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AFFIRMING THE LINK BETWEEN WORKERS' SAFETY BEHAVIOR AND ORGANISATIONAL SAFETY PERFORMANCE OF SME MANUFACTURING

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ABSTRACT

In the Malaysian context, small and medium enterprises (SMEs) encountered workplace accidents. Scholarly consensus attributes a substantial portion of these accidents and injuries to the human factor, specifically unsafe behaviours. This study, conducted in Malaysia's northern region, focused on Safety and Health/Human Resource professionals within the manufacturing sector of SMEs. We compiled a robust dataset comprising 107 responses garnered through a meticulously designed self-administered questionnaire. To scrutinise the intricate relationship between safety behaviour and safety performance, we subjected the data to rigorous analysis using SmartPLS 3.2.9, employing advanced partial least square–structural equation modelling (PLS-SEM) techniques. The research outcomes unequivocally underscore the palpable and consequential impact of safety behaviour variables, namely safety compliance and safety participation, on improving safety performance, gauged through parameters such as accidents, injuries, and property damages. These results resoundingly validate the research hypotheses. Consequently, this study accentuates the importance of cultivating employee safety behaviour, particularly in resource-constrained SME settings, as an imperative step toward enhancing workplace safety.

Keywords: safety behaviour, safety compliance, safety participation, safety performance, accident

INTRODUCTION

Based on the statistics of the Department of Occupational Safety and Health (DOSH), the manufacturing sector contributes to the highest number of industrial accidents. As the overall data showed an increasing trend, the small and medium enterprises (SME) sector was found to contribute to 80% of occupational accidents in Malaysia (Nor Azma et al., 2016; Zulkifly et al., 2018). According to the most recent systematic review, half of national accident cases originate from SMEs, where the likelihood of fatality is eight times higher (Nor Azma et al., 2016).

This statement aligns with prior research findings that consistently identified unsafe working behaviour as the predominant contributor to workplace accidents. Heinrich's seminal work in the 1940s demonstrated that unsafe behaviour accounted for 88% of industrial accidents, with the remaining percentage attributed to unsafe conditions and chance occurrences (Heinrich, 1941). Subsequent studies have echoed this sentiment, emphasising human factors, including risky behaviour, engineering, technology, work system failures, and hazardous working conditions as primary predictors of industrial accidents (Bowonder, 1987; Gyekye, 2010). In the context of Malaysia's manufacturing industry, individual factors and unsafe acts such as circumventing safety protocols and neglecting personal protective equipment (PPE) emerge as the primary causes of accidents, followed by hazardous workplace conditions (Hussin et al., 2008; Zakaria et al., 2012).

Although scholars have reached a consensus on the role of safety behaviour in causing accidents (Griffin & Neal, 2000; Saraih et al., 2021; Vinodkumar & Bhasi, 2010), there is limited availability of studies that comprehensively assess the impact of safety behaviour on accidents. Similarly, within the context of Malaysian SMEs, scholarly attention has been directed towards identifying the factors that influence safety behaviour (Mohd Fauzi et al., 2022; Subramaniam et al., 2017; Zulkifly et al., 2022; Zulkifly & Mohamad Zahir, 2022), yet there remains a dearth of studies investigating the direct association between safety behaviour and accidents.

Safety performance measurement is crucial in occupational safety and health, encompassing several vital dimensions. Initially, scholars measured safety performance using accident/incident indicators. These incidents can vary in severity, from minor injuries to fatal outcomes, and are widely recognised as critical safety performance indicators (Bowonder, 1987). Nevertheless, contemporary research has advocated for a more proactive approach, emphasising measuring safety performance through constructs such as safety behaviour (Gyekye, 2010; Lu & Yang, 2010a; Vinodkumar & Bhasi, 2010). While those scholars measure safety performance using behavioural elements, there is a subset of scholars who employ accident rates, injury statistics, and property damage incidents as metrics to assess safety performance (Chua & Wahab, 2017; Shang et al., 2015; Zulkifly et al., 2021).

On the other hand, safety compliance and safety participation are integral components of safety behaviour, and their assessment provides valuable insights into an organisation's safety performance and the effectiveness of safety management efforts. Researchers often explore these dimensions to understand their impact on safety outcomes and inform strategies for enhancing workplace safety (Clarke, 2006; Neal & Griffin, 2006).

In the context of Malaysian manufacturing, including SMEs, some scholars measure safety performance through safety behaviour dimensions, specifically safety compliance and safety participation (Alias et al., 2022; Zulkifly et al., 2017), while others employ safety performance indicators such as accidents, injuries, and losses related to goods and equipment (Chua & Wahab, 2017; Zulkifly et al., 2021).

Heinrich's Domino Theory of workplace safety posits that accidents result from events, starting with unsafe acts and substandard conditions at the base, followed by near-miss incidents, culminating in

accidents. This theory underscores the importance of addressing underlying factors to prevent workplace accidents (Heinrich, 1941). Furthermore, Heinrich’s research findings indicate that unsafe behaviour accounted for 88% of workplace accidents. Henceforth, this study aims to investigate the impact of safety compliance and safety participation empirically, integral dimensions of safety behaviour, on safety performance indicated by accidents, injuries and property losses, contributing to the ongoing discourse on enhancing workplace safety.

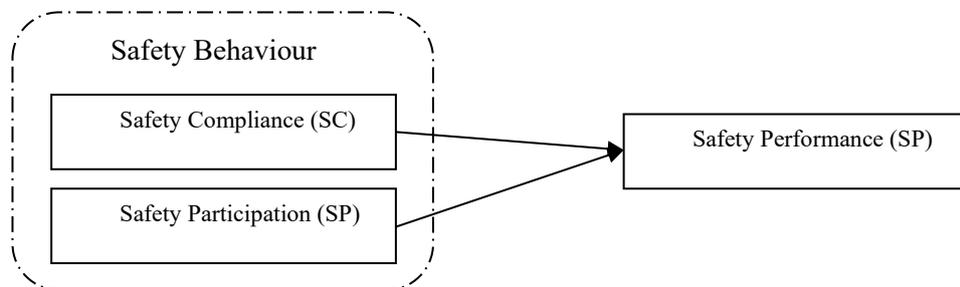
METHODOLOGY

This section explains the methodology used for this study.

Study Framework

The present research framework is designed to investigate the relationship between safety behaviour (comprising compliance and participation) and safety performance (measured through accident rates, injuries, property damage, and goods loss incidents). The justification for this framework is grounded in prior research and theory explained in the previous section, which consistently underscores the significance of safety behaviour in shaping safety outcomes and the established use of these safety performance indicators in the literature. For example, a recent study conducted among foreign construction general labourers in Hong Kong demonstrated that safety behaviour negatively and significantly affected safety results, as evaluated by injury and near-miss rates (Lyu et al., 2018). The research framework is illustrated in Figure 1.

Figure 1
Research framework



Hypotheses Development

Based on the previous literature, theory and research framework, the alternative hypotheses for this research are developed as follows:

H₁ : Safety Behaviour in terms of Safety Compliance has a significant effect on Safety Performance within SME Manufacturing Firms

H₂ : Safety Behaviour in terms of Safety Participation has a significant effect on Safety Performance within SME Manufacturing Firms

Sample Size and Sampling

In this research, 107 participants, including safety and health officers, safety and health coordinators, safety and health representatives, and human resource officers, were engaged using the purposive

sampling method. The respondents represented SMEs located in Penang, Perlis, and Kedah regions. The determination of the sample size was facilitated through G*Power 3.1.9.7, which yielded a minimum required sample size of 107 SMEs.

G*Power is utilised to determine the sample size for several reasons. Firstly, it is a widely recognised and robust software tool commonly employed in research methodology for power analysis (Faul et al., 2007). Power analysis is crucial in determining the adequacy of a sample size to detect effects of a certain magnitude with a given level of confidence.

Secondly, GPower allows researchers to input parameters such as effect size, alpha level (significance level), power level, and the number of predictors in the model (Faul et al., 2007, 2009). Based on these inputs, GPower calculates the required sample size to achieve sufficient statistical power to detect the effects of interest. This ensures that the study has a high probability of detecting actual effects, thereby enhancing the reliability and validity of the findings.

Additionally, G*Power facilitates sensitivity analysis, enabling researchers to assess the robustness of their results across different scenarios by varying key parameters (Faul et al., 2007). This helps evaluate the stability of the findings and make informed decisions regarding sample size adequacy.

Overall, the use of G*Power in determining sample size enhances the study's methodological rigour, ensuring that the research findings are statistically sound and generalisable to the target population.

Research Instrument

The study instrument utilised in this research comprises a meticulously designed self-administered questionnaire adapted from previous research in the field (Neal & Griffin, 2006; Shang et al., 2011). Specifically tailored to gather data from Safety and Health/Human Resource professionals within the manufacturing sector of small and medium enterprises (SMEs) in Malaysia's northern region, the questionnaire draws upon validated constructs and items identified in prior studies on safety behaviour and performance (Neal & Griffin, 2006; Shang et al., 2011). Instruments were translated into Malay for clarity, and a pre-test was performed for validity and reliability. All constructs were evaluated using a 5-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. For safety behaviour dimensions, namely safety participation and safety performance, the items included "Employees put in extra effort to improve the safety of the workplace," "Employees voluntarily carry out tasks or activities that help to improve workplace safety," "Employees use all the necessary safety equipment to do their job," and "Employees use the correct safety procedures for carrying out their job." Conversely, items for safety performance comprised "The frequencies of accidents are reducing" and "The frequency of injuries is reducing."

RESULTS

This study undertook a comprehensive evaluation of the measurement model. Additionally, it conducted a rigorous examination of the structural model to test the hypotheses.

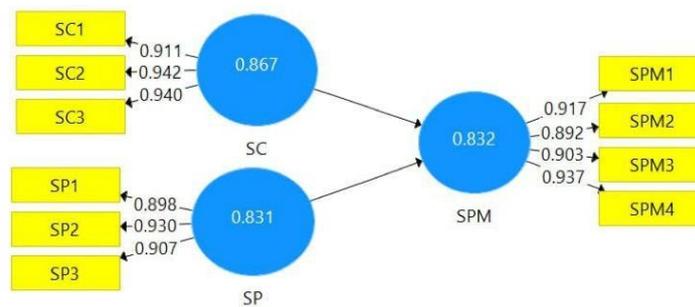
Assessment of Measurement Model

Firstly, the measurement model should be examined before proceeding to the structural model. The reflective measurement model was used in this study. Based on Fornell-Larcker (Fornell & Larcker, 1981), there are four steps for reflective measurement models: indicator loadings measurement, internal consistency reliability, convergent validity, and discriminant validity.

Table 1
Reliability Assessment

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	R Square
Safety Compliance	0.923	0.951	0.867	
Safety Participation	0.899	0.937	0.831	0.425
Safety Performance	0.933	0.952	0.832	

Figure 2
Measurement Model



In the presented results in Table 1 and Figure 2, several crucial statistical metrics have been assessed to gauge the reliability and validity of the constructs within our research model and to understand the extent to which these constructs explain variance in our dependent variable, Safety Performance. First, Cronbach’s Alpha, a measure of internal consistency reliability, was applied to our constructs. It yielded high values for Safety Compliance (0.923), Safety Participation (0.899), and Safety Performance (0.933), indicating strong internal consistency among the respective items measuring these constructs (Tabachnick & Fidell, 2014). Additionally, Composite Reliability, another measure of construct reliability, supported these findings, further affirming the strong reliability of Safety Compliance, Safety Participation, and Safety Performance.

Convergent validity was also assessed as measured by Average Variance Extracted (AVE). Safety Compliance demonstrated good convergent validity with an AVE of 0.867, as did Safety Participation with an AVE of 0.831, and Safety Performance with an AVE of 0.832. These AVE values surpassed the recommended threshold of 0.50, indicating that the constructs adequately captured variance relative to measurement error and supporting their convergent validity (Hair et al., 2019; Ramayah et al., 2018).

Lastly, the R Square (R^2) value for Safety Performance was determined to be 0.425. This value represents the proportion of variance in Safety Performance explained by the independent variables, Safety Compliance and Safety Participation. The model suggests that these two constructs account for 42.5% of the variance in Safety Performance. These comprehensive findings collectively endorse the reliability and validity of our research model and provide robust support for the efficacy of Safety Compliance and Safety Participation in explaining a significant portion of the variance in Safety Performance, laying the groundwork for further hypothesis testing and analysis in our study.

Table 2
Discriminant Validity

	Safety Compliance	Safety Participation	Safety Performance
Safety Compliance			
Safety Participation	0.732		
Safety Performance	0.654	0.631	

The discriminant validity of the constructs in our research model was evaluated using the Heterotrait-Monotrait (HTMT) ratio (Franke & Sarstedt, 2019). As presented in Table 2, the results indicate the strength of discrimination between the constructs.

The HTMT ratios between Safety Compliance and Safety Participation, Safety Compliance and Safety Performance, and Safety Participation and Safety Performance were calculated to be 0.732, 0.654, and 0.631, respectively. These values are all below the commonly recommended threshold of 0.85, signifying that the constructs exhibit adequate discriminant validity (Ramayah et al., 2018).

In essence, the HTMT ratio analysis confirms that our constructs—Safety Compliance, Safety Participation, and Safety Performance—can be considered distinct, and their shared variances do not overshadow their individual characteristics. This assessment further strengthens the credibility of our research model and assures that the constructs indeed represent separate and unique dimensions within our study.

Assessment of Structural Model (Hypotheses Testing)

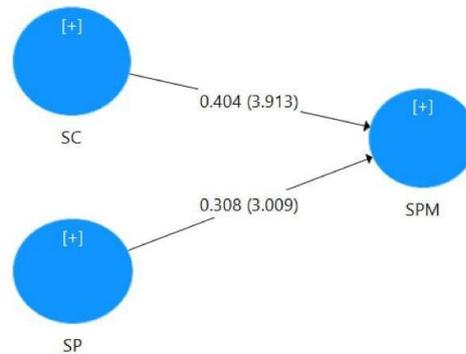
In the structural model assessment, bootstrapping with 1000 resampled iterations was pivotal in hypotheses testing. This statistical technique provided a robust means to evaluate the relationships between variables. By repeatedly resampling the data and estimating the structural model, we generated a distribution of parameter estimates, facilitating the calculation of p-values and confidence intervals. These outcomes were essential for determining the statistical significance of hypothesised relationships and assessing the model’s fit. Importantly, bootstrapping accommodated potential deviations from normality in the data, contributing to the rigour and credibility of the research findings (Hair et al., 2011; Ramayah et al., 2018). Table 3 depicts the path coefficient results.

Table 3
Path Coefficient

	Beta Value	T Statistics
Safety Compliance -> Safety Performance	0.404	3.913*
Safety Participation -> Safety Performance	0.308	3.009*

*significant at P<0.05

Figure 3
Structural Model



As presented in Table 3 and Figure 3, the structural model assessment provides valuable insights into the relationships between our key constructs. Specifically, we examined the path coefficients and their associated statistical significance to determine the impact of Safety Compliance and Safety Participation on Safety Performance.

The path coefficient from Safety Compliance to Safety Performance was 0.404, with a T statistic 3.913. This result signifies a statistically significant positive relationship between Safety Compliance and Safety Performance. In practical terms, it suggests that an increase in Safety Compliance is associated with a corresponding improvement in Safety Performance.

Similarly, the path coefficient from Safety Participation to Safety Performance yielded a value of 0.308, with a T statistic of 3.009. This outcome demonstrates a statistically significant and positive relationship between Safety Participation and Performance. In essence, higher levels of Safety Participation are associated with enhanced Safety Performance within the organisation.

Notably, both relationships were statistically significant at the $P < 0.05$ level, underscoring their importance in the present research model. These findings also provide empirical support for research hypotheses, indicating that both Safety Compliance and Safety Participation play pivotal roles in shaping and improving Safety Performance.

DISCUSSIONS

The results of this study shed light on the critical role of safety behaviour in shaping safety performance within the context of small and medium enterprises (SMEs) in Malaysia.

Firstly, the high internal consistency and strong reliability of our constructs, Safety Compliance and Safety Participation reaffirmed their robustness as reliable measures of safety behaviour (Lu & Yang, 2010b; Vinodkumar & Bhasi, 2010; Zulkifly et al., 2017). The convergence of these constructs with theoretical expectations and prior research further emphasised their validity in assessing safety-related activities in the workplace.

Secondly, our structural model analysis revealed significant positive relationships between safety behaviour (Safety Compliance and Safety Participation) and safety performance. The path coefficients and their associated statistical significance confirmed that improved safety behaviour is linked to enhanced safety outcomes, encompassing accident rates, injuries, and incidents related to property

damage and goods loss (Shang et al., 2011). These findings underscore the significance of fostering a safety-conscious culture within SMEs, where employees comply with safety protocols and actively engage in safety-related activities.

Furthermore, our study contributes to the existing literature by emphasising the multifaceted nature of safety behaviour. Safety Compliance and Safety Participation were distinct yet complementary dimensions, each uniquely contributing to safety performance. Organisations should recognise the importance of addressing compliance and participation to enhance workplace safety comprehensively.

In the context of Malaysia, the research outcomes unequivocally underscore the palpable and consequential impact of safety behaviour variables, namely safety compliance and safety participation, on improving safety performance, gauged through parameters such as accidents, injuries, and property damages. These results resoundingly validate the research hypotheses.

By providing empirical evidence within the Malaysian context, our findings contribute to the broader discourse on SME safety performance, enhancing the generalizability of the study's conclusions. They shed light on the common challenges faced by SMEs globally, emphasising the universal importance of cultivating safety behaviour among employees. This study underscores the pivotal significance of such efforts, particularly in resource-constrained SME settings, as an imperative step toward enhancing workplace safety.

CONCLUSION

In conclusion, this study provides valuable insights into the relationship between safety behaviour and safety performance within the specific context of SMEs in Malaysia. Our findings highlight the critical role of Safety Compliance and Safety Participation in promoting safety outcomes. By addressing these dimensions, organisations can reduce accidents, injuries, and incidents and cultivate a culture of safety consciousness.

The significance of this research lies in its practical implications for SMEs seeking to improve workplace safety. Recognising the distinct yet interconnected nature of safety behaviour dimensions, organisations can tailor their safety management strategies to address compliance and participation aspects effectively. Such efforts can result in safer work environments, reduced operational costs, and enhanced organisational performance.

Moreover, this study underscores the importance of continued research in occupational safety, particularly in SMEs. Future investigations can delve deeper into how safety behaviour influences safety performance and explore interventions and strategies that facilitate sustainable improvements in workplace safety.

In summary, this research contributes to the knowledge of safety behaviour and its impact on safety performance, providing valuable insights for academia and industry. As organisations increasingly recognise the significance of safety in their operations, our findings serve as a stepping stone toward fostering safer and more productive workplaces.

LIMITATION AND FUTURE RESEARCH

While this study contributes valuable insights into the relationship between safety behaviour and performance within Malaysian SMEs, it is not without limitations. Firstly, the research design primarily relies on self-reported data from Safety and Health/Human Resource professionals within the manufacturing sector of SMEs, which may introduce response bias and social desirability effects,

potentially impacting the accuracy and reliability of the findings. Additionally, the study's focus on the northern region of Malaysia may limit the generalizability of the results to other geographical areas or industries within the country. Furthermore, the cross-sectional nature of the data prevents establishing causal relationships between safety behaviour and performance over time, warranting future longitudinal studies to provide more robust evidence. Moreover, while SmartPLS 3.2.9 offers advanced statistical techniques for analysing complex relationships, alternative methodologies or complementary approaches could provide additional insights. Finally, the study does not explore potential moderating or mediating factors that could influence the relationship between safety behaviour and performance, leaving room for future research to delve deeper into these aspects.

Future research endeavours could benefit from exploring alternative methodologies to complement the current study's findings. A mixed-methods approach, combining quantitative surveys with qualitative interviews or focus groups, could offer a more comprehensive understanding of the complex interplay between safety behaviour and performance within SMEs. Qualitative methods would allow for in-depth exploration of the underlying factors influencing safety behaviour, such as organisational culture, leadership practices, and individual perceptions, providing richer insights into the mechanisms driving safety performance outcomes. Additionally, experimental or quasi-experimental designs could be employed to evaluate the effectiveness of specific safety behaviour interventions or training programs in real-world SME settings. By implementing controlled interventions and measuring outcomes pre- and post-intervention, researchers could assess the causal impact of interventions on safety performance indicators, offering valuable insights for evidence-based safety management practices. Furthermore, participatory action research (PAR) approaches could empower SME employees to actively identify safety issues, co-develop interventions, and evaluate their effectiveness collaboratively with researchers and management. By involving stakeholders at every stage of the research process, PAR fosters ownership and sustainability of safety initiatives, leading to more meaningful and impactful outcomes for improving workplace safety in SMEs.

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