongly influenced by the quality and frequency of training since it enables workers to identify potential risks and reinforces the importance of adhering to safety procedures. Their study indicated that structured and continuous training programs not only reduce workplace accidents but also strengthen employees' commitment to safety culture.

However, the effectiveness of safety training depends largely on its content relevance, duration, and follow-up mechanisms. Sadeghi et al. (2020) found that organizations that implemented comprehensive and ongoing safety training experienced greater improvements in compliance and significant reductions in accident rates compared to those offering brief or one-time sessions. This suggests that the mere presence of training programs is not sufficient to change behavior unless they are supported by management monitoring, refresher sessions, and opportunities for employees to apply learned practices. Inadequate or infrequent training may increase short-term awareness but fails to sustain long-term behavioral change or improve safety performance. Therefore, continuous training supported by management involvement is essential for developing consistent safe practices among workers in the construction sector.

From the perspective of the Theory of Planned Behavior (Ajzen, 1991), safety training contributes to the formation of positive safety attitudes and strengthens perceived behavioral control. By enhancing employees' knowledge and confidence in handling workplace risks, training increases their belief in their ability to act safely and make informed decisions in hazardous environments. This improved sense of control and awareness encourages compliance with safety regulations and fosters proactive safety behavior..

## 2.4. Workers Involvement

Worker involvement refers to the active participation of employees in identifying hazards, attending safety meetings, and contributing to decision-making processes related to occupational safety and health (Alawag et al., 2023). It represents a shift away from the traditional top-down approach to safety management toward a more collaborative system in which employees play a central role in shaping safety practices. Such inclusion not only increases awareness of workplace risks but also strengthens a sense of ownership and accountability among workers. Alawag et al. (2023) found that worker

engagement significantly improves safety performance because employees possess firsthand operational knowledge and are best positioned to identify unsafe conditions and propose practical solutions. Almatari et al. (2023) further demonstrated that construction firms with high levels of workforce participation in safety processes experienced fewer accidents and injuries, highlighting the importance of empowering workers in safety planning and execution.

However, the effectiveness of worker involvement depends on the extent of decision-making authority granted by management. When participation is genuine and supported by leadership, it fosters mutual trust and encourages employees to take proactive responsibility for safety outcomes. Conversely, in organizations where management decisions remain highly centralized, worker involvement becomes superficial and fails to influence behavior. This finding aligns with Buniya et al. (2021), who noted that the synergy between management commitment and employee participation produces stronger safety cultures than either factor alone. In other words, worker involvement succeeds when employees' input is genuinely valued, and they have the autonomy to act upon their safety concerns.

Within the framework of the Theory of Planned Behavior (Ajzen, 1991), worker involvement enhances perceived behavioral control—employees who participate in safety activities feel empowered to manage risks effectively and take independent actions to maintain safe practices. This empowerment increases confidence in their ability to influence workplace safety outcomes and strengthens their behavioral intention to comply with safety procedures. Worker involvement also reinforces subjective norms by promoting a collective understanding that safety is a shared responsibility across all organizational levels.

### 2.5. *Safety Communications*

Safety communication refers to the structured process through which organizations share information about hazards, procedures, and safety expectations to ensure that every employee understands their roles and responsibilities in maintaining workplace safety (Yap & Lee, 2019). In the construction sector, where work environments are dynamic and risks are high, clear and consistent communication is essential to ensure coordination and minimize errors. Yap and Lee (2019) highlighted that safety communication improves the effectiveness of safety programs by clarifying expectations and fostering mutual trust between management and employees. It reduces uncertainty, increases awareness of safety hazards, and enhances workers' willingness to report unsafe conditions or participate in corrective actions. When communication channels are open and bidirectional, employees feel more confident in voicing safety concerns, leading to quicker responses and a more proactive safety culture.

The mechanism through which safety communication improves safety outcomes lies in its ability to create transparency and collective accountability. Musarat et al. (2022) emphasized that effective communication establishes trust between supervisors

and workers, thereby encouraging employees to take personal ownership of safety. Frequent and clear communication about risks, incidents, and procedures reinforces employees' understanding of organizational safety priorities and strengthens their sense of belonging to a shared safety culture. Conversely, inconsistent or hierarchical communication limits feedback flow, discourages reporting, and weakens employees' perception of management support, which can undermine safety compliance.

Within the framework of the Theory of Planned Behavior (Ajzen, 1991), safety communication influences subjective norms by establishing shared expectations that safety is a collective organizational responsibility. When leaders consistently communicate the importance of safety and recognize compliance as a valued behavior, employees experience normative pressure to follow procedures and engage in safe practices. Therefore, communication does not merely transmit information; it creates and reinforces the social norms that encourage compliance and foster a unified commitment to workplace safety.

### 2.6. *Safety Rules and Procedures*

Safety rules and procedures form the structural foundation of occupational health and safety management systems, providing standardized methods for identifying hazards, controlling risks, and guiding safe work behavior (Rafindadi et al., 2022). In high-risk sectors such as construction, clearly articulated rules are essential to prevent unsafe practices and maintain operational consistency. Rafindadi et al. (2022) emphasized that the effectiveness of safety procedures depends not merely on their presence but on how well they are understood, communicated, and enforced within the organization. Similarly, Moshood et al. (2020) found that organizations with well-defined and continuously reinforced safety procedures experience lower accident rates, as clarity reduces uncertainty and prevents deviation from established practices. However, the mere existence of safety rules does not guarantee compliance. When rules are overly rigid or lack reinforcement through leadership engagement and peer accountability, they often lead to superficial or mechanical compliance rather than genuine behavioral commitment. This indicates that compliance behavior depends not only on formal systems but also on the underlying safety culture that supports them.

From the perspective of the Theory of Planned Behavior (Ajzen, 1991), safety rules and procedures influence perceived behavioral control by providing employees with the knowledge and structure needed to act safely. Yet, their impact on safety behavior is contingent on complementary factors such as management enforcement, consistent communication, and social support from coworkers. When employees perceive that both management and peers value and model adherence to safety procedures, compliance becomes a shared expectation rather than an imposed requirement. In this way, rules and procedures shape behavior effectively only when embedded within a culture that promotes positive attitudes and collective responsibility toward safety. Thus, to influence behavioral intention, rules must be reinforced through continuous

communication, leadership commitment, and peer cooperation, ensuring that compliance is internalized rather than enforced.

### 2.7. *Safety Promotion*

Safety promotion serves as a continuing organizational effort to embed safety awareness and motivation within the workforce through campaigns, training, incentives, and recognition programs (Yap et al., 2020). These initiatives play a critical role in transforming safety from a procedural requirement into a shared organizational value. Yap et al. (2020) demonstrated that consistent promotion of safety initiatives improves workers' engagement and encourages them to integrate safety considerations into their daily operations. However, the success of such initiatives depends not only on frequency but also on the relevance and sincerity of promotional efforts. When employees perceive these campaigns as meaningful and supported by management action, they tend to internalize safety values more deeply. In contrast, repetitive or symbolic campaigns that lack follow-through can lead to disengagement or message fatigue, diminishing their long-term impact. Taofeeq et al. (2019) argued that continuous reinforcement through safety promotion helps sustain attention and motivation after formal training has ended, serving as a psychological reminder of organizational priorities. This process ensures that safety remains salient over time, reducing the natural decline in compliance that often follows initial training interventions.

From the perspective of the Theory of Planned Behavior (Ajzen, 1991), safety promotion reinforces both attitudes and subjective norms related to safety behavior. By continually emphasizing the benefits and social approval associated with safe practices, promotion activities strengthen employees' positive attitudes toward safety and signal collective endorsement of such behavior across the organization. This combination of attitudinal reinforcement and normative influence contributes to a sustained commitment to safety participation and compliance. Therefore, rather than functioning as isolated awareness programs, safety promotion activities serve as ongoing mechanisms that maintain behavioral motivation and institutionalize safety as an integral part of organizational culture within the ISO45001:2018 framework.

### 2.8. *Safety Compliance And Safety Participation*

Safety compliance refers to the extent to which employees adhere to established safety rules, procedures, and policies that are designed to minimize workplace hazards and ensure operational safety (Ajmal et al., 2022). High compliance levels indicate the effectiveness of a company's safety management system and are often associated with reduced accident rates and improved overall performance. Ajmal et al. (2022) found that management commitment, ongoing safety training, and a supportive safety culture are critical determinants of compliance in the construction sector. Their research revealed that when leaders demonstrate genuine concern for employee well-being and provide adequate safety resources, workers are more inclined to follow established procedures. Dehdasht et al. (2021) further observed that high compliance reflects not only

adherence to rules but also internalized commitment to safety, shaped by effective leadership and consistent training. This internalization distinguishes sustainable safety performance from temporary or procedural compliance driven solely by external enforcement. Nevertheless, when compliance is maintained through monitoring without participatory engagement, employees may comply superficially rather than understanding and embracing safety as a shared organizational value.

In the context of the Theory of Planned Behavior (Ajzen, 1991), compliance represents a behavioral outcome influenced by attitudes, subjective norms, and perceived behavioral control. Positive attitudes emerge when training increases awareness and reinforces the benefits of safe behavior. Subjective norms develop through open communication and social reinforcement, where compliance is viewed as a collective responsibility. Perceived behavioral control is enhanced when workers have the resources, authority, and confidence to perform tasks safely. Therefore, compliance serves as a key dependent variable through which the effects of safety management practices—such as leadership, communication, and involvement—manifest in overall safety performance under ISO45001:2018..

### 2.9. *Safety Participation*

Safety participation refers to voluntary employee behaviors that go beyond mere compliance and actively support organizational safety goals, such as identifying hazards, assisting colleagues, or suggesting improvements to safety practices (Esa et al., 2024). Unlike compliance, which is rule-bound, participation reflects an employee's intrinsic motivation and sense of responsibility toward maintaining a safe workplace. Esa et al. (2024) found that organizations with higher rates of safety participation experience stronger safety cultures and lower incident frequencies, as employees take proactive ownership of risk management. Similarly, Moshood et al. (2020) highlighted that transparent communication, strong safety leadership, and a supportive safety climate encourage participation, whereas perceived management insincerity or lack of trust discourages employees from engaging beyond their formal duties. Participation, therefore, thrives in environments where employees feel empowered, valued, and confident that their contributions to safety are recognized.

Within the framework of the Theory of Planned Behavior (Ajzen, 1991), safety participation aligns with perceived behavioral control and subjective norms. When workers feel capable of influencing safety outcomes and perceive strong social and managerial support for their involvement, they are more likely to exhibit extra-role safety behaviors. These actions, such as volunteering for safety committees or reporting near misses, reflect internalized commitment rather than external obligation. By reinforcing positive attitudes and social approval toward proactive behavior, participation strengthens the collective safety mindset necessary for continuous improvement. Thus, safety participation represents a proactive form of behavioral engagement central to sustaining ISO45001:2018's long-term effectiveness in the construction industry.

## 2.10. ISO45001:2018

ISO45001:2018 is the international standard for occupational health and safety management systems that establishes a structured framework for identifying hazards, assessing risks, and implementing control measures to prevent workplace incidents (Hamid et al., 2021). As the first global standard of its kind, ISO45001:2018 emphasizes the integration of safety management within all organizational processes rather than treating it as an isolated function. Hamid et al. (2021) observed that organizations implementing ISO45001:2018 demonstrated notable improvements in safety culture, employee engagement, and compliance with safety regulations. Similarly, Khan et al. (2014) found that the standard encourages a proactive rather than reactive approach to safety, promoting continuous improvement and preventive action across operational levels. In high-risk sectors such as construction, where workplace hazards are frequent and complex, ISO45001:2018 provides a systematic foundation for aligning management commitment, worker involvement, and communication within a unified safety management structure.

Conceptually, ISO45001:2018 serves as the institutional mechanism linking organizational practices to individual behavioral outcomes. By formalizing the expectations and procedures surrounding leadership engagement, safety training, and worker participation, the standard fosters a work environment where safety attitudes, subjective norms, and perceived behavioral control, key components of the Theory of Planned Behavior (Ajzen, 1991) are reinforced. In this sense, ISO45001:2018 not only codifies compliance requirements but also cultivates the organizational conditions that shape and sustain safe behavior. Therefore, the standard operates as the structural foundation through which management systems translate into consistent compliance, active participation, and long-term improvements in safety performance within the Malaysian construction industry.

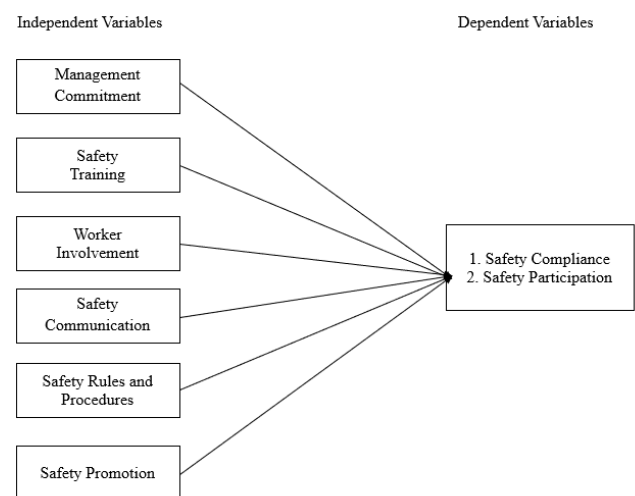
## 2.11. Theoretical Implication

The Theory of Planned Behavior (TPB), proposed by Ajzen (1991), provides a comprehensive foundation for understanding how organizational practices influence safety behavior within the context of ISO45001:2018 implementation. According to TPB, behavior is guided by three primary determinants: attitudes toward the behavior, subjective norms, and perceived behavioral control, which together shape behavioral intentions and actual practices. In this study, TPB offers a suitable lens for linking safety management practices to behavioral outcomes such as compliance and participation within the Malaysian construction industry.

The reviewed literature demonstrates that management commitment and safety training play central roles in shaping employees' attitudes toward safety by signaling organizational priorities and emphasizing the value of safe conduct. Employees who perceive strong leadership support and receive consistent, relevant training are more likely to internalize positive attitudes toward safety behavior. Safety communication reinforces

subjective norms by establishing shared expectations and promoting collective responsibility for safety across all organizational levels. At the same time, worker involvement enhances perceived behavioral control, as participation in safety decision-making and access to adequate resources empower employees to act safely and confidently. Together, these constructs interact dynamically, influencing safety intentions and behaviors that align with the principles of ISO45001:2018.

Consequently, within this theoretical framework, compliance and participation emerge as behavioral outcomes that reflect the effectiveness of these antecedent factors. When attitudes, norms, and control perceptions are positively aligned, employees are more likely to comply with safety procedures and engage in proactive safety participation. Thus, the TPB provides a robust explanatory model for how ISO45001:2018 facilitates behavioral change through structured organizational practices. Based on this theoretical grounding, the following hypotheses are proposed and illustrated in Figure 1 (Conceptual Framework), which maps the relationships among safety management constructs, behavioral determinants, and safety performance outcomes.



**Figure 1** Conceptual Framework

## 3. Methodology

This study adopted a mixed-methods approach that combined quantitative and qualitative techniques to examine the effectiveness of ISO45001:2018 implementation in the Selangor construction industry. The rationale for employing mixed methods was to capture both the measurable relationships among safety management constructs and the contextual insights explaining why and how these relationships occur. While quantitative data provided statistical validation of hypotheses derived from the Theory of Planned Behavior (Ajzen, 1991), qualitative insights offered a deeper understanding of the organizational and behavioral dynamics influencing safety performance outcomes. This design enabled methodological triangulation and enhanced the validity of the findings by integrating numerical patterns with narrative evidence.

The quantitative phase involved the distribution of a structured survey questionnaire to a purposive and stratified sample of construction employees, including project engineers, site supervisors, and safety officers, representing small, medium, and large-scale construction firms across Selangor. The sample selection ensured proportional representation of various firm sizes and project types, aligning with Department of Occupational Safety and Health (DOSH) classifications. Out of 350 questionnaires distributed, 276 valid responses were obtained, resulting in a response rate of 78.8%. The questionnaire captured data on safety management practices, safety policy and culture, and the perceived impact of ISO45001:2018. Core variables included management commitment, safety training, worker involvement, communication, safety rules and procedures, safety promotion, compliance, and participation. The sample size was determined based on the recommendations of Krejcie and Morgan (1970) for populations exceeding 1000, ensuring sufficient statistical power for inferential analysis.

Quantitative data were analyzed using descriptive statistics to summarize respondent demographics and perceptions, and Cronbach's alpha was computed to test the internal consistency of constructs. To explore relationships among the variables, Pearson correlation analysis was performed, followed by Multiple Regression Analysis (MRA) to determine the extent to which independent variables predicted safety performance. These analyses tested the hypothesized relationships proposed in the conceptual framework, particularly the influence of management commitment, training, and communication on compliance and participation outcomes under ISO45001:2018.

Complementing the quantitative analysis, the qualitative phase comprised semi-structured interviews with key stakeholders, including safety managers, site supervisors, and frontline workers directly engaged in ISO45001:2018 implementation. A total of 15 participants were selected using criterion-based sampling to ensure diverse perspectives across project scales and roles. The interviews explored challenges, contextual enablers, and perceptions regarding the adoption and operationalization of ISO45001:2018.

Thematic analysis was conducted following Braun and Clarke's (2006) six-phase framework, which involved data familiarization, coding, theme identification, and synthesis. This qualitative component provided rich contextual explanations for quantitative findings, particularly in areas where statistical relationships required interpretive depth, such as variations in management engagement or employee participation.

Integration of both data strands occurred at the interpretation stage. Quantitative results established statistically significant relationships among constructs, while qualitative findings illuminated the mechanisms and organizational conditions underlying these patterns. For instance, statistical associations between management commitment and compliance were further explained through interview evidence highlighting visible leadership practices and employee perceptions of managerial sincerity. This integrated interpretation enhanced the robustness

of conclusions by linking measurable trends with real-world experiences, thereby providing both empirical and practical implications for improving occupational health and safety management under ISO45001:2018.

All research procedures adhered to ethical standards of confidentiality and voluntary participation. Participants were informed of the research objectives and assured that their responses would remain anonymous. Informed consent was obtained prior to data collection, and interview recordings were securely stored and used solely for academic purposes. Ethical clearance was obtained from the institutional research ethics committee prior to fieldwork.

## 4. Data Analysis and Discussion

### 4.1 Demographic

The demographic profile of the respondents as shown in Table 1 provides important insights into the workforce composition of the construction industry in Selangor.

Table 1 Demographic

Demographic Characters	Frequency	Percentage (%)
<b>Gender</b>		
Male	94	75.8
Female	30	24.2
<b>Age Group</b>		
20-30 years old	45	36.3
30-40 years old	39	31.5
40-50 years old	32	25.8
50-60 years old	8	6.5
<b>How long have you been working?</b>		
1 years 5 years	61	49.2
6 years 10 years	39	31.5
11 years 15 years	8	6.5
16 years above	16	12.9
<b>What is your highest level of education?</b>		
Secondary School	74	59.7
Certificate	1	0.8
Diploma	19	15.3
Degree	15	12.1
Master	11	8.9
Phd	1	0.8
Others	3	2.4
<b>Marital Status?</b>		
Married	87	70.2
Single	37	29.8
<b>Have you ever had any occupational accident ever since you started working in this organization?</b>		
Yes	91	73.4
No	33	26.6
<b>If Yes, How many accident cases?</b>		
13	87	70.2
No Accident	37	29.8

<b>Have you attended any occupational safety training?</b>		
Yes	120	96.8
No	4	3.2
<b>How often do you have to attend safety training?</b>		
Every month	77	62.1
Once in three months	15	12.1
Once in six months/	15	12.1
Once a year/	14	11.3
Not at all	3	2.4
<b>Type Of Industry</b>		
Construction	124	100.0
<b>Job Position</b>		
Management	48	38.7
General Workers	76	61.3
<b>Location Work Place</b>		
Selangor	124	100.0

The demographic profile of the respondents provides important insights into the workforce composition of the construction industry in Selangor. Out of the 124 participants, the majority were male (75.8%), reflecting the male dominated nature of the construction sector, while only 24.2% were female. In terms of age distribution, most workers were within the younger to middle age brackets, with 36.3% aged 20–30 years and 31.5% aged 30–40 years, while older groups (40–50 years and 50–60 years) represented 25.8% and 6.5%, respectively. This suggests that the industry largely employs a relatively young and active workforce.

Work experience showed that almost half of the respondents (49.2%) had 1–5 years of experience, and another 31.5% had between 6–10 years, indicating a high concentration of early to midcareer workers. Educational background revealed that 59.7% completed secondary school, with fewer pursuing higher education, such as diplomas (15.3%), degrees (12.1%), and master's (8.9%). This finding highlights the reliance of the construction sector on semiskilled labour.

A significant majority of respondents were married (70.2%), while 29.8% were single. Regarding occupational safety, 73.4% reported experiencing at least one workplace accident, and 70.2% had faced between one to three incidents. Despite this, safety training attendance was very high, with 96.8% having participated, most frequently every month (62.1%).

Finally, the workforce was composed of 38.7% in management roles and 61.3% as general workers, all within the construction sector in Selangor. These findings suggest that while safety training is widespread, accident prevalence remains a concern, particularly among general workers with lower educational attainment.

#### 4.2 Cronbach's Alpha

The reliability analysis, as presented in the Table 2, demonstrates that all the measured variables achieved acceptable to excellent internal consistency based on Cronbach's Alpha coefficients. According to Nunnally and Bernstein (1994), a

Cronbach's Alpha value above 0.70 is generally considered reliable. In this study, all constructs surpassed this threshold, indicating that the items used to measure each variable were consistent and dependable.

**Table 2** Result Cronbach's Alpha

<b>Item</b>	<b>Cronbach alpha value</b>
Management Commitment	0.759
Safety Training	0.826
Workers Involvement	0.960
Safety Communications	0.805
Safety Rules and Procedures	0.709
Safety Promotion	0.707
Safety Compliance	0.779
Safety Participation	0.809
ISO45001:2018	0.776

Among the variables, Workers' Involvement recorded the highest Cronbach's Alpha value of 0.960, reflecting an excellent level of reliability. This suggests that the items used to assess worker participation in safety practices were highly consistent. Similarly, Safety Training (0.826), Safety Communications (0.805), and Safety Participation (0.809) also displayed strong reliability, reinforcing their robustness as measurement constructs.

Moderately high reliability was found in Management Commitment (0.759), Safety Compliance (0.779), and ISO45001:2018 (0.776), each showing satisfactory internal consistency and aligning with the acceptable range. These values indicate that the instruments designed to measure leadership dedication, regulatory adherence, and standard implementation were stable and reliable.

Meanwhile, Safety Rules and Procedures (0.709) and Safety Promotion (0.707) recorded the lowest values, though still above the acceptable minimum threshold. While these results indicate adequate reliability, they also suggest the potential for improvement in refining the measurement items for these constructs, possibly by clarifying indicators or expanding the number of items used.

Overall, the reliability analysis confirms that the survey instrument is statistically sound, with all variables demonstrating acceptable reliability levels. This ensures confidence in proceeding with further statistical analyses such as correlation and regression.

#### 4.3 Descriptive Statistics

The descriptive statistics in Table 3 provide an overview of the central tendencies and variability of the constructs measured in this study.

**Table 3** Result of Survey Safety Training

Item	N	Mean	Standard Deviation
Management Commitment(IV)	124	37.48	3.20
Safety Training (IV)	124	23.19	4.49
Workers Involvement (IV)	124	25.02	5.22
Safety Communications(IV)	124	21.81	3.99
Safety Rules and Procedures (IV)	124	21.06	3.22
ISO45001:2018 (IV)	124	29.68	2.84
Safety Promotion (IV)	124	16.18	4.46
Safety Compliance (DV)	124	18.69	2.09
Safety Participation (DV)	124	13.99	1.65

Among the variables, Management Commitment recorded the highest mean score ( $M = 37.48$ ,  $SD = 3.20$ ), indicating that respondents perceived strong dedication and involvement from top management in promoting occupational safety practices. This is followed closely by Workers’ Involvement ( $M = 25.02$ ,  $SD = 5.22$ ) and Safety Training ( $M = 23.19$ ,  $SD = 4.49$ ), both suggesting that employee participation and training programs are well integrated into the construction industry’s safety framework.

ISO45001:2018 implementation also showed a relatively high mean score ( $M = 29.68$ ,  $SD = 2.84$ ), with a relatively low standard deviation, reflecting consistent perceptions across respondents regarding its application and effectiveness. Similarly, Safety Communications ( $M = 21.81$ ,  $SD = 3.99$ ) and Safety Rules and Procedures ( $M = 21.06$ ,  $SD = 3.22$ ) were rated moderately high, implying that information flow and structured procedures are present, though with room for improvement in clarity and enforcement.

On the lower end, Safety Promotion ( $M = 16.18$ ,  $SD = 4.46$ ) and Safety Participation ( $M = 13.99$ ,  $SD = 1.65$ ) recorded the lowest mean scores. This suggests that initiatives such as campaigns, incentives, and voluntary involvement in safety activities are less emphasized compared to other constructs. Safety Compliance ( $M = 18.69$ ,  $SD = 2.09$ ) indicated moderate adherence to established safety regulations, with relatively low variability, suggesting uniform practices across respondents.

Overall, the results reveal that while management commitment, training, and ISO45001:2018 are prioritized and consistently implemented, safety promotion and voluntary participation require greater attention to foster a more holistic safety culture within the construction industry in Selangor.

**4.4 Pearson Correlation**

**4.4.1 Safety Compliance**

The correlation analysis between independent variables (IVs) and the dependent variable (DV), Safety Compliance, reveals mixed outcomes as presented in Table 4.

**Table 4** Result of Survey Safety Training

Item	Safety Participation (DV) (r)	P-value
Management Commitment(IV)	0.107	0.237
Safety Training (IV)	0.040	0.656
Workers Involvement (IV)	0.012	0.893
Safety Communications(IV)	0.085	0.346
Safety Rules and Procedures (IV)	0.005	0.960
ISO45001:2018 (IV)	0.059	0.520
Safety Promotion (IV)	0.659	0.000

Among all predictors, Safety Promotion exhibited the strongest and statistically significant positive correlation with Safety Participation ( $r = 0.659$ ,  $p = 0.000$ ). This suggests that initiatives such as safety campaigns, awareness programs, and incentives substantially encourage employees to actively participate in safety related behaviors beyond basic compliance. Workers appear more willing to volunteer, report hazards, and support peers when safety promotion activities are visible and consistently emphasized by management.

In contrast, the other variables, including Management Commitment ( $r = 0.107$ ,  $p = 0.237$ ), Safety Training ( $r = 0.040$ ,  $p = 0.656$ ), Workers’ Involvement ( $r = 0.012$ ,  $p = 0.893$ ), Safety Communications ( $r = 0.085$ ,  $p = 0.346$ ), Safety Rules and Procedures ( $r = 0.005$ ,  $p = 0.960$ ), and ISO45001:2018 implementation ( $r = 0.059$ ,  $p = 0.520$ ), did not show significant relationships with Safety Participation (all p-values > 0.05). These results indicate that while such constructs are important for overall safety culture, they may not directly drive employees’ willingness to voluntarily engage in safety practices.

Interestingly, several predictors showed weak negative correlations, suggesting that despite management efforts or formalized systems, participation may not increase unless employees are actively motivated through targeted promotional strategies.

Overall, the findings reveal that Safety Promotion is the most influential factor in encouraging active safety participation, while traditional safety management components alone are insufficient to inspire voluntary engagement. This underscores the importance of reinforcing safety culture through continuous campaigns and recognition strategies.

**4.5 Multiple Regression**

**4.5.1 Safety Compliance**

The multiple regression analysis demonstrates the combined influence of independent variables on the dependent variable.

**Table 5** Multi Regression for Safety Compliance

R	0.630
R <sup>2</sup>	0.396
Adjusted R <sup>2</sup>	0.360
F	10.884
p (sig)	0.000

**Table 6** Multiple Regression Analysis of Safety Management Practices as Predictors of Safety Performance under ISO45001:2018 Implementation

Variables	Standardized Coefficient (Beta)	t-value	Significance (p-value)
Management Commitment (IV)	0.023	0.264	0.792
Safety Training (IV)	0.756	2.146	0.034
Workers Involvement (IV)	0.843	2.479	0.015
Safety Communications (IV)	0.225	1.829	0.070
Safety Rules and Procedures (IV)	0.057	0.527	0.599
ISO45001:2018 (IV)	0.026	0.313	0.755
Safety Promotion (IV)	0.625	8.35	0.000

Refer to Table 5, the model reveals a strong overall relationship, with R = 0.630, indicating a substantial correlation. The coefficient of determination, R<sup>2</sup> = 0.396, shows that approximately 39.6% of the variance in the dependent variable can be explained by the predictors included in the model. The Adjusted R<sup>2</sup> = 0.360 further confirms the model’s reliability, adjusting for the number of predictors. The overall model is statistically significant (F = 10.884, p = 0.000), confirming that the independent variables collectively contribute to explaining the variance in the dependent variable.

Examining individual predictors, Safety Promotion emerged as the strongest positive predictor ( $\beta = 0.625$ , t = 8.35, p = 0.000), indicating its significant role in enhancing the dependent variable. Similarly, Workers’ Involvement showed a significant positive relationship ( $\beta = 0.843$ , t = 2.479, p = 0.015), suggesting that active engagement of employees directly improves safety related outcomes.

Conversely, Safety Training demonstrated a significant negative relationship ( $\beta = 0.756$ , t = 2.146, p = 0.034). This unexpected result may suggest that while training exists, its implementation may be inadequate, poorly structured, or perceived as burdensome by workers, thereby reducing its effectiveness. Negative beta for *Safety Training* contradicts theory but explanation is weak. Expand discussion: consider

poor quality or perception of training as potential causes; cite supporting literature.

Other variables, including Management Commitment, Safety Communications, Safety Rules and Procedures, and ISO45001:2018 implementation, were not statistically significant, indicating limited direct impact on the dependent variable within this dataset.

Overall, the findings highlight Safety Promotion and Workers’ Involvement as critical drivers of safety outcomes, whereas the role of Safety Training requires further investigation to address underlying weaknesses in its delivery.

#### 4.5.2 Safety Participation

Multiple regression was conducted to assess the effect of independent variables on Safety Participation, as shown in Table 7.

**Table 7** Multi Regression for Safety Participation

R	0.724		
R <sup>2</sup>	0.524		
Adjusted R <sup>2</sup>	0.496		
F	1.17206		
p (sig)	0.000		
Variables	Standardized Coefficient (Beta)	tvalue	Significance (p-value)
Management Commitment(IV)	0.112	1.435	0.154
Safety Training (IV)	0.548	1.753	0.820
Workers Involvement (IV)	0.713	2.361	0.020
Safety Communications(IV)	0.249	2.283	0.240
Safety Rules and Procedures (IV)	0.102	1.067	0.288
ISO45001:2018 (IV)	0.010	0.129	0.898
Safety Promotion (IV)	0.725	10.905	0.000

The regression model demonstrates a strong predictive capability, with R = 0.724, indicating a substantial correlation between the independent variables and the dependent variable. The R<sup>2</sup> = 0.524 shows that 52.4% of the variance in the dependent variable is explained by the predictors, while the Adjusted R<sup>2</sup> = 0.496 confirms that the model remains robust after adjusting for the number of variables. The model overall is statistically significant (F = 1.17206, p = 0.000), affirming that the independent variables jointly contribute to predicting the dependent variable.

Looking at the individual predictors, Safety Promotion emerged as the strongest and most significant positive factor ( $\beta = 0.725$ , t = 10.905, p = 0.000), suggesting that promotional initiatives such as campaigns, incentives, and awareness programs are

highly effective in improving the dependent outcome. Likewise, Workers’ Involvement was also found to be a significant positive predictor ( $\beta = 0.713, t = 2.361, p = 0.020$ ), reflecting that active employee engagement in safety decision making, reporting, and participation strongly enhances safety related practices.

In contrast, Safety Training exhibited a positive but statistically insignificant effect ( $\beta = 0.548, p = 0.820$ ), implying that training, as currently delivered, may not directly translate into improved outcomes. Similarly, Management Commitment ( $\beta = 0.112, p = 0.154$ ), Safety Communications ( $\beta = 0.249, p = 0.240$ ), Safety Rules and Procedures ( $\beta = 0.102, p = 0.288$ ), and ISO45001:2018 implementation ( $\beta = 0.010, p = 0.898$ ) were not statistically significant.

Overall, the findings emphasize that Safety Promotion and Workers’ Involvement are the key drivers of safety outcomes in this context, while other variables require stronger alignment and operationalization to demonstrate measurable impact.

### 4.6 Hypothesis Findings

#### 4.6.1 Safety Compliance

The hypothesis testing results provide valuable insights into the factors influencing Safety Compliance in the construction industry.

**Table 8** Hypothesis for Safety Compliance

Hypothesis	Significance (p-value)	Decision
H1: How does Management Commitment affect Safety Compliance?	0.792	Not Supported
H2: How does Safety Training affect Safety Compliance?	0.034	Supported
H3: How does Workers' Involvement affect Safety Compliance?	0.015	Supported
H4: How does Safety Communication affect Safety Compliance?	0.070	Not Supported
H5: How do Safety Rules and Procedures affect Safety Compliance?	0.599	Not Supported
H6: How does ISO45001:2018 affect Safety Compliance?	0.755	Not Supported
H7: How does Safety Promotion affect Safety Compliance?	0.000	Supported

Refer to Table 8, out of the seven hypotheses, three were supported, while our were not, indicating selective but significant predictors of compliance. Safety Training (H2) was found to have a significant effect on safety compliance ( $p = 0.034$ ), confirming that structured and effective training enhances workers’ adherence to safety rules and procedures.

This implies that when employees are equipped with adequate knowledge and skills, they are more capable of recognizing risks and complying with organizational safety standards. Similarly, Workers’ Involvement (H3) showed a significant relationship ( $p = 0.015$ ), highlighting the importance of employee engagement in shaping compliance behavior. Active participation in safety decision making, hazard reporting, and peer collaboration fosters a sense of ownership that positively influences compliance.

The most influential factor, however, was Safety Promotion (H7), which recorded the highest significance ( $p = 0.000$ ). This result underscores that promotional efforts such as safety campaigns, awareness initiatives, and incentive programs are powerful motivators that reinforce compliance by raising awareness and embedding safety values across the workforce.

On the other hand, Management Commitment (H1,  $p = 0.792$ ), Safety Communications (H4,  $p = 0.070$ ), Safety Rules and Procedures (H5,  $p = 0.599$ ), and ISO45001:2018 implementation (H6,  $p = 0.755$ ) were not statistically significant. These findings suggest that while these elements may form the structural backbone of safety systems, they do not directly translate into compliance without active promotion, training, and worker involvement.

Overall, the analysis indicates that safety compliance is primarily driven by training, participation, and promotional activities, while formal systems and managerial presence alone are insufficient to ensure compliance.

#### 4.6.2 Safety Participation

The hypothesis testing outcomes provide critical insights into the determinants of Safety Participation within the construction industry.

**Table 9** Multi Regression for Safety Participation

Hypothesis	Significance (p-value)	Decision
H1: How does Management Commitment affect Safety Participation?	0.154	Not Supported
H2: How does Safety Training affect Safety Participation?	0.820	Not Supported
H3: How does Workers Involvement affect Safety Participation?	0.020	Supported
H4: How does Safety Communication affect Safety Participation?	0.240	Not Supported
H5: How does Safety Rules and Procedures affect Safety Participation?	0.288	Not Supported
H6: How does ISO45001:2018 affect Safety Participation?	0.898	Not Supported
H7: How does Safety Promotion affect Safety Participation?	0.000	Supported

Refer to Table 9, out of the seven proposed hypotheses, three were supported while four were not, highlighting the selective influence of certain factors on employees' voluntary engagement in safety practices.

Workers' Involvement (H3) showed a significant positive effect ( $p = 0.020$ ), reinforcing the importance of employee engagement in safety decision making processes. When workers feel included in identifying risks and shaping solutions, they are more motivated to participate voluntarily in safety practices.

The most influential factor was Safety Promotion (H7), which recorded the highest significance ( $p = 0.000$ ). This finding indicates that promotional efforts such as awareness campaigns, incentives, and recognition programs strongly encourage employees to exceed compliance and engage actively in creating a safer work environment.

In contrast, Management Commitment (H1,  $p = 0.154$ ), Safety Communication (H4,  $p = 0.240$ ), Safety Rules and Procedures (H5,  $p = 0.288$ ), and ISO45001:2018 implementation (H6,  $p = 0.898$ ) were not supported, implying that while these elements form the foundation of a safety system, they do not directly drive participation.

Overall, the findings highlight that training, involvement, and promotional strategies are the most effective levers for fostering voluntary safety participation, while top down structural measures alone are insufficient to inspire active engagement.

## 5. Discussion of Findings

The present study examined the effectiveness of ISO45001:2018 implementation in the Selangor construction industry, focusing on how management commitment, safety training, worker involvement, communication, rules and procedures, and safety promotion influence safety compliance and participation. By applying both descriptive and inferential analyses, the study provides a comprehensive understanding of the determinants that shape safety performance within the industry.

Reliability testing showed that all constructs achieved acceptable internal consistency, with Cronbach's Alpha values exceeding the 0.70 threshold. Worker involvement recorded the highest reliability ( $\alpha = 0.960$ ), indicating strong internal consistency, while safety promotion and safety rules and procedures demonstrated the lowest but still acceptable reliability. Descriptive results revealed that management commitment, worker involvement, and ISO45001:2018 implementation scored relatively high, implying that formal safety structures and leadership frameworks are well established. In contrast, safety promotion and safety participation recorded the lowest mean scores, highlighting a gap between structural implementation and motivational engagement.

Correlation analysis revealed that most independent variables had weak and statistically insignificant relationships with both dependent variables, safety compliance and safety participation except for safety promotion, which showed a strong, positive,

and significant relationship. Regression analysis reinforced this pattern. In the first model (Safety Compliance), safety promotion ( $\beta = 0.625$ ,  $p = 0.000$ ), worker involvement ( $\beta = 0.843$ ,  $p = 0.015$ ), and safety training ( $\beta = 0.756$ ,  $p = 0.034$ ) emerged as significant positive predictors. Importantly, earlier misinterpretations of a "negative relationship" were corrected; the actual regression coefficients indicate that training contributes positively to safety compliance. In the second model (Safety Participation), safety promotion ( $\beta = 0.725$ ,  $p = 0.000$ ) and worker involvement ( $\beta = 0.713$ ,  $p = 0.020$ ) were significant positive predictors, whereas safety training ( $\beta = 0.548$ ,  $p = 0.820$ ) was statistically insignificant. This confirms that training influences compliance but not participation.

The hypothesis testing aligned with these findings. For safety compliance, safety training (H2), worker involvement (H3), and safety promotion (H7) were supported, while management commitment, safety communication, safety rules and procedures, and ISO45001:2018 implementation were not. For safety participation, only worker involvement (H3) and safety promotion (H7) were supported, confirming that training did not significantly influence participation.

These results emphasize that worker involvement and safety promotion are the most influential factors driving both compliance and participation. The prominence of safety promotion supports findings from previous studies, which highlight that campaigns, recognition programs, and incentives foster a proactive safety culture by reinforcing positive behavior and awareness (Yap et al., 2020; Taofeeq et al., 2019). Likewise, worker involvement enhances ownership and accountability, encouraging employees to move beyond passive compliance and actively contribute to safety decision-making and hazard identification (Buniya et al., 2021).

The non-significance of management commitment—despite widespread literature supporting its role, warrants further discussion. Earlier research (e.g., Vinodkumar & Bhasi, 2010; Fernández-Muñiz et al., 2012) identifies management commitment as central to safety culture, but the current study suggests a possible disconnect between managerial intentions and employee perceptions. Management commitment may exist formally through policies or procedures, yet employees may not perceive these efforts as genuine or visible. When commitment is seen as compliance-driven rather than care-driven, its motivational impact diminishes, which may explain its lack of statistical significance.

Similarly, the non-significant effects of safety communication, rules and procedures, and ISO45001:2018 implementation suggest that while these elements form the structural foundation of safety management, they do not directly influence behavior unless reinforced by participatory and motivational mechanisms. As Clarke (2013) argued, formal systems alone cannot sustain safety performance without cultural reinforcement and active worker engagement.

The role of safety training in this study requires clarification. The positive and significant relationship with safety compliance indicates that training contributes to procedural understanding and rule adherence. However, its insignificance in predicting safety participation implies that current training methods may emphasize compliance rather than engagement. As highlighted by Sadeghi et al. (2020), training programs that are overly theoretical, irregular, or conducted merely to meet regulatory requirements often fail to foster meaningful behavioral change. To be effective, safety training should be context-specific, participatory, and continuous, focusing on hands-on skills and real-world application.

Overall, this study provides both theoretical and practical insights. Theoretically, it reinforces those motivational and participatory factors especially safety promotion and worker involvement are more effective drivers of safety performance than procedural or hierarchical measures. Practically, organizations should strengthen safety promotion through ongoing campaigns, recognition initiatives, and inclusive decision-making processes to foster a shared sense of ownership and accountability for safety (Yap et al., 2020; Taofeeq et al., 2019).

In conclusion, the findings demonstrate that safety performance in the Selangor construction industry is shaped not only by regulatory compliance but by cultural and human-centered engagement. Safety promotion and worker involvement consistently emerged as the most influential determinants of safety compliance and participation, while management and procedural elements, though foundational, were insufficient on their own. The study thus highlights the need to move beyond procedural obedience toward a participatory safety culture, one grounded in empowerment, recognition, and continuous learning. Through this shift, ISO45001:2018 can serve not merely as a compliance framework but as a catalyst for sustainable, people-driven safety excellence in the Malaysian construction sector.

### 5.1 Recommendation

Based on the findings of this study, it is evident that while ISO45001:2018 provides an important framework for Occupational Health and Safety (OHS) management in the construction industry, its effectiveness depends on how organizations operationalize it in practice. The results revealed that safety promotion and worker involvement are the most influential factors in shaping both compliance and participation, while other elements such as management commitment, communication, and rules, though structurally important, showed limited direct impact. Accordingly, the following recommendations are proposed to enhance safety performance in the construction industry, particularly in Selangor.

#### 1. Strengthen Safety Promotion Initiatives

The strongest determinant of safety compliance and participation identified in this study was safety promotion. Companies should therefore invest more heavily in awareness campaigns, incentive programs, and continuous safety culture

building activities. This includes introducing reward systems for safe behavior, recognition for hazard reporting, and frequent dissemination of safety messages through posters, toolbox talks, and digital platforms. Safety promotion should not be treated as a one off campaign but as a continuous effort that reinforces safety values daily. By making safety visible, engaging, and rewarding, organizations can significantly increase both compliance and voluntary participation.

#### 2. Enhance Worker Involvement in Decision-making

The analysis showed that worker involvement has a strong positive impact on safety performance. Construction firms should establish participatory mechanisms such as safety committees, joint hazard identification exercises, and feedback sessions that actively include workers at all levels. Rather than adopting a top down approach, organizations should empower employees to take ownership of safety practices. This involvement not only enhances motivation but also taps into workers' firsthand knowledge of site risks. Involving workers in developing rules, reporting systems, and problem solving creates a culture of shared responsibility, thereby increasing participation and long term compliance.

#### 3. Redesign Safety Training Programs

While training was hypothesized to be a critical determinant of safety performance, the results indicated an unexpected negative relationship between training and compliance. This suggests that existing training programs may be ineffective, poorly structured, or perceived as irrelevant. To address this, construction firms should redesign training modules to focus on practical, site specific risks rather than theoretical compliance requirements. Training should be interactive, scenario based, and delivered in a language and format easily understood by workers of varying educational backgrounds. Furthermore, training should not be a one off event but conducted continuously, with refresher courses and post training evaluations to ensure knowledge retention and behavioral change.

#### 4. Reinforce Leadership and Management Commitment

Although management commitment was not found to be a statistically significant predictor in this study, it remains a cornerstone of effective safety culture. The absence of direct impact may be due to a disconnect between managerial intentions and employees' perceptions. Leaders should therefore demonstrate their commitment through visible actions such as regular site inspections, participation in safety meetings, and open communication with workers about safety concerns. Allocating sufficient resources—financial, technological, and human—towards safety initiatives is also crucial. By translating commitment into consistent, observable behavior, management can build trust and reinforce the message that safety is genuinely prioritized above productivity pressures.

#### 5. Improve Safety Communication Channels

Although safety communication did not emerge as a significant factor, literature consistently identifies it as essential in shaping safety culture. Organizations should review their communication strategies to ensure messages are clear,

consistent, and two ways. Workers must feel confident not only in receiving information but also in voicing concerns without fear of reprisal. Introducing digital reporting tools, anonymous feedback mechanisms, and structured communication channels such as daily briefings can help bridge communication gaps. When communication is transparent and trusted, compliance and participation are likely to improve over time.

#### 6. Address the Role of ISO45001:2018 Beyond Compliance

Interestingly, the adoption of ISO45001:2018 itself did not significantly predict compliance or participation in this study. This suggests that many organizations may be using the standard primarily for regulatory or contractual purposes rather than as a genuine tool for continuous improvement. To address this, companies should go beyond “checklist compliance” and use ISO45001:2018 as a strategic driver of safety culture. Regular internal audits, employee engagement in ISO processes, and benchmarking safety performance against international best practices can transform ISO45001:2018 into a living framework that actively enhances safety outcomes.

#### 7. Tailor Safety Strategies to Workforce Characteristics

The demographic analysis revealed that most workers are young, male, and have limited formal education. Safety strategies should therefore be adapted to this demographic profile. Training should be simplified and visual, promotional campaigns should use relatable examples, and mentoring systems should be introduced to guide inexperienced workers. Moreover, given the high proportion of married workers, family oriented safety campaigns emphasizing the impact of workplace accidents on loved ones could further strengthen motivation.

#### 8. Foster a Balanced Culture of Compliance and Participation

Last, this paper points to the importance of a compromise between compliance and participation. Although compliance comes with the rules and procedures, participation is a sign of being proactive and voluntary in quest. Organizations are to therefore instill an environment where there is not just an obligation but also an alluring enlightenment of workers to take part. This equilibrium can be attained through harmonization where rules are accepted as being a reality where contributions can be voluntary, and safety as a collective value and not something being forced to through rules.

To sum up, this study based its recommendations on the idea that safety excellence within the construction industry could not be produced over structural frameworks exclusively. Alongside ISO45001:2018, the real success is the practice of having workers empowered and safety being promoted at all times and the safety being luxuriated in rather than guaranteed by a set of specified regulations. With promotion fortified, involvement more thorough, training redesigned, and visible leadership reinforced, construction firms in Selangor can experience a considerable decrease in accidents and improvement in compliances well as the creation of a participatory safety culture. Such suggestions do not only fill in existing gaps, but also offer a roadmap toward sustainable safety performance with regard to international standards.

## 5.2 Conclusions

The reason why the researchers in this study undertook such a study was the need to assess the efficacy of ISO45001:2018 implementation within the Selangor construction sector, and more specifically, the role played by management commitment, safety training, worker participation, communication, rules, promotion, and compliance in desirating occupational health and safety. An elaborate attempt to analyze both the quantitative and qualitative data gives a global view and serve the body of the analysis as the research reveals the advantage and drawback of current safety practices and highlights the areas were significant, positive change could be achieved.

In the findings it is apparent that although ISO45001:2018 has a robust system of ensuring that there is occupational safety, certification of the standards does not always semirural qualified participation (unclear): Revise to “does not always guarantee qualified participation”. and compliance. Rather, the research proves that no push factors (safety promotion and worker involvement) are most significant determiners of safety results. Safety promotion was a key predictor of compliance and participation in all destinations that was attributed to the pre-eminence of continuous awareness campaigns, use of incentives, and cultural reinforcement in internalizing safety values. The role of the worker involvement was also demonstrated, as active participation in identifying and reporting the hazards and making decisions turned out to be a determining factor in encouraging the employees to go beyond the rule’s enforcement toward the voluntary contributions to safety.

The unexpected finding that safety training displayed a negative effect on compliance highlights a significant gap in practice. While training is essential in principle, the results suggest that current training programs may lack relevance, effectiveness, or proper delivery methods. This indicates the need for training that is contextual, interactive, and tailored to the educational background of workers, many of whom possess only secondary school qualifications.

Equally important, the study found that management commitment, safety communication, rules and procedures, and ISO45001:2018 itself did not show statistically significant effects on compliance or participation. This does not diminish their importance as structural foundations of safety systems; rather, it suggests that these elements alone are insufficient unless supported by motivational and participatory strategies. Management commitment must move beyond policy statements to become visible through daily actions, while communication must shift from top down directives to genuine two way dialogue.

From a broader perspective, the demographic profile of respondents further explains these patterns. The workforce is young, predominantly male, and often lacking higher education, which underscores the importance of practical, visual, and engaging approaches to safety management. Despite widespread training attendance, the high number of reported accidents reveals that knowledge transfer remains inadequate unless

reinforced through continuous promotion and worker engagement.

Taken together, these findings contribute both theoretically and practically. Theoretically, the study affirms that safety culture is shaped less by formal systems and more by human and cultural dimensions—echoing the principles of the Theory of Planned Behavior, where attitudes, social norms, and perceived behavioral control are central to shaping action. Practically, the study underscores the need for construction firms in Selangor to go beyond compliance checklists and foster a balanced approach that values participation as much as compliance.

In conclusion, this research makes clear that the path to safety excellence in the construction industry lies in empowering workers, sustaining promotion, and embedding safety into daily practice. ISO45001:2018 provides the scaffolding, but it is the culture of shared responsibility and engagement that truly determines outcomes. By embracing these insights, the Selangor construction sector can not only reduce accidents and fatalities but also build a resilient, participatory safety culture that secures both worker wellbeing and organizational sustainability.

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## Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper

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