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Safety Climate and Workers' Trust in Safety Systems: Key Determinants of Safety Behavior in Construction

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Abstract
This study explores how safety climate in safety systems influences workers' behavior, specifically focusing on safety compliance and participation in high-risk industries like construction. The goal was to examine how safety climate dimensions, such as management safety empowerment and workers' trust in safety systems, affect safety behavior. This study employed a quantitative cross-sectional survey design. A questionnaire was administered to 438 construction workers, and the data were analyzed using descriptive statistics, Pearson's correlation, and multiple regression. The results show significant positive correlations between safety climate dimensions and safety behavior. Management safety empowerment was identified as the most prominent factor associated with both safety compliance and safety participation. In addition, workers' trust in the effectiveness of safety systems was significantly associated with safety compliance. Age and worker status significantly affected safety perceptions, with older workers and permanent workers demonstrating higher levels of safety compliance and participation. The study found that safety climate factors could explain 21.7% of the variance in safety compliance and 17.0% of the variance in safety participation.

Keywords: Safety Climate, Safety Behavior, Trust in Safety Systems, Safety Compliance, Safety Participation.

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1. INTRODUCTION

The construction industry remains one of the most hazardous sectors worldwide, consistently recording disproportionate rates of occupational injuries and fatalities compared to other industries. Despite accounting for a relatively small share of the global workforce, construction workers contribute to a substantial proportion of fatal and non-fatal accidents due to dynamic work environments, high-risk tasks, subcontracting structures, and time and production pressures (Abegaz et al., 2025; Chen et al., 2021; Kim et al., 2025). Traditional safety management approaches in construction have largely emphasized technical controls, regulatory compliance, and lagging indicators such as accident and injury rates. However, growing evidence suggests that these approaches alone are insufficient to sustainably improve safety outcomes, prompting increased scholarly attention to organizational and psychosocial determinants of safety behavior (Brondino et al., 2025; Khoshakhlagh et al., 2023). Accordingly, the core research problem addressed in this study is the inadequate explanation of construction workers' safety behavior when safety management relies predominantly on technical and regulatory measures, without sufficiently accounting for how safety climate and workers' trust in safety systems influence everyday safety practices.

Recent empirical evidence suggests that occupational safety performance is strongly influenced by safety-oriented transformational leadership at the team level, which not only directly enhances safety compliance and participation, but also indirectly shapes these behaviors through the development of a positive team safety climate and increased team safety motivation (Wang et al., 2023) A substantial body of research across construction, manufacturing, energy, healthcare, and other high-risk industries consistently demonstrates that a favorable safety climate is associated with higher levels of safety compliance and participation, as well as lower accident rates (Abegaz et al., 2025; Chen et al., 2021; Shabani et al., 2025). Unlike safety culture, which reflects deeper and more stable organizational values, safety climate represents a more immediate and measurable snapshot of how safety is enacted and perceived at a given time, making it particularly valuable for diagnosing weaknesses and guiding targeted interventions in construction projects (Han, Son, & Kim, 2021; Shohet, Naveh, & Shahin, 2025). However, despite this extensive evidence, existing studies have treated mainly the mechanisms linking safety climate to safety behavior in a generalized manner, with limited explicit attention to workers' trust in the efficacy of safety systems as a mediating process through which leadership and safety climate are translated into consistent everyday safety behavior.

The predictive power of safety climate lies in its ability to shape workers' safety behavior, which is widely recognized as a primary proximal cause of occupational accidents. Safety behavior is commonly conceptualized as comprising two dimensions: safety compliance, referring to adherence to mandatory rules and procedures, and safety participation, referring to voluntary behaviors that contribute to a safer work environment (Griffin & Neal, 2000). Empirical evidence consistently shows that safety climate exerts a significant positive influence on both dimensions across construction contexts (Abegaz et al., 2025; Chen et al., 2021; Hertanto et al., 2023). Moreover, longitudinal and multilevel studies demonstrate that safety climate affects accident outcomes indirectly by influencing safety motivation, knowledge, and behavior over time (Brondino et al., 2025). These findings position safety climate as a central mechanism through which organizational intentions are translated into individual safety actions. Taken together, these findings suggest that safety climate functions not merely as a contextual predictor but as a translation mechanism through which workers must cognitively and psychologically internalize organizational safety intentions before they can be enacted as consistent safety behavior underscoring the need to examine the intervening processes that facilitate this translation.

Recent longitudinal evidence suggests that safety climate is not merely a static structural attribute or a set of managerial policies, but a dynamic social process shaped by ongoing

interactions between supervisors and coworkers, which, in turn, influences workers' safety motivation, safety knowledge, and safety behavior (Brondino et al., 2025). These findings indicate that the effectiveness of occupational safety systems depends not only on the formal existence of rules and procedures, but also on the extent to which safety values are collectively practiced, reinforced, and internalized within work teams. Supporting this view, several studies using the Nordic Occupational Safety Climate Questionnaire (NOSACQ-50) identify "workers' trust in the efficacy of safety systems" as a distinct and critical dimension of safety climate that is strongly associated with safe work practices and reduced risk-taking behavior (Alamoudi, 2022; Arooj et al., 2022). In construction environments characterized by temporary work arrangements and fragmented responsibilities, the presence or absence of trust in safety systems may therefore be especially consequential. Taken together, this study is conceptually grounded in a model in which safety climate influences safety compliance and safety participation both directly and indirectly through workers' trust in the efficacy of safety systems, positioning trust as a key mediating mechanism that translates shared safety perceptions into consistent safety behavior.

Leadership and management practices play a pivotal role in shaping both safety climate and workers' trust in safety systems within construction projects. Empirical studies in the construction sector consistently show that management safety priority, commitment, justice, and empowerment are among the most influential determinants of safety climate, as they signal the extent to which safety is genuinely valued relative to production goals (Saleem & Malik, 2022; Sankar et al., 2024; Wang et al., 2023). In construction specifically, supervisors and contractor managers exert a disproportionate influence on workers' safety perceptions by directly controlling work sequencing, resource allocation, subcontractor coordination, and the day-to-day enforcement of safety rules (Elosta & Alzubi, 2024; Kim et al., 2025). When construction leaders consistently demonstrate safety-oriented decision-making, allocate adequate resources, and respond fairly to incidents and near misses, workers are more likely to develop trust in safety systems and, in turn, display higher levels of safety compliance and safety participation (Shohet, Naveh, & Shahin, 2025; Song et al., 2024).

Recent studies also highlight the importance of mediating and moderating mechanisms linking safety climate, trust, and safety behavior. Psychological and psychosocial factors such as safety motivation, mindful organizing, work engagement, and job stress have been shown to mediate or moderate the effects of safety climate on behavior and accident risk (Dera et al., 2025; Khoshakhlagh et al., 2023; Omidi et al., 2024). Empirical evidence indicates that safety climate does not always exert a direct effect on accident outcomes; instead, it often operates indirectly by reducing job stress, strengthening cognitive vigilance, and enhancing workers' emotional readiness to act safely under demanding conditions (Khoshakhlagh et al., 2023). These findings reinforce the view that safety climate functions through a combination of structural safety arrangements and workers' subjective interpretations, underscoring the need for integrative models that explicitly account for trust in safety systems as a key psychological mechanism linking organizational safety intentions to observable safety behavior.

Despite the growing volume of safety climate research, several gaps remain evident in the construction safety literature. First, many studies examine safety climate and safety behavior without explicitly conceptualizing trust in safety systems as a core explanatory construct, even though trust-related dimensions repeatedly emerge as significant predictors in validated measurement instruments (Alamoudi, 2022; Arooj et al., 2022; Lagerstrom et al., 2019). Second, a substantial proportion of existing research relies on cross-sectional designs or focuses on single organizational levels, limiting understanding of how safety climate perceptions formed at the management or supervisory level translate into workers' trust and behavior on construction sites (Brondino et al., 2025; Wang et al., 2023). Third, empirical evidence from developing countries and complex subcontracting environments remains

fragmented, despite these contexts facing some of the most severe safety challenges (Abegaz et al., 2025; Arooj et al., 2022; Kadir et al., 2022). In response to these gaps, this study aims to advance construction safety research by examining safety climate and workers' trust in safety systems as key, interrelated determinants of safety behavior. The main contribution of this study lies in its explicit integration of trust in safety systems into the safety climate safety behavior framework, thereby providing a more nuanced explanation of how management safety practices are internalized and enacted by construction workers. The study focuses on construction workers' perceptions and behaviors, offering empirically grounded insights to inform both the development of safety theory and practical safety management strategies.

2. RESEARCH METHOD

This study employed a quantitative cross-sectional survey design to examine the relationships among safety climate, workers' trust in safety systems, and safety behavior in the construction industry. Data were collected at a single point in time from two construction companies operating within the same sector. A purposive sampling technique was used to recruit construction workers directly involved in on-site activities and sufficiently exposed to organizational safety practices. The final validated sample comprised 438 respondents (128 from Company A and 310 from Company B) after data screening. Demographic variables including gender, age, education level, and employment status were collected to explore differences in perceptions of safety climate and safety behavior across respondent groups.

Safety climate was measured using the Indonesian-language version of the Nordic Occupational Safety Climate Questionnaire (NOSACQ-50), which conceptualizes safety climate as a multidimensional construct comprising 7 dimensions and 50 items. The instrument had been previously translated and adapted for Indonesian occupational contexts to ensure linguistic and conceptual equivalence. To confirm contextual suitability for the construction sector, a pretest was conducted with four licensed senior construction safety experts, resulting in minor wording clarifications without altering the original construct meanings. Safety behavior was measured using the framework proposed by Gryphon and Neal (2000), encompassing safety compliance and safety participation. All safety climate and safety behavior items were assessed using a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree).

Data analysis included descriptive statistics, Pearson correlation, and one-way ANOVA to examine relationships and group differences. Stepwise Regression Analysis (SRA) was applied to identify the most influential safety climate dimensions predicting safety compliance and safety participation, justified by the multidimensional nature of safety climate and the need to control for intercorrelations among predictors. All statistical analyses were conducted using SPSS with a 95% confidence level ($\alpha = 0.05$). Ethical considerations were strictly observed, including voluntary participation, informed consent, and assurances of anonymity and confidentiality.

3. RESULTS AND DISCUSSION

Table 1 presents the demographic characteristics of the respondents involved in this study. A total of 438 construction workers participated, with the sample predominantly male. Most respondents were in the productive working-age group of 26–45 years and had completed senior high school education. The distribution of employment status was relatively balanced between permanent and non-permanent workers, indicating representation of diverse contractual arrangements within the construction sector.

Table 1. Demographic Characteristics of Respondents (n = 438).

Attribute	Classification	n	%
Gender	Male	423	96.6

Attribute	Classification	n	%
	Female	15	3.4
Age Group	≤ 25 years	44	10.0
	26–45 years	304	69.4
	46–65 years	90	20.6
Education Level	Junior high or below	14	3.2
	Senior high	402	91.8
	Junior college	1	0.2
	College	1	0.2
	Graduate institute	20	4.6
Worker Status	Permanent	210	47.9
	Non-permanent	228	52.1

The average scores from the Likert-scale items reflect respondents' aggregated perceptions and cognitive evaluations. For positively worded items, higher mean values indicate stronger acknowledgment of the importance of those items by the respondents. In contrast, for reverse-coded items, higher mean scores reflect lower levels of agreement regarding item importance. As shown in Table 2, the descriptive statistics for the safety climate (SC) and safety behavior (SB) items indicate that safety advice and employees' awareness of it were perceived as relatively weak aspects that warrant further improvement.

Table 2. Descriptive Statistics and Reliability of Safety Climate and Safety Behavior Dimensions.

Construct	Dimension	Mean	SD	Cronbach's α
Safety Climate	Management safety priority and ability	2.60	0.295	0.862
	Management safety empowerment	2.82	0.361	0.857
	Management safety justice	2.83	0.374	0.863
	Workers safety commitment	2.65	0.338	0.865
	Workers safety priority & risk non-acceptance	2.20	0.462	0.896
	Peer safety communication, learning & trust	3.07	0.397	0.864
	Workers' trust in safety system efficacy	2.64	0.308	0.863
Safety Behavior	Safety participation	3.50	0.506	0.862
	Safety compliance	3.52	0.530	0.859

The descriptive statistics indicate a moderate safety climate profile, with mean values ranging from 2.20 to 3.07 across dimensions. These values should not be interpreted as neutral; instead, they reveal structural weaknesses in key safety climate dimensions. In particular, the low mean score for workers' safety priority and risk non-acceptance (2.20) suggests that risk-taking behavior remains socially tolerated and insufficiently discouraged at the site level. This finding implies that safety rules may be formally in place but not fully internalized by workers as non-negotiable norms, a condition frequently reported in construction contexts characterized by production pressure and informal work practices (Alamoudi, 2022; Arooj et al., 2022).

Conversely, the relatively higher mean score for peer safety communication, learning, and trust in safety ability (3.07) indicates that informal peer-based mechanisms partially compensate for deficiencies in formal safety management. Workers rely on coworkers as immediate sources of safety guidance, which reflects adaptive behavior in environments where managerial control is intermittent or inconsistent. Similar compensatory patterns have been observed in high-risk construction and healthcare teams, where peer communication becomes a critical buffer against systemic safety gaps (Omidi et al., 2024; Shohet, Naveh, & Shahin, 2025).

The typical reliability test for the Likert-type responses is "Cronbach α," where a reliability coefficient above 0.9 indicates perfect consistency (Gay, 2012; Tavakol & Dennick, 2011). The minimum acceptable is 0.7 (DeVellis & Thorpe, 2022). Levels or constructs with Cronbach's α below 0.5 (indicating low credibility) should be rejected rejected (Chen et al., 2019). As shown in Table 2, all Cronbach α values exceeded the threshold for reliable internal consistency and were suitable for further analysis.

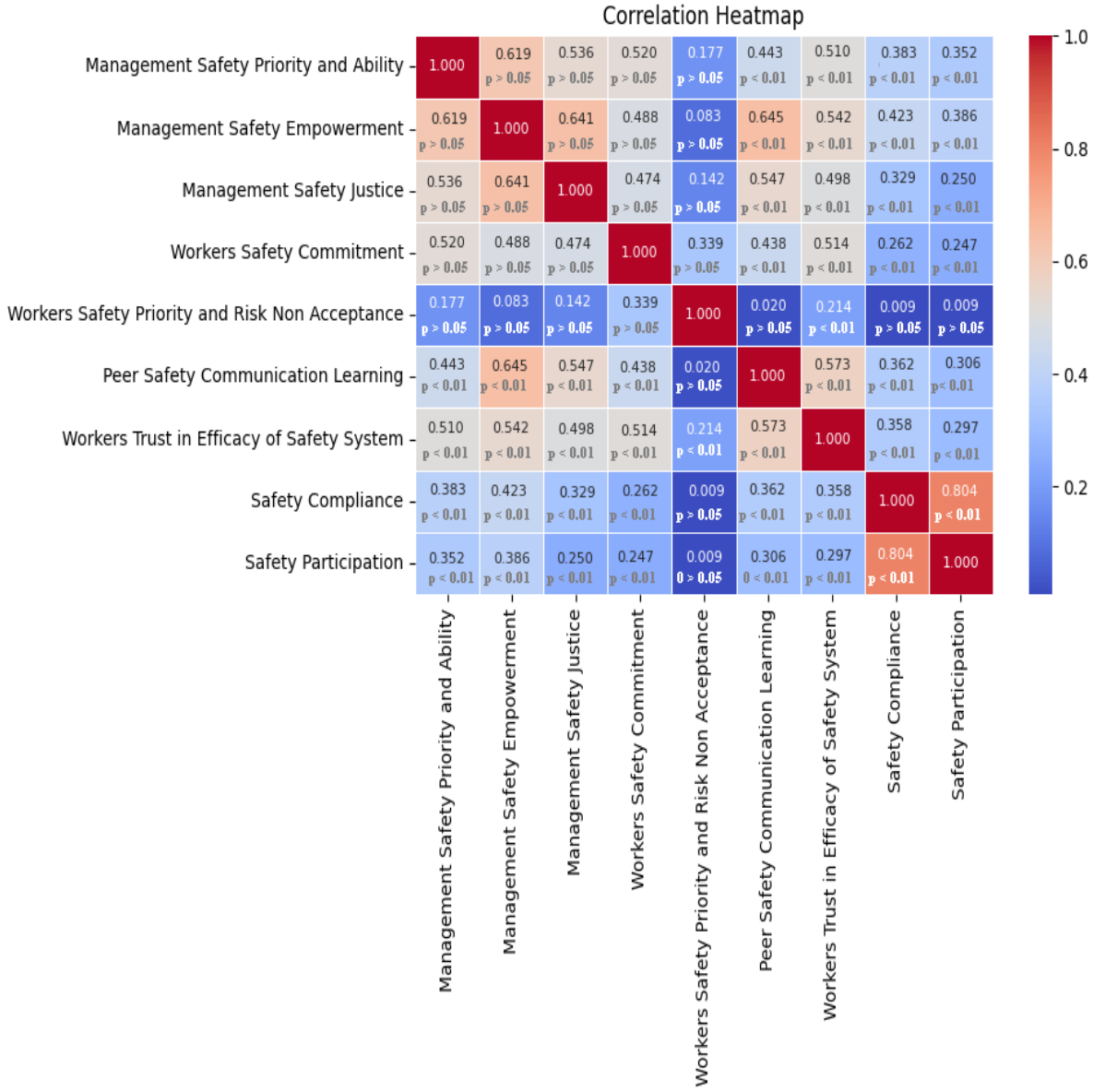

Figure 1. Correlation heatmap between SC dimensions dan SB dimensions (n=438)

A Pearson correlation test, as shown in Figure 1, was used to examine the associations between safety climate and safety behavior dimensions. The analysis demonstrated a strong positive relationship between peer safety communication learning and management safety

empowerment (r = 0.645, p < .01), suggesting that workers who perceived a more favorable safety climate were more active participants in peer-based safety communication learning. In addition, reporting intention was positively and significantly associated with workers' trust in the effectiveness of the safety system (r = 0.573, p < .01), perceptions of management safety justice (r = 0.547, p < .01), and worker safety communication (r = 0.514, p < .01). Conversely, workers' safety priority and risk non-acceptance did not exhibit a significant relationship with peer safety communication learning (r = 0.020, p > .05).

The study's findings demonstrated a strong, positive relationship between peer safety communication learning and management safety empowerment. The magnitude of this association (r = 0.645, p < .01) highlights the pivotal role of a well-established safety climate in fostering effective communication, continuous learning, and strengthening managerial safety empowerment. These results are consistent with prior research demonstrating that management empowerment substantially enhances safety communication and influences the safety climate. Recent research shows that safety-oriented leadership styles, particularly transformational leadership, play a significant role in improving workers' safety performance and commitment by strengthening their motivation and engagement in safety practices (Payne et al., 2025). Effective safety leadership practices not only increase employee engagement in the safety process but also create a work environment that supports a two-way dialogue about safety. Employee engagement and a sense of psychological safety significantly strengthen the impact of safety leadership on safety performance, and employee engagement through upward voice, along with a safety climate, contributes to proactive team learning and better safety outcomes (Quansah et al., 2023; Silla et al., 2025). This empowerment not only enhances individual agency but also improves organizational safety outcomes as employees align their personal safety values with the organization's safety goals.

Additionally, studies indicate that when employees perceive their leaders as committed to safety and open to communication, it results in enhanced trust and collaboration within teams (AlMousa et al., 2022). This collaborative spirit is instrumental in fostering a proactive safety climate in which employees are encouraged to share feedback and participate in safety training and initiatives, further embedding safety into the organizational culture (El-Sayed et al., 2025). We cannot overstate the synergy between safety communication, management empowerment, and safety climate. Upward safety communication was closely linked to strengthening the safety climate and workers' safety behavior, reflecting the important role of safety dialogue between workers and management in creating a safe work environment (Silla et al., 2025). This empowerment, supported by an open communication culture, fosters an environment where safety issues can be addressed promptly and efficiently.

Table 3. Differences in Safety Climate and Safety Behavior by Individual Characteristics.

Individual Variable	**Safety Climate (Overall) p-value**	**Safety Behavior (Overall) p-value**
Worker Status	0.031*	0.174
Age	0.001**	0.004**
Education Level	0.997	0.334

*$p < 0.05$, ** $p < 0.01$*

The gender variable was not analyzed in this study due to the highly skewed distribution of respondents between the male (423) and female (15) groups, resulting in an unbalanced data distribution that did not meet the assumption of normality for comparative analysis. This imbalance in the number of respondents across groups can increase the risk of misinterpretation and yield less stable estimates. Therefore, gender-based analysis was excluded to maintain the statistical validity and reliability of the research results.

The analysis of variance revealed that individual characteristics influenced safety perceptions differently. Worker status showed a significant difference in overall safety climate ($p < 0.05$), indicating variations in safety perceptions between permanent and non-permanent workers. Age demonstrated a consistent and significant effect on both safety climate and safety behavior ($p < 0.01$), suggesting that experience and maturity play an essential role in shaping safety-related attitudes and behaviors. In contrast, education level did not produce statistically significant differences across safety climate or safety behavior dimensions.

Based on the analysis results presented in Table 3, employment status showed a significant effect on overall safety climate ($p = 0.031$), but not on overall safety behavior ($p = 0.174$). This finding suggested that differences in employment status influence how workers perceive the organization's safety climate, particularly regarding perceived safety systems, policies, and commitment, but that these differences are not necessarily reflected directly in daily safety behavior. Thus, although groups of workers with different employment statuses had different perceptions of safety climate, their levels of safety compliance and participation were generally relatively similar. These results indicate that organization-based safety interventions need to place greater emphasis on strengthening an inclusive safety climate across employment statuses, without assuming differences in aggregate safety behavior across worker groups.

As shown in Table 3, age significantly influences both overall safety climate (SC) and overall safety behavior (SB) ($p < 0.01$). This indicates that workers' perceptions of the safety climate and their engagement in safety-related behaviors vary significantly across age groups. The significant age-related differences in safety climate suggest that experience and tenure contribute to how workers evaluate management's safety efforts and peer communication related to safety. Similarly, the significant effect of age on safety behavior indicates that older workers tend to demonstrate higher levels of safety compliance and participation. This may be attributed to accumulated experience, greater awareness of workplace risks, and stronger adherence to organizational safety procedures.

As shown in Table 3, education level does not have a statistically significant effect on either overall safety climate (SC) or overall safety behavior (SB) ($p > 0.05$). The absence of significant differences suggests that variations in formal educational attainment do not meaningfully affect workers' safety perceptions or behaviors in this study. Compared to worker status and age, education level is a less influential demographic factor in determining safety climate and safety behavior outcomes. Therefore, organizational safety interventions may benefit more from addressing differences in employment status and age than from focusing primarily on educational background.

The analysis of variance demonstrates that worker status (permanent vs. non-permanent) significantly affects both safety climate perceptions and safety behavior. Non-permanent workers reported lower perceptions of management safety priority and empowerment, as well as lower safety compliance. This suggests that contractual insecurity may weaken workers' psychological attachment to organizational safety values and reduce their willingness to engage with safety systems fully. These findings are consistent with prior construction research showing that subcontracted and temporary workers often experience marginalization in safety communication and training (Kadir et al., 2022; Kim et al., 2025)

Age also emerged as a significant differentiating factor. Older workers exhibited higher safety compliance and participation, likely due to accumulated experience, greater hazard awareness, and stronger risk appraisal capabilities. Younger workers, by contrast, may prioritize productivity or speed over safety, particularly in environments where risk-taking is implicitly rewarded. This age-based pattern aligns with previous evidence from construction and other high-risk industries, indicating that experience moderates the relationship between safety climate and safety behavior (Abegaz et al., 2025; He et al., 2023). The absence of

significant education-level effects further suggests that experiential learning and organizational position outweigh formal education in shaping safety-related perceptions and behaviors.

Table 4. Stepwise Regression Results for Predicting Safety Compliance.

Predictor	Standardized β	t	p-value	VIF
Management safety empowerment	0.249	4.342	0.000	1.825
Management safety priority and ability	0.156	2.788	0.006	1.741
Workers' trust in safety system efficacy	0.143	2.734	0.007	1.521

Model statistics: $R^2 = 0.217$, Adjusted $R^2 = 0.211$, $F = 40.071$, $p < 0.001$

The results of the stepwise regression analysis for safety compliance were presented in Table 4, with predictor variables including safety empowerment by management, management priority, and capability towards safety, and worker confidence in the effectiveness of the safety system. The coefficient of determination (R^2) of 0.217 indicated that the three variables together explained 21.7% of the variation in safety compliance. Based on the standardized beta coefficient value, safety empowerment by management is the most dominant predictor ($\beta = 0.249$), followed by management priority and capability towards safety ($\beta = 0.156$) and worker confidence in the effectiveness of the safety system ($\beta = 0.143$). All predictor variables showed a positive and significant relationship with safety compliance ($p < 0.05$), indicating that the higher the worker perception of these safety aspects, the higher the level of safety compliance. The unstandardized and standardized regression equations are presented in Equation (1) and Equation (2), respectively :

$$Y1=1.104 + 0.281X1 + 0.365X2 + 0.247X7 \quad (1)$$

$$Y1= 0.156\ X1 + 0.249\ X2 + 0.143\ X7 \quad (2)$$

Table 5. Stepwise Regression Results for Predicting Safety Participation.

Predictor	Standardized β	t	p-value	VIF
Management safety empowerment	0.272	4.900	0.000	1.620
Management safety priority and ability	0.183	3.298	0.001	1.620

Model statistics: $R^2 = 0.170$, Adjusted $R^2 = 0.166$, $F = 44.327$, $p < 0.001$

The stepwise regression analysis showed that management safety empowerment was the strongest predictor of safety compliance and safety participation across all models. The inclusion of management's safety priority and ability improved the model's explanatory power, while workers' trust in the safety system's efficacy provided an additional, though more minor, contribution. The final model explained approximately 21.7% of the variance in safety compliance and 17.0% of the variance in safety participation, indicating a moderate explanatory strength.

As shown in Table 5, the stepwise regression resulted in a final model consisting of two predictor variables, namely safety empowerment by management and management priority and

capability towards safety, with a coefficient of determination (R^2) of 0.170. This indicated that the two variables together explain 17.0% of the variation in safety participation. Based on the standardized beta coefficient value, safety empowerment by management was the most dominant predictor ($\beta = 0.272$), followed by management priority and capability towards safety ($\beta = 0.183$). All predictor variables showed a positive, statistically significant relationship ($p < 0.05$), indicating that the higher a worker's perception of management's safety commitment and empowerment, the higher the level of worker participation in safety activities. The non-standardized regression equation (Equation (3)) and the standardized regression equation (Equation (4)) are shown below:

$$Y2 = 1.605 + 0.315\ X1 + 0.382\ X2 \quad (3)$$

$$Y2 = 0.183\ X1 + 0.272\ X2 \quad (4)$$

The stepwise regression analysis (SRA) provided valuable insight into the relative importance of safety climate dimensions; however, its limitations must be acknowledged. SRA prioritises statistical contribution over theoretical structure, potentially excluding conceptually relevant variables if their incremental explanatory power is modest. As such, the absence of workers' trust in the efficacy of safety systems as a predictor of safety participation should not be interpreted as evidence of irrelevance, but rather as an indication of functional differentiation between safety behavior dimensions.

The finding that trust significantly predicts safety compliance but not safety participation suggests that trust primarily supports rule-following behavior, where adherence depends on confidence in the fairness and effectiveness of safety systems. In contrast, safety participation requires additional motivational and relational drivers, particularly empowerment, leadership support, and opportunities for involvement. This distinction is consistent with models proposing that compliance is norm-driven, whereas participation is engagement-driven (Brondino et al., 2025; Griffin & Neal, 2000). Therefore, the insignificance of trust in predicting safety participation highlights the need for integrated intervention strategies that combine trust-building with empowerment-oriented leadership to promote proactive safety behaviors.

Several study limitations warrant consideration. First, because the research adopted a cross-sectional design, it does not allow causal conclusions about the relationships among safety climate, trust in safety systems, and safety behavior. Second, the use of self-reported data introduces the possibility of common-method variance and social desirability bias, which may lead to an overestimation of observed relationships. Third, as the investigation was confined to a single national and industrial setting, the external validity and generalizability of the results may be constrained. Lastly, while age and worker status were analyzed, other potentially influential variables such as length of employment, subcontracting structures, and exposure to safety training were not examined and could further explain differences in safety climate and safety behavior.

4. CONCLUSION

This study affirms that safety climate constitutes a key determinant of construction workers' safety behavior, including both safety compliance and safety participation. The results indicate that management safety empowerment, management safety priority, and management safety priority and ability are the strongest predictors of safety behavior, underscoring the vital role of explicit managerial commitment and employee empowerment in translating safety policies into routine work practices. Trust in the effectiveness of safety systems was shown to significantly support safety compliance. However, it did not substantially influence safety participation, suggesting that trust mainly reinforces adherence to established rules. By contrast, active engagement in safety initiatives appears to depend on additional motivational and relational factors. Moreover, age and employment status were found to shape perceptions of safety climate and safety behavior significantly. In contrast, formal educational attainment showed no significant effect, highlighting the greater relevance of work experience and

employment conditions in the construction context. Overall, the findings underscore that long-term safety enhancement in the construction industry cannot be achieved solely through technical measures or regulatory enforcement, but instead requires a comprehensive strategy that enhances safety climate, strengthens trust in safety systems, and encourages empowerment-focused leadership to promote sustained and proactive safety behavior.

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