

Impact of Employer Safety Policies on Safety Performance in Ghana's Manufacturing Sector: Mediated by Safety Training

Collins Odame

Environmental & Safety Engineering Department, University of Mines and Technology, Tarkwa, Ghana

ABSTRACT: Occupational health and safety (OHS) remains a major concern in manufacturing industries, particularly in developing economies where accident rates persist despite regulatory frameworks and formal safety systems. While employer safety policies are widely regarded as essential drivers of workplace safety, limited empirical evidence explains how these policies translate into improved safety performance in high-risk industrial contexts. This study examines the impact of employer safety policies on safety performance and investigates the mediating role of safety training within Ghana's manufacturing sector. A quantitative cross-sectional design was adopted using stratified random sampling across sixteen manufacturing subsectors. Data were collected from 863 employees in large-scale manufacturing firms through structured questionnaires measuring employer safety policies, safety training, and safety performance using both leading and lagging indicators. Reliability and validity of the constructs were established prior to hypothesis testing. Structural Equation Modeling (SEM) with bootstrapped mediation analysis was conducted using R and Python software. The results indicate that employer safety policies significantly and positively predict safety performance ($\beta = 0.375$, $p < 0.001$). Safety training was also positively associated with safety performance and partially mediated the relationship between employer safety policies and safety performance (indirect effect $\beta = 0.059$, $p < 0.001$). The study contributes to OHS literature by clarifying the mechanism linking policy frameworks to safety outcomes in a developing-country manufacturing context. Practically, the findings highlight that formal safety policies must be complemented by continuous and effective safety training programmes to translate organisational safety intentions into improved workplace safety outcomes in developing industrial contexts.

Corresponding Author:
Collins Odame

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KEYWORDS:
Employer safety policies; Safety performance; Safety training; Manufacturing industry; Occupational health and safety

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INTRODUCTION

Occupational health and safety (OHS) remain a critical component of organisational sustainability, operational efficiency, and employee well-being, particularly within high-risk industries such as manufacturing (Mixafentiet al., 2025). Despite global advancements in safety technologies and regulatory frameworks, workplace accidents and occupational diseases continue to impose substantial human and economic costs on organisations and national economies (International Labour Organization, 2023). The manufacturing sector is widely recognised as one of the most hazardous industrial environments because employees are regularly exposed to mechanical, chemical, physical, and ergonomic risks during production processes (Rikhotso et al., 2022).

Globally, the International Labour Organization estimates that approximately 2.78 million workers die annually due to work-related accidents and occupational diseases, while nearly 374 million non-fatal injuries occur each year (International Labour Organization, 2023). These challenges are often more severe in developing countries where safety regulations, enforcement mechanisms, and organisational safety resources are relatively limited (Nkrumah et al., 2021). Ghana reflects similar trends.

Statistics from the Ministry of Employment and Labour Relations (2025) and Daily Graphic Online indicate that between 2020 and 2024, 4,647 occupational accident cases were recorded, resulting in 140 fatalities and 4,108 non-fatal injuries, with compensation payments totalling GHC 52,010,796. These statistics highlight persistent workplace safety challenges within Ghana’s industrial sector, particularly within manufacturing organisations where operational hazards are typically higher.

One important mechanism organisations adopt to manage workplace hazards is the development and implementation of employer safety policies. Employer safety policies refer to formal organisational rules, procedures, and guidelines designed to prevent workplace accidents and promote safe work practices (Kwon et al., 2010). These policies form a critical component of occupational health and safety management systems because they define safety expectations, allocate responsibilities, and establish organisational commitment to employee protection (Pawłowska, 2015). In Ghana, workplace safety management is guided by legislative frameworks such as the Labour Act 651 of 2003 and the Factories, Offices and Shops Act 328 of 1970, which require employers to ensure safe working conditions for employees (Osei-Boateng & Ampratwum, 2011). Consequently, organisations increasingly implement internal safety policies as part of broader efforts to improve regulatory compliance and reduce workplace accidents.

Existing literature generally suggests that effective safety policies and management practices contribute positively to organisational safety performance (Razali et al., 2018; Yorio et al., 2020). Safety performance refers to the effectiveness of organisational efforts to prevent accidents and promote safe behaviour within the workplace (Griffin & Neal, 2000). It is typically assessed using both lagging indicators, such as accident rates and injury records, and leading indicators, including safety compliance and safety participation (Pawłowska, 2015; Yorio et al., 2020). These indicators collectively provide a comprehensive understanding of safety outcomes within organisations. Empirical studies indicate that strong safety management practices can improve safety performance by influencing employee attitudes, behaviours, and adherence to safety procedures (Vinodkumar & Bhasi, 2010; Andersen et al., 2019).

However, despite the recognised importance of employer safety policies, empirical evidence regarding their effectiveness in improving safety performance within developing-country manufacturing contexts remains limited and sometimes inconsistent. For example, Dwomoh et al. (2013) find only a weak relationship between occupational safety policies and employee performance within Ghana’s timber industry. Such findings suggest that the presence of safety policies alone may not automatically translate into improved workplace safety outcomes. Instead, the effectiveness of safety policies may depend on how they are implemented and communicated within organisations.

One important mechanism that may influence this relationship is safety training. Safety training equips employees with the knowledge, skills, and hazard awareness necessary to perform tasks safely and comply with organisational safety procedures (Vinodkumar & Bhasi, 2010). Previous studies suggest that safety knowledge and motivation play a mediating role in linking management practices to safety performance (Griffin & Neal, 2000). Effective training programmes enhance workers’ ability to identify hazards, follow safety procedures, and participate in proactive safety activities, thereby contributing to improved safety outcomes (Andersen et al., 2019; Luo, 2020).

Despite growing recognition of the importance of employer safety policies and safety training, empirical evidence explaining how safety policies influence safety performance through organisational mechanisms remains limited in developing-country manufacturing environments, particularly in Ghana. Few studies explicitly examine whether safety training functions as a mediating mechanism linking employer safety policies to safety performance. This gap limits the understanding of how organisational safety policies translate into improved safety behaviour and reduced workplace accidents.

Therefore, this study investigates the impact of employer safety policies on safety performance within Ghana’s manufacturing sector and examines the mediating role of safety training in this relationship. A quantitative research design using structural equation modelling (SEM) is employed to empirically examine the relationships among employer safety policies, safety training, and safety performance. By clarifying the mechanism through which safety policies influence safety outcomes, this study contributes to the occupational health and safety literature and provides practical insights for improving safety management practices within high-risk industrial environments.

1.1 Research Hypotheses

H1: Employer safety policies positively predict safety performance in manufacturing firms.

H2: Safety training mediates the relationship between employer safety policies and safety performance



Figure 1: Conceptual Framework

MATERIALS AND METHODS

Research Design

This study adopted a quantitative research approach using a cross-sectional survey design to collect data from manufacturing firms in Ghana. The cross-sectional design was appropriate because it allowed data to be collected at a single point in time to examine relationships among study variables (Creswell, 2009). Cross-sectional designs have been widely used in occupational health and safety (OHS) research to investigate organisational safety practices and outcomes (Nordlöf et al., 2017). The design enabled the examination of relationships among key variables, including employer safety policies, safety training, and safety performance. The quantitative approach also allowed for statistical analysis and hypothesis testing, thereby supporting generalisation of the findings within the manufacturing sector (Yamoah & Nsowah, 2024).

Target Population

A population refers to the entire group of individuals or elements that a researcher intends to investigate (Sekaran & Bougie, 2016). The target population for this study consisted of factory workers and middle-level management employees from sixteen active manufacturing companies in Ghana, with a total population of 4,315 employees. The survey was conducted between October and December 2025. Manufacturing firms were selected because of their significant contribution to the national economy and their relatively higher exposure to occupational hazards compared to other sectors (Mixafenti et al., 2025).

Sampling Technique

This study employed a stratified random sampling technique to ensure adequate representation across different manufacturing sectors. Stratified sampling involves dividing the population into distinct subgroups or strata based on relevant characteristics and then randomly selecting participants from each subgroup (Creswell, 2013; Sekaran & Bougie, 2016). In occupational health and safety research, stratified sampling has been widely applied to improve representativeness and reduce sampling bias (Naji et al., 2022; Yamoah & Nsowah, 2024; Mandowa et al., 2025; Mixafenti et al., 2025).

The stratification process was based on the Ghana Statistical Service Industrial Classification System (2024) and the adaptation of the International Standard Industrial Classification (ISIC) described by Nti (2015). Sixteen manufacturing categories were identified, including food and beverages, textiles, chemicals, electronics, machinery, wood products, fabricated metal products, and other related manufacturing activities. Each category constituted a separate stratum, from which respondents were randomly selected proportionally.

Sample Size

The sample size was determined using A Priori Power Analysis conducted with G*Power version 3.1.9.4. Power analysis is commonly used in quantitative research to estimate the minimum sample size required to detect statistically significant relationships among variables (Memon et al., 2020; Kang, 2022). Following the recommendations of Cohen (1988), the analysis was based on an F-test for linear multiple regression (fixed model, R^2 increase) with a significance level of $\alpha = 0.05$, statistical power of 0.95, and a small effect size ($f^2 = 0.02$). The power analysis indicated that a minimum sample of 652 respondents was required to achieve adequate statistical power. Consequently, 863 respondents were selected through proportionate stratified sampling from the total population of 4,315 employees.

Data Collection Procedure

Data were collected using personally administered questionnaires, consistent with recommendations for survey-based quantitative research (Creswell, 2013; Sekaran & Bougie, 2016). This approach was appropriate because the study was conducted within a defined geographical area and allowed the researcher to distribute and retrieve questionnaires efficiently. Personally administering the questionnaires also enabled the researcher to clarify questions where necessary and ensure consistent understanding of the survey items.

The questionnaires were administered through on-site visits to the sixteen selected manufacturing firms. Participation was voluntary, and respondents were informed about the purpose of the study before completing the survey. Ethical considerations were observed by ensuring confidentiality, anonymity, and informed consent. Respondents were also informed of their right to withdraw from the study at any stage without consequences.

Measurement of Variables

The questionnaire consisted of two sections. The first section collected demographic and work-related information, including age, gender, education level, organisational size, job position, and work experience. The second section measured the key constructs of the study.

Employer safety policies were measured using the eight-item Work Safety Scale developed by Hayes et al. (1998). The items assessed aspects such as clarity of safety rules, enforcement of safety procedures, communication of safety policies, and consistency of policy implementation. Responses were recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Safety training was measured using a seven-item scale developed by Ghahramani et al. (2023). The instrument evaluated the frequency, relevance, and effectiveness of safety training programmes within organisations, particularly in terms of equipping employees with the knowledge and skills required to prevent workplace accidents.

Safety performance was measured using a combination of leading and lagging indicators adapted from Pawłowska (2015). Leading indicators included proactive safety behaviours such as safety inspections, audits, and safety meetings, while lagging indicators captured outcomes such as workplace accidents, near misses, and injury occurrences. The use of both indicators provided a comprehensive assessment of organisational safety outcomes (Moore et al., 2022).

Data Analysis

The collected data were analysed using R and Python statistical software. The Pearson Product–Moment Correlation Coefficient was applied to examine the strength and direction of the relationship between employer safety policies and safety performance. To assess the mediating role of safety training, mediation analysis using a bootstrapped indirect effect approach was conducted. Bootstrapping techniques were applied to estimate indirect effects and determine the significance of the mediation relationship between the study variables

RESULTS

Sample Characteristics

Out of the 863 respondents, 603 (69.9%) were males, and 260 (30.1%) were females. Most respondents were between the ages of 35 and 44 years (52.6%), followed by those aged 45–54 years (22.1%) and 25–34 years (17.8%), with only small proportions aged 55 years and above (7.1%) and 18–24 years (0.3%). In terms of education, the largest groups had secondary education (32.4%) or diploma qualifications (30.1%), followed by bachelor's degree holders (15.8%), respondents with basic education (10.9%), and those with postgraduate qualifications (10.8%). Regarding job roles, supervisors formed the largest group (40.3%), closely followed by factory hands (37.2%), while managers represented 20.2% and other roles accounted for 2.3%. Work experience was generally high, with nearly half of respondents having 6–10 years of experience (47.3%), followed by 1–5 years (30.5%) and more than 10 years (16.3%), while only 5.9% had less than one year of experience.

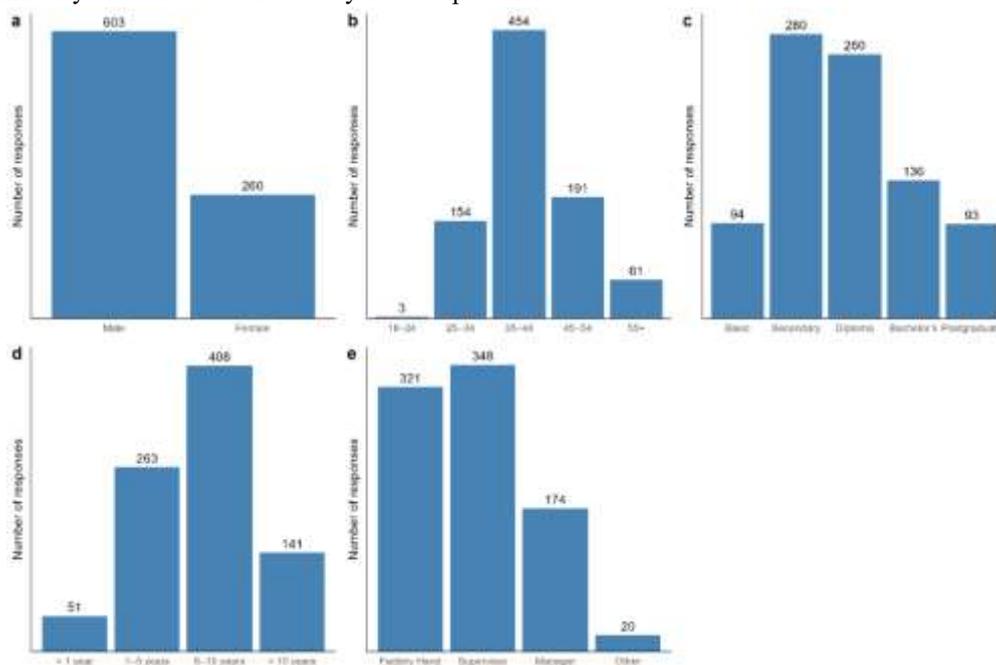


Figure 1. Demographics of employees interviewed (N=863): (a) Gender, (b) Age, (c) Educational level, (d) Years of working experience, and (e) Job title

Model Assessment

The measurement model was assessed to evaluate the reliability and validity of the constructs: Employer Safety Policies (ESP), Safety Training (ST), and Safety Performance (SP). Internal consistency reliability was examined using Cronbach's alpha and composite reliability (CR), while convergent validity was assessed using factor loadings and average variance extracted (AVE).

As shown in Table 1, Cronbach's alpha values ranged from 0.73 to 0.87, exceeding the recommended threshold of 0.70, indicating satisfactory internal consistency reliability (Hair et al., 2019). Similarly, composite reliability values ranged from 0.74 to 0.88, which also surpassed the recommended minimum of 0.70, confirming the reliability of the measurement scales.

Convergent validity was evaluated using standardized factor loadings and AVE values. All measurement items loaded significantly on their respective constructs with factor loadings above 0.70, indicating strong indicator reliability. In addition, the AVE values

for all constructs exceeded the recommended threshold of 0.50, demonstrating that the constructs explained more than half of the variance of their respective indicators (Fornell & Larcker, 1981).

Discriminant validity was assessed using the Fornell–Larcker criterion, which compares the square root of AVE for each construct with the correlations between constructs. The results showed that the square root of AVE for each construct was greater than its correlations with other constructs, indicating adequate discriminant validity. This confirms that each construct captures a unique aspect of the safety management system and is empirically distinct from the others.

Overall, the results indicate that the measurement model demonstrates satisfactory reliability, convergent validity, and discriminant validity, thereby supporting the adequacy of the constructs for subsequent structural analysis.

Table 2. Psychometric characteristics of structures and variables

| Variable | M | SD | Factor Loading | t-statistics | Cronbach's Alpha | CR |
|----------|------|------|----------------|--------------|------------------|-------|
| ESP | | | | | 0.865 | 0.854 |
| ESP2 | 3.83 | 1.07 | 0.98 | 844.87 | | |
| ESP3 | 3.83 | 1.03 | 0.98 | 698.62 | | |
| ESP4 | 3.83 | 1.06 | 0.97 | 567.36 | | |
| SP | | | | | 0.743 | 0.545 |
| SP10 | 4.16 | 0.73 | 0.949 | 259.71 | | |
| SP11 | 4.14 | 0.72 | 0.97 | 406.09 | | |
| SP12 | 4.14 | 0.72 | 0.999 | 729.96 | | |
| ST | | | | | 0.727 | 0.743 |
| ST3 | 4.22 | 0.74 | 0.989 | 408.67 | | |
| ST4 | 4.22 | 0.74 | 0.959 | 271.81 | | |
| ST5 | 4.22 | 0.75 | 0.926 | 174.59 | | |

Descriptive Statistics of Study Variables

Descriptive statistics for the construct-level variables are presented in Table 2. Respondents reported moderate to high levels of Employer Safety Policies (M = 3.83, SD = 1.05), Safety Training (M = 4.22, SD = 0.74), and Safety Performance (M = 4.14, SD = 0.72).

Table 3. Descriptive Statistics of Study Constructs (N = 863)

| Construct | Mean ± SD |
|--------------------------|-------------|
| Employer Safety Policies | 3.83 ± 1.05 |
| Safety Training | 4.22 ± 0.74 |
| Safety Performance | 4.14 ± 0.72 |

Correlation Analysis

Pearson correlation analysis was conducted to examine the relationships among the key study variables. As shown in Table 3, Employer Safety Policies were positively and significantly correlated with Safety Performance ($r = 0.55$, $p < 0.001$) and Safety Training ($r = 0.26$, $p < 0.001$). Safety Training was also positively and significantly correlated with Safety Performance ($r = 0.45$, $p < 0.001$).

Table 4. Correlation Matrix

| Variables | r | p-value |
|---|-------|---------|
| Employer Safety Policies ↔ Safety Performance | 0.549 | <0.001 |
| Employer Safety Policies ↔ Safety Training | 0.257 | <0.001 |
| Safety Training ↔ Safety Performance | 0.455 | <0.001 |

Direct Effect of Employer Safety Policies on Safety Performance

A regression analysis was conducted to examine the direct effect of Employer Safety Policies on Safety Performance. The results in Table 4 indicate that Employer Safety Policies had a positive and statistically significant effect on Safety Performance ($\beta = 0.375$, $p < 0.001$).

Table 5. Direct Effect of Employer Safety Policies on Safety Performance

| Predictor | Coef. | Std. Err. | t | p-value | 95% CI |
|--------------------------|-------|-----------|-------|---------|----------------|
| Constant | 2.710 | 0.077 | 35.13 | <0.001 | [2.56, 2.86] |
| Employer Safety Policies | 0.375 | 0.019 | 19.28 | <0.001 | [0.337, 0.413] |

Mediation Analysis of Safety Training

A mediation analysis was performed to examine whether Safety Training mediates the relationship between Employer Safety Policies and Safety Performance. As presented in Table 5, the path from Employer Safety Policies to Safety Training was positive and statistically significant ($\beta = 0.178$, $p < 0.001$), and the path from Safety Training to Safety Performance was also positive and statistically significant ($\beta = 0.448$, $p < 0.001$). The indirect effect of Employer Safety Policies on Safety Performance through Safety Training was statistically significant, as the bootstrapped confidence interval did not include zero. The direct effect of Employer Safety Policies on Safety Performance remained significant.

Table 6. Mediation Analysis Results

| Path | Coefficient | SE | p-value | 95% CI | Supported |
|--|-------------|-------|---------|----------------|-----------|
| Employer Safety Policies → Safety Training | 0.178 | 0.023 | <0.001 | [0.133, 0.223] | Yes |
| Safety Training → Safety Performance | 0.448 | 0.03 | <0.001 | [0.390, 0.507] | Yes |
| Total Effect | 0.375 | 0.019 | <0.001 | [0.337, 0.413] | Yes |
| Direct Effect | 0.316 | 0.019 | <0.001 | [0.279, 0.352] | Yes |
| Indirect Effect | 0.059 | 0.011 | <0.001 | [0.041, 0.084] | Yes |

IV. DISCUSSION

This study examines the impact of employer safety policies on safety performance and the mediating role of safety training within Ghana's manufacturing sector. The findings provide empirical evidence supporting both hypotheses and contribute to the growing body of research on occupational health and safety (OHS) management in high-risk industrial environments.

The results indicate that employer safety policies exert a positive and statistically significant influence on safety performance ($\beta = 0.375$, $p < 0.001$), accompanied by a moderate positive correlation ($r = 0.549$, $p < 0.001$). This finding supports H1 and aligns with previous research demonstrating that structured employer safety policies improve organisational safety outcomes. For example, Razali et al. (2018) show that safety management practices significantly predict safety performance across organisations. Similarly, Tawfeeq et al. (2024) demonstrate that well-implemented safety management systems enhance safety performance indicators within industrial settings. The findings also corroborate the work of Olanipekun et al. (2022), who report a positive association between occupational health policies and employee performance outcomes. In addition, Nkrumah et al. (2021) emphasise that effective OHS management practices improve employee motivation and performance by strengthening perceptions of management commitment to safety.

The present study extends these findings within the context of Ghana's manufacturing sector. The results suggest that when safety policies are clearly defined, consistently enforced, and effectively communicated, they translate into measurable improvements in safety performance. These findings are consistent with Wachter & Yorio (2014), who demonstrate that comprehensive safety management systems and strong worker engagement contribute significantly to accident reduction. Similarly, Wang, He & Wang (2026) report that managerial safety practices including safety training, communication, and policy enforcement predict higher levels of safety compliance and participation. The positive relationships observed in this study also align with Otitolaiye and Aziz (2025), who identify significant associations between aggregated safety practice indices and multiple dimensions of safety performance within manufacturing-related organisations. Collectively, these studies reinforce the argument that employer driven safety policies form a critical foundation for improving organisational safety performance.

The mediation analysis further provides important theoretical and practical insights. The results indicate that safety training significantly mediates the relationship between employer safety policies and safety performance (indirect effect $\beta = 0.059$, $p < 0.001$), supporting H2. Although the direct effect of employer safety policies on safety performance remains significant ($\beta = 0.316$, $p < 0.001$), the presence of a significant indirect effect indicates partial mediation. This finding suggests that safety policies influence safety performance both directly and indirectly through training interventions.

This result aligns with the theoretical framework proposed by Vinodkumar and Bhasi (2010), which emphasises the role of safety training in strengthening employees' hazard recognition, risk awareness, and compliance with safety procedures. Training therefore serves as a mechanism that translates formal organisational policies into safe workplace behaviours. Similarly, Loebbaka (2008) reports a negative relationship between safety training and accident frequency, indicating that organisations with stronger training programmes experience fewer workplace incidents. More recent evidence from Wang, He & Wang (2026) also demonstrates that safety training and incentive mechanisms strongly predict safety compliance and participation and mediate the influence of managerial commitment on employee safety behaviours.

The findings therefore highlight the critical role of safety training as an operational mechanism through which employer safety policies influence workplace safety outcomes. Within the Ghanaian manufacturing environment where technological complexity and exposure to mechanical and chemical hazards remain relatively high formal safety policies alone may not be sufficient to ensure safe behaviour. Continuous and context-specific training enables employees to understand, internalise, and apply safety procedures in their daily tasks, thereby improving organisational safety performance.

Overall, the results support contemporary OHS theory, which emphasises the interaction between management commitment, formal safety systems, and behavioural interventions in achieving sustainable safety outcomes. The findings demonstrate that safety policies become more effective when supported by structured training programmes that translate policy directives into practical workplace behaviours.

V. CONCLUSION

This study investigates the impact of employer safety policies on safety performance and examines the mediating role of safety training within Ghana's manufacturing sector. The findings demonstrate that employer safety policies significantly and positively influence organisational safety performance. The results further show that safety training partially mediates this relationship, indicating that structured training programmes strengthen the translation of safety policies into improved safety outcomes.

The study contributes to the occupational health and safety literature by clarifying the mechanism through which organisational safety policies influence safety performance. Specifically, the findings highlight safety training as a critical behavioural and organisational pathway that enhances the effectiveness of employer safety policies. From a practical perspective, the results suggest that manufacturing organisations should not only establish comprehensive safety policies but also invest in continuous and well-structured safety training programmes to maximise safety performance improvements. Strengthening the integration of safety policies with training initiatives may therefore enhance employee safety awareness, compliance with safety procedures, and overall workplace safety performance.

In the context of persistent occupational accidents within Ghana's industrial sector, strengthening employer safety frameworks and embedding them within systematic training programmes provides a viable strategy for reducing workplace injuries and promoting sustainable organisational safety performance.

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