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Linking Supervisors' Safety Leadership Styles and Safety Performance amongst Workers in Small and Medium Manufacturing Firms

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ABSTRACT

In the Malaysian context, small to medium-sized businesses (SMEs), particularly in the manufacturing sector, frequently encounter difficulties in realizing their safety performance potential due to limited resources. Workplace safety performance, both in terms of safety behaviour and workplace accident frequencies is found to be heavily influenced by leadership styles, particularly those of the transformational and transactional variety. This research delves into the effects of such leadership approaches on the safety behavior of employees as well as safety performance in the SME manufacturing sphere in the northern region of Malaysia. The data were gathered from 107 Safety and Health executives through a survey, and analyzed it using SmartPLS 3.2.9 software using partial least squares-structural equation modeling (PLS-SEM) technique. The results indicate that both transformational and transactional leadership methods significantly influence safety compliance and safety participation, as well as safety performance. This research enriches the academic literature with an empirical based model, underlining the critical role of transformational-transactional leadership in improving the overall safety performance within SME manufacturing. The findings offer valuable insights for academia and industry alike, highlighting the need for the implementation of effective leadership styles to foster safety behavior and decrease workplace accidents in the SME manufacturing industry.

KEYWORDS – Leadership, transformational, transactional, safety performance, SME.

1. INTRODUCTION

The Small and Medium-Sized Enterprises (SME) sector is a critical pillar of industrial growth in Malaysia, contributing significantly to job creation [1]. Regrettably, it also represents 60-70% of the total yearly industrial mishaps. Studies carried out since the 1940s determine that workplace incidents predominantly stem from unsafe behaviors and environments. It's crucial to tackle factors impacting worker safety behavior, especially within the context of SMEs [2], [3], [4].

Research has indicated that the size of a firm can have a significant impact on the efficacy of safety management, with issues such as financial limitations, lack of specialized knowledge, and staffing issues being primary contributors to suboptimal safety management in SMEs [5], [6], [7]. Solutions proposed by earlier researchers often appear to be more applicable to larger companies, implying that SMEs may need strategies that are more bespoke to their context [8], [9].

This paper puts forward the idea of instigating self-regulation practices amongst lower managerial staff via the roles of safety leadership within the SMEs. Safety leadership is regarded as a cost-effective and successful method for SMEs, having a positive effect on workers' safety attitudes and behaviors, whilst concurrently reducing injury rates and boosting productivity [8], [10]. Leveraging internal resources to manage Occupational Safety and Health (OSH) through self-regulation provides a sustainable and economically viable solution well-suited to the needs of SMEs [9].

2. LITERATURE REVIEW

The importance of leadership in shaping safety behaviors within organizations is an area that has been extensively researched. Various leadership styles, notably transformational and transactional, play significant roles in

influencing safety performance among employees. Their impact on safety compliance and safety participation, two critical elements of safety behavior, has been a particular focus of scholarly investigation.

Previous research has firmly underscored the correlation between leadership styles and safety behaviors. However, a deeper understanding is needed, especially in the context of small and medium-sized enterprises (SMEs). These businesses often face resource constraints that can impede optimal safety performance, necessitating tailored strategies that leverage the potential of transformational and transactional leadership.

This literature review will delve into the existing body of research on the influence of these leadership styles on safety behavior. We will explore empirical studies that have investigated these relationships in different organizational contexts, including SMEs. We will also examine how the components of transformational and transactional leadership in the context of safety affect safety performance. This exploration aims to deepen our understanding of how effective leadership can enhance safety behaviors and reduce workplace accidents, particularly within resource-constrained environments like SMEs.

2.1 Safety Performance

An organization's safety performance can be evaluated by considering both leading and lagging indicators. Leading indicators can be measured via safety behaviors, while lagging indicators stem from incidents resulting in injuries or fatalities [11], [9]. It's observed that focusing on leading indicators tends to be more advantageous than relying solely on lagging ones [12], [13]. This is because safety performance using leading indicators tends to distribute more evenly, thus enabling more accurate evaluation links, forming a more substantiated basis for safety assessments and interventions. Lagging indicators, on the other hand, encompass factors such as the frequency of accidents, instances of equipment failure, losses in production, property damage, and personal injuries [14]. By evaluating both leading and lagging factors, a comprehensive understanding of accident reduction can be obtained.

2.2 Safety Behaviour

Safety behavior encompasses two key components: safety compliance and safety participation [11], [12]. Safety compliance is defined as the fundamental and necessary actions undertaken to uphold safety in the workplace, which may involve adhering to established work procedures and the usage of personal protective equipment. On the other hand, safety participation signifies behaviors aimed at fostering a safety-supportive work environment without directly impacting an individual's safety. This could manifest as voluntary involvement in safety-related activities, offering help to colleagues encountering safety concerns, and active participation in safety-focused meetings [12].

2.3 Transformational Leadership

The principle of "Walking the talk" exemplifies the foundation of transformational leadership techniques. In such an approach, the leader embodies the exact behaviors they expect their subordinates to adopt, specifically those congruent with the protocols and procedures set forth to augment safety behaviors. This behavioral exemplification serves as a palpable guide and underscores the import of the prescribed behavior.

Bass, in his comprehensive Full Range Leadership model, compartmentalizes transformational leadership into four distinct categories: Inspirational Motivation, Idealized Influence, Intellectual Stimulation, and Individual Consideration [15]. These facets of transformational leadership encapsulate the diverse ways in which leaders can inspire, motivate, and engage their subordinates in the pursuit of enhanced safety behavior within the organization [16].

2.4 Transactional Leadership

Transactional leadership pertains to leadership approaches where followers receive rewards from leaders upon attaining specified objectives or meeting certain performance benchmarks [17]. As articulated by [18], the transactional leadership paradigm is grounded in a reciprocal interaction within the leader-follower dynamic. In this arrangement, followers are compensated for efficacious performance of their duties, whereas, conversely, they face repercussions for non-performance or underperformance [16]. This style of leadership also garners recognition as managerial leadership. Its primary focus is on the domains of administrative responsibility, organisational structure, and collective performance, encapsulating its essential managerial essence.

2.5 Leadership and Safety Performance

As elaborated earlier, safety performance can be measured through leading and lagging indicator namely safety behaviour and safety performance respectively. There is several previous research who measure safety

performance using safety behaviour components namely safety compliance and safety participation [19], [20], [13]. On the other hand, previous studies also measured safety performance using frequencies of accident, injury and property damage [21], [22].

Previous research has firmly established a substantial correlation between leadership styles and safety behaviour [23], [11], [7], [24]. A study employed the Transformational-Transactional Leadership Theory and affirmed the influence of both transformational and transactional leadership styles on safety behavior, expressed through safety participation and safety compliance behaviour [25]. The study involved blue-collar workers from a Turkish corporation, and the results underscored the impact of transformational leadership on safety participation, and transactional leadership on safety compliance.

Similarly, another study embarked on an exploration of the relationship between leadership and safety behavior, integrating the theory of empowerment leadership [26]. Conducted within two nuclear power plants, the study revealed an enhancement of workers' safety performance, especially safety participation behavior, under empowering leadership [26].

For instance, [11] examined the effects of safety leadership variables (safety policy, which was transactional, and safety motivation and safety concern, both transformational) on safety behavior among dockyard workers in China. The results attested to the significant influence of the transformational component of safety leadership on safety behavior. In contrast, a study [27] focused on long-tenured healthcare industry workers and examined the impact of incongruous safety-specific leadership style on safety participation behavior and safety compliance behavior. The findings indicated that transformational safety-specific leadership exhibited a stronger association with behavior dimensions than did passive safety-specific leadership. This highlighted the enhancement of employee safety performance, especially their participation in safety, through an empowering leadership style.

Besides those studies, [11] and [7] determined that the transactional component of safety leadership also has a significant influence on safety behaviour. Conversely, a rigorous research investigation involving a sample of 322 personnel from various shipping firms in Taiwan divulged a positive correlation between transformational leadership, transactional leadership (contingent reward), and safety behavior [28]. Concerning the relationship between transactional leadership and safety performance, numerous scholarly inquiries have established that safety policy and safety monitoring exert a substantial impact on safety performance, as measured by the frequency of injuries, accidents, and instances of property damage [29], [21], [30]. Safety policy and safety controlling are acknowledged as transactional leadership components [11], [31].

In sum, this section discusses various studies that have cemented the significant correlation between transformational leadership styles and safety behavior. Likewise, transactional leadership styles have been decisively identified by prior research as exerting significant impacts on safety behavior. Furthermore, the elements of both transactional and transformational leadership, particularly within the realm of safety, have been discovered to influence safety performance considerably. The usage of Transformational-Transactional Leadership Theory has helped ascertain the impacts of both styles on safety behaviors. These studies collectively hint towards the pivotal role of both leadership styles in fostering a robust overall safety performance in the workplace [9].

3. METHODOLOGY

This section outlines the methodology employed in this research. The details provided here ensure the rigor of the investigation, thereby contributing to the robustness and reliability of the research findings.

3.1 Research Framework and Hypothesis Development

The research framework is developed based on previous literature [11], [21], [9], [24]. Moreover, the bulk of research has primarily evaluated the relationship between transformational leadership and safety behavior in isolated contexts. However, [32] emphasize the crucial necessity of consolidating both elements of safety performance—specifically, safety behavior and safety outcomes—into a singular facet, as they could exert disparate impacts on their antecedents. Based on these facts, the research framework is constructed as Fig.1.

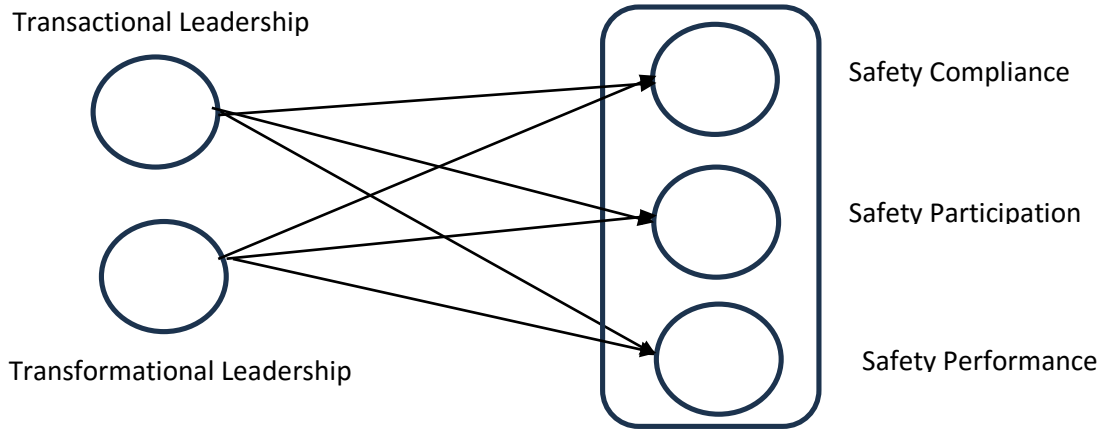

Figure 1. Research framework

Furthermore, based on the research framework, alternative hypotheses are developed as follows:
H_{1a}: Transactional leadership of supervisors has a significant effect on safety compliance of SMEs workers.
H_{1b}: Transactional leadership of supervisors has a significant effect on safety participation of SMEs workers.
H_{1c}: Transactional leadership of supervisors has a significant effect on safety performance of SMEs workers.

H_{ca}: Transformational leadership of supervisors has a significant effect on safety compliance of SMEs workers.
H_{2b}: Transformational leadership of supervisors has a significant effect on safety participation of SMEs workers.
H_{2c}: Transformational leadership of supervisors has a significant effect on safety performance of SMEs workers.

3.2 Research Instrument

A self-administered survey was applied for this research. The researcher drew from measurements used in preceding studies, tailoring and modifying them to align with the current research context. Further adjustments were made to these measurement items, which were then reviewed by experts in the field to ensure their accuracy and relevance. To augment comprehension among respondents, the instruments were translated into the Malay language. Before proceeding with the principal data collection, a pre-test was conducted to confirm the instrument's reliability, as well as face and content validity.

Respondents were requested to individually evaluate each items, utilizing a Likert scale that spanned from 1 (strongly disagree) to 5 (strongly agree). Detailed specifics concerning the utilized items are delineated in Table 1.

Table 1. Research Instrument's Construct

Items	Name of Variables	Number of Items	Source
1	Safety Performance (SPM)	4	(Lu & Shang, 2005)
2	Safety Behaviour	3- Safety Compliance (SC) 3-Safety Participation (SP)	(Neal & Griffin, 2006)
3	Transformational Leadership (TF)	8	(Sawhney & Cigularov, 2019)
4	Transactional Leadership (TC)	8	

3.3 Sample Size and Sampling Technique

This investigation incorporated the participation of 107 safety and health professionals' work in small and medium manufacturing firms located in the states of Penang, Perlis, and Kedah. These participants hold critical roles in the sphere of occupational safety and health. The determination of the sample size was computed by the utilization of the G*Power 3.1.9.7 software. Furthermore, purposive sampling technique was applied for this research.

3.4 Data Analysis Method

For the purpose of this study, the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique using SmartPLS 3.2.9 software was employed to analyse the data. This advanced multivariate analysis technique allowed us to examine the complex relationships between the independent variables (transformational and transactional leadership) and dependent variables (safety compliance, safety participation, and safety performance). First, the measurement model was tested, followed by the structural model assessment to test the hypotheses [33].

4. RESULTS AND DISCUSSIONS

This research undertook an evaluation of measurement models to establish the reliability and both discriminant and convergent validity of the measurement model Additionally, an evaluation of the structural model was conducted towards the structural model meticulously for the purpose of hypotheses testing, thereby elevating the scientific rigour of the study.

4.1 Assessment of Measurement Model

The assessment of a reflective measurement model in this investigation was executed through a four-pronged approach applying PLS Algorithm. This encompassed the measurement of indicator loadings, an evaluation of internal consistency reliability via Composite Reliability (CR), the assessment of convergent validity by calculating the Average Variance Extracted (AVE), and the demonstration of discriminant validity through the application of the Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio (HTMT) values. This meticulously tailored methodology [34] was rigorously adhered to in this research. Drawing from the outcomes delineated in Table 2, it can be observed that each of the Composite Reliability (CR) scores surpassed the established threshold of 0.70 [35], [34], denoting satisfactory internal consistency. Moreover, all Average Variance Extracted (AVE) values met the criteria for acceptability, exceeding the benchmark value of 0.5 which speaks to the robust convergent validity of our measures [33], [36].

Table 2. Results of Measurement Model (Convergent Validity)

Variable	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
1.Safety Compliance	0.923	0.951	0.867
2.Safety Participation	0.895	0.935	0.827
3.Safety Performance	0.933	0.952	0.832
4.Transactional Leadership	0.897	0.914	0.574
5.Transformational Leadership	0.938	0.948	0.697

For discriminant validity, this research utilized two methods of assessment namely Fornell-Larcker Criterion and the Heterotrait-Monotrait ratio (HTMT). The Fornell-Larcker Criterion is based on the premise that a construct should share more variance with its indicators than it does with any other construct. To satisfy this criterion, the square root of the Average Variance Extracted (AVE) for a given construct should be greater than its highest correlation with any other construct [37]. The Heterotrait-Monotrait ratio (HTMT) is a more recent method for assessing discriminant validity. The HTMT is a ratio of the between-trait correlations to the within-trait correlations. Values less than 0.85 generally indicate adequate discriminant validity. An HTMT value closer to 1 suggests a lack of discriminant validity between constructs [38], [34]. By employing both the Fornell-Larcker Criterion and the HTMT, we were able to establish the robustness of the discriminant validity of our measures, ensuring that each construct in our model is statistically distinct and contributes uniquely to our understanding of the phenomena under investigation. Table 3 and Table 4 reported the results of Fornell-Larcker and HTMT respectively.

Table 3. Results of Fornell-Larcker Criterion

	1	2	3	4	5
1.Safety Compliance	0.931				
2.Safety Participation	0.684	0.910			
3.Safety Performance	0.606	0.534	0.912		
4.Transactional Leadership	0.448	0.574	0.537	0.758	
5.Transformational Leadership	0.575	0.699	0.528	0.555	0.835

Table 4. Results of HTMT

	1	2	2	4	5
1.Safety Compliance					
2.Safety Participation	0.732				
3.Safety Performance	0.654	0.631			
4.Transactional Leadership	0.449	0.610	0.541		
5.Transformational Leadership	0.605	0.678	0.547	0.552	

4.2 Assessment of Structural Model (Hypothesis Testing)

In assessing the structural model of this research, bootstrapping (1000 re-sampled) was conducted. The data confirmed that a supervisor's transactional leadership significantly impacts the safety compliance (H1a: $\beta = 0.187$, $T = 1.744$, $p < 0.10$), safety participation (H1b: $\beta = 0.269$, $T = 2.654$, $p < 0.05$), and safety performance (H1c: $\beta = 0.353$, $T = 4.059$, $p < 0.05$) of workers in SMEs.

Similarly, the transformational leadership of supervisors was found to significantly influence safety compliance (H2a: $\beta = 0.471$, $T = 5.758$, $p < 0.05$), safety participation (H2b: $\beta = 0.549$, $T = 7.092$, $p < 0.05$), and safety performance (H2c: $\beta = 0.332$, $T = 2.990$, $p < 0.05$) among SMEs workers.

The results support all of the research hypotheses, as per depicted in Table 5. Thus, the findings suggest that both transactional and transformational leadership styles of supervisors play a crucial role in promoting safety in the workplace among SMEs workers in the manufacturing sector.

Table 5. Path Co-efficient

	β	T Statistics	Results
Transactional Leadership -> Safety Compliance	0.187	1.744*	**Supported**
Transactional Leadership -> Safety Participation	0.269	2.654**	**Supported**
Transactional Leadership -> Safety Performance	0.353	4.059**	**Supported**
Transformational Leadership -> Safety Compliance	0.471	5.758**	**Supported**
Transformational Leadership -> Safety Participation	0.549	7.092**	**Supported**
Transformational Leadership -> Safety Performance	0.332	2.990**	**Supported**

* significant at p<0.10 **significant at p<0.05

The R-squared values represent the proportion of the variance in the dependent variable that can be explained by the independent variables. In other words, R-squared gives the degree to which changes in the dependent variable can be predicted from the independent variables [39], [40]. For Safety compliance, the R-squared value is 0.354, implying that approximately 35.4% of the variability in safety compliance can be explained by the transformational and transactional leadership styles in our model. This suggests that while our model captures a substantial proportion of the influences on safety compliance, there may still be other factors not included in our model that account for the remaining variance. For Safety Participation, the R-squared value is 0.538. This means that 53.8% of the changes in safety participation can be accounted for by the independent variables, again primarily transformational and transactional leadership styles. This result indicates a relatively strong explanatory power for the model with respect to safety participation. Finally, for safety performance, the R-squared value is 0.364. This suggests that our model's independent variables explain about 36.4% of the variance in safety performance. Although the model provides significant insight into the factors influencing safety performance, it indicates that other unaccounted variables may also contribute to changes in safety performance. The results of R^2 are summarised in Table 6.

Table 6. R Squared

	R^2
Safety Compliance	0.354
Safety Participation	0.538
Safety Performance	0.364

Table 7. Effect Size (f Squared)

	1	2	3	4	5
1.Safety Compliance					
2.Safety Participation					
3.Safety Performance					
4.Transactional Leadership	0.037	0.109	0.135		
5.Transformational Leadership	0.238	0.452	0.120		

Meanwhile, Table 7 reports the results of effect size based on f^2 values. The highest effect size is observed for safety participation with the value of 0.452, which denotes a large effect size. This suggests that the transformational leadership style has a substantial influence on safety participation. Turning to the effect sizes for safety compliance (0.238) and safety performance (0.120) based on the transformational leadership style, these figures indicate medium effect sizes, suggesting that this leadership style has a meaningful impact on both safety participation and safety performance. The f^2 value of 0.135, carries the meaning of transactional leadership styles have a moderately strong impact on safety performance [41]. Similarly, the effect size value of 0.109 indicates medium effect size [41], suggesting a more noticeable impact of the transactional leadership styles on safety participation. Lastly, the value of 0.037 indicates a small effect of transactional leadership on safety compliance. This implies that the impact of the leadership styles on safety compliance, while statistically significant, is relatively small.

The findings of the present study provide empirical evidence that both transformational and transactional leadership styles exert significant influence on safety compliance, safety participation, and safety performance of workers in SMEs, aligning with the theoretical propositions put forward by prior research [42], [43]. Transactional leadership was found to have a substantial impact on safety compliance, safety participation, and safety performance. This is consistent with the previous studies that have posited and empirically validated the direct influence of transactional leadership on safety outcomes [44]. Notably, the current results extend the findings by [45] by revealing a positive relationship between transactional leadership and safety participation, suggesting that performance-contingent rewards may encourage workers to actively engage in safety activities.

Simultaneously, transformational leadership was significantly related to safety compliance, safety participation, and safety performance, substantiating the role of transformational leadership in enhancing safety behavior [46]. This confirms the premise that leaders who inspire and motivate their followers can effectively foster a safety-supportive work environment, facilitating adherence to safety rules and engagement in safety-related activities [47].

It is essential to note that safety participation was found to be more strongly associated with transformational leadership than transactional leadership, indicating that the inspiring and motivational elements of transformational leadership may be particularly effective in promoting active involvement in safety behaviors [48].

In sum, this study supports and extends the current literature on leadership and safety in SMEs, providing new insights into the unique ways in which transactional and transformational leadership influence lagging and leading indicator of safety performance [49].

5. CONCLUSION

In conclusion, this study has contributed significantly to the existing body of knowledge on safety behavior in the context of small and medium enterprises (SMEs) by substantiating the importance of leadership styles. The comprehensive examination of both transformational and transactional leadership styles and their distinct influences on safety compliance, safety participation, and organisational safety performance has underscored the pivotal role that leaders play in shaping safety behavior and outcomes. The findings have robustly confirmed that both leadership styles significantly influence safety in the workplace, with transformational leadership showing a particularly strong association with safety participation. This illuminates the critical need for SMEs to foster an

environment where leaders inspire, motivate, and engage their employees, augmenting their adherence to safety protocols and active involvement in safety practices. Our research thus provides substantial evidence-based guidance for leadership development initiatives and policy formulations in SMEs to bolster occupational safety. Further, by meticulously adhering to a rigorous methodological design, this study has yielded robust and reliable results, adding further credence to our conclusions. We are confident that this work advances scholarly understanding of safety in SMEs and offers valuable insights for practitioners committed to enhancing safety culture and performance.

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