Factors Influencing Employees' Perceptions of Occupational Safety Management in Plastic Manufacturing Factories in Lamphun Province

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Abstract

This study investigates the factors influencing employees' perceptions of occupational safety management in plastic manufacturing factories in Lamphun Province, Thailand, a growing industrial hub with significant safety challenges. The research was guided by two objectives: (1) to examine employees' perceptions of occupational safety management and (2) to identify the organizational and managerial factors shaping these perceptions. The study applied a quantitative research design to ensure systematic measurement and generalizable findings. A sample of 400 respondents was drawn from 58 factories, consisting of 58 managers, 58 safety officers, and 284 production employees, using stratified and proportional sampling methods. Structured questionnaires were developed and validated with expert review and a pilot test, yielding a Cronbach's alpha of 0.914, indicating high reliability. Data were analyzed using descriptive statistics, Pearson's correlation, and multiple regression techniques. Findings revealed that employees generally reported high perceptions of safety management (Mean = 4.06, SD = 0.50), recognizing strong practices such as accident investigations, new-hire safety orientation, hazard surveys, and regular health examinations. Managers expressed high levels of safety attitudes (Mean = 4.34, SD = 0.31), especially toward policy and compliance, whereas safety officers demonstrated moderate overall practice (Mean = 3.20, SD = 0.30) with notable strengths in safety management, surveying, and prevention but less consistency across domains. Correlation analysis indicated that managerial attitudes were positively associated with officers' practices (r = .38–.52, p ≤ .01), which in turn significantly influenced employees' perceptions, confirming an indirect leadership effect. Regression analysis identified officers' visible management practices (e.g., safety committees, training, role assignments) as the strongest predictor of employees' safety perceptions (β = .194, p = .027). Interestingly, managerial planning attitudes exhibited negative coefficients across several models, suggesting that over-formalized or misaligned planning weakened effective safety implementation. These results support safety-climate theory by demonstrating that employees' perceptions are shaped less by direct managerial attitudes than by the practices operationalized by safety officers. The findings highlight the importance of aligning leadership, officer practices, and employee engagement to strengthen occupational safety outcomes. The study contributes to the literature by contextualizing safety management within Thailand's industrial sector and offers practical implications for policymakers and factory managers to refine training, participatory planning, and continuous improvement in safety systems.

Keywords: Occupational Safety, Employee Perceptions, Plastic Manufacturing

INTRODUCTION

Occupational health and safety (OHS) has become a central concern for governments, businesses, and civil society worldwide, particularly in labor-intensive industrial sectors. As modern economies grow increasingly competitive and interconnected, the costs of workplace accidents both direct and indirect are receiving greater attention from executives, regulators, and scholars. Direct impacts of unsafe conditions include injuries, disabilities, fatalities, and damage to equipment or facilities. These events carry significant financial costs, such as medical expenses, compensation payments, repairs, and downtime in production. Indirect impacts include lost work time, reduced morale, reputational harm, and diminished competitiveness in global markets (International Labour Organization [ILO], 2018; Reason, 1997). In today's global economy, workplace safety is therefore not only a legal or ethical requirement but also a strategic imperative for sustaining productivity, competitiveness, and long-term profitability. Research in occupational safety consistently demonstrates that the majority of workplace accidents can be prevented through effective safety management systems. Heinrich's (1931) seminal "Domino Theory" emphasized unsafe acts and hazardous conditions as root causes of accidents, while more recent perspectives highlight the interplay between organizational systems, management commitment, and employee behavior (Geller,

2001; DeJoy, 2005). Indeed, modern safety management is no longer viewed as a mere expense but as a form of strategic investment. When safety practices are embedded into organizational culture and supported by senior leadership, firms experience not only fewer accidents but also improved productivity and employee morale (Clarke, 2013; Mullen, Kelloway, & Teed, 2017). Thailand, like many emerging economies, faces significant challenges in strengthening occupational safety systems, especially in rapidly industrializing regions. Studies highlight that while employees often demonstrate strong personal safety practices, institutional systems such as laboratory protocols, waste management, and emergency preparedness remain underdeveloped (Sattayatham & Promas, 2019; Chokchai & La-orchan, 2019). This imbalance reflects global patterns: workers may adopt protective behaviors, but systemic supports such as safety infrastructure, training, and leadership are frequently insufficient (Bryce, Copes, & Gamage, 2020). Consequently, researchers have called for more integrated approaches that combine individual-level training with organizational-level investment in safety systems and leadership accountability (Bevilacqua, Ciarapica, & Mazzuto, 2018).

Lamphun Province in northern Thailand provides a compelling context for examining these dynamics. The province is a key industrial hub in the North, hosting multiple manufacturing clusters including food processing, electronics, rubber, and plastic industries. According to national statistics, the number of plastic manufacturing factories in Lamphun reached approximately 90 in 2023–2024, with a total registered investment of 35,896 million baht and an estimated workforce of 198,529 employees. This concentration of labor-intensive industries underscores both the economic significance of the sector and the heightened risks associated with occupational hazards. The growth of plastic and rubber manufacturing in particular reflects broader industrial expansion in the region, but it also introduces elevated risks due to exposure to chemicals, heat, noise, and machine-related accidents (National Research Council of Thailand, 2012; Gogtay, Doshi, & Kshirsagar, 2018). Recent data further demonstrate the urgency of improved safety management in this context. National statistics from the Workmen's Compensation Fund of the Social Security Office (Ministry of Labor) reveal a consistent rise in reported occupational accidents between 2022 and 2024. Cases range in severity from minor injuries requiring fewer than three days off work to more serious incidents involving permanent disability or death. While provinces such as Nakhon Ratchasima report particularly high incident rates, Lamphun's expanding industrial base indicates parallel risks, especially in sectors characterized by chemical use, heavy machinery, and high-volume production processes. Thus, enhancing safety perceptions and practices among employees in Lamphun's plastic manufacturing sector is both an economic and social priority. Historically, Thai businesses often treated safety expenditures as non-essential costs, resulting in limited budgets for protective equipment, training, and system-wide risk management. Early studies reported minimal annual investments in safety sometimes less than 5,000 baht per employee per year restricted largely to basic protective gear (Anonothai, 1994). Safety was often delegated solely to designated officers or committees, rather than integrated across management systems (Ritthichai, 2000). Such approaches proved inadequate for addressing systemic risks, as they focused narrowly on individual errors rather than organizational failures. This reflects the limitations of traditional accident theories that attributed incidents primarily to "human error," neglecting structural contributors such as inadequate training, poor design, or weak managerial oversight (Reason, 2016; Hale & Borys, 2013). Contemporary approaches to safety management, however, emphasize systems thinking and leadership engagement. Frameworks such as ISO 45001 (2018) promote comprehensive safety management systems that integrate management responsibility, worker participation, hazard identification, and continuous improvement. Similarly, Zohar's (2010) extensive research on safety climate underscores that employees' perceptions of organizational safety commitment are critical predictors of actual safety behaviors and outcomes. When workers perceive strong leadership, clear communication, and reliable infrastructure, they are more likely to comply with safety procedures and contribute to collective risk reduction (Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010). Against this backdrop, the present study investigates the factors influencing employees' perceptions of occupational safety management in plastic manufacturing factories in Lamphun Province. By focusing on employee perceptions, the study aligns with the safety climate tradition, which emphasizes the psychological and cultural dimensions of workplace safety (Zohar & Luria, 2005). Employees' perceptions are not merely subjective views; they are powerful indicators of how organizational policies, practices, and leadership are actually experienced on the ground. Exploring these perceptions provides valuable insights into whether safety policies are effectively implemented, whether resources are adequate, and whether management is genuinely committed to occupational health. In Lamphun, the intersection of rapid industrial growth, increasing accident statistics, and underdeveloped

systemic safety measures makes this research both timely and significant. Understanding the determinants of safety perceptions among employees can guide managers and policymakers in designing targeted interventions that address both behavioral and structural dimensions of occupational risk. This is particularly important in the plastic manufacturing sector, where workers face a combination of chemical, ergonomic, and machine-related hazards. Identifying which factors such as training, leadership support, infrastructure, or organizational culture most strongly shape perceptions will help allocate resources effectively and foster a culture of safety that benefits employees, firms, and the broader economy. In summary, occupational safety in Lamphun's plastic manufacturing sector is not merely a matter of compliance but a strategic necessity for economic growth and social well-being. With the province serving as a northern industrial hub and employing nearly 200,000 workers in high-risk sectors, ensuring robust safety management is essential. This study contributes to that effort by analyzing the factors that influence employees' perceptions of safety management, offering evidence-based insights for preventing accidents, enhancing well-being, and strengthening organizational competitiveness.

Research Objectives
1. To examine employees' perceptions of occupational safety management in plastic manufacturing factories in Lamphun Province.
2. To identify the factors influencing employees' perceptions of occupational safety management in plastic manufacturing factories in Lamphun Province.

LITERATURE REVIEWS
1) Theories and Concepts of Perception. Perception refers to the process through which individuals select, organize, and interpret stimuli in their environment to create meaning and guide behavior (Robbins & Judge, 2019). In the context of occupational safety, perception influences how employees recognize risks, evaluate safety policies, and comply with procedures. Neal and Griffin (2006) emphasized that employees' safety perceptions are shaped by both organizational climate and individual motivation, which in turn affect actual safety behavior. Similarly, Zohar and Luria (2005) proposed a multilevel model of safety climate showing that organizational-level practices and group-level interactions combine to shape safety-related perceptions and behaviors. These insights highlight the need to examine not only policies and structures but also how employees subjectively perceive safety management efforts. 2) Theories and Concepts of Safety, Occupational safety has long been conceptualized as freedom from harm, accidents, or work-related illnesses (International Labour Organization [ILO], 2018). Heinrich's (1931) Domino Theory explained accidents as sequential events often initiated by unsafe acts or conditions, while Reason (1997, 2016) advanced the Swiss Cheese Model to show that organizational accidents arise when multiple system defenses fail. Both models underscore the importance of addressing structural and human factors simultaneously. In Thailand, Sattayatham and Promas (2019) observed that industrial safety challenges remain prevalent due to gaps in enforcement, training, and systemic management. Importantly, the World Health Organization (WHO, 2021) stresses that occupational health must integrate prevention, protection, and adaptation to evolving industrial risks. For employees in plastic manufacturing factories, safety encompasses personal practices such as the use of protective equipment, environmental conditions like ventilation and waste management, and organizational measures including safety committees and emergency response systems (Bryce, Copes, & Gamage, 2020). 3) Safety Management in Organizations, Modern occupational safety management has shifted from reactive accident prevention toward proactive systems-based management (Bevilacqua, Ciarapica, & Mazzuto, 2018). ISO 45001 (2018) formalized safety management systems emphasizing leadership commitment, worker participation, risk assessment, and continual improvement. Cooper (2015) argued that leadership style directly affects safety outcomes, with transformational and participatory leadership producing stronger safety climates. This is consistent with Clarke's (2013) meta-analysis, which found that transformational leadership positively predicts employee safety compliance and participation. In the Thai context, the National Research Council of Thailand (2012) issued guidelines for laboratory and industrial safety management that highlight the role of management, safety committees, and safety officers in coordinating policies and practices. These guidelines align with Vinodkumar and Bhasi's (2010) findings that management commitment, training, and communication significantly shape safety knowledge and motivation, which mediate safe behavior. Moreover, Mullen, Kelloway, and Teed (2017) demonstrated that employer obligations combined with effective leadership can enhance employee safety performance. 4) Employees' Perceptions of Safety Management, Employees' perceptions of safety management involve awareness of organizational

structures, rules, and preventive measures designed to ensure safety at work. When employees perceive safety policies as credible and well enforced, they are more likely to engage in safe practices (DeJoy, 2005). Safety surveys and audits serve as tools for identifying risk factors, assessing policy effectiveness, and adjusting interventions (Haddad, Carayon, & Smith, 2021). Preventive strategies—such as personal protective equipment, hazard signage, training, and regular inspections—are essential not only for compliance but also for shaping positive employee perceptions of organizational commitment (Geller, 2001). In Lamphun Province, where plastic manufacturing represents a growing industrial sector, employees' perceptions are particularly important given the region's rising accident statistics and the industry's inherent risks in handling chemical and mechanical processes. Understanding these perceptions can guide management and policymakers in designing interventions that address both behavioral and systemic safety factors, thereby reducing accidents and strengthening competitiveness and as shown in Figure 1 Conceptual Framework.
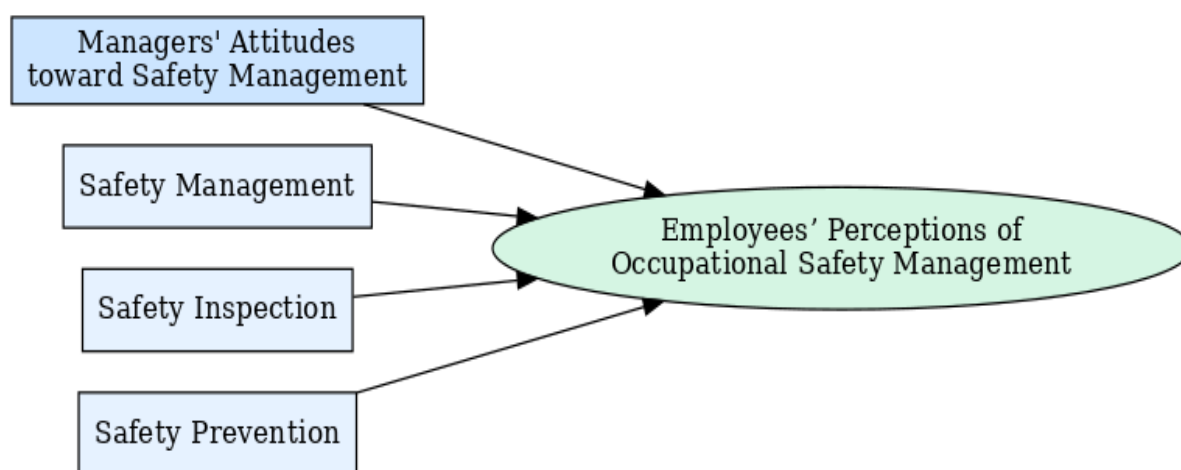

Figure 1 Conceptual framework of

RESEARCH METHODOLOGY

This study investigates factors influencing employees' perceptions of occupational safety management in plastic manufacturing factories in Lamphun Province. A quantitative research design was adopted because it allows for systematic collection and statistical analysis of numerical data, enabling generalizable conclusions (Creswell & Creswell, 2018). The methodology included defining the population and sample, developing and validating the research instrument, collecting data, and applying appropriate statistical analyses. Population and Sample, The population comprised stakeholders in plastic manufacturing factories in Lamphun Province at the end of 2024, including managers, safety officers, and production-level employees. According to official records, 80 factories were operating in the province. The sample size was calculated using Yamane's (1973) formula with a 95% confidence level, which is widely applied in management and social sciences research. The final sample included 58 factories, 58 managers, 58 occupational safety officers, and 384 production employees, yielding a total of 400 respondents. Stratified and proportional sampling ensured representation across organizational levels, while simple random and convenience sampling facilitated accessibility, consistent with best practices in survey research (Etikan & Bala, 2017). Research Instrument, Data were collected using structured questionnaires designed from prior studies on occupational safety management and aligned with international guidelines (International Labour Organization [ILO], 2018; Zohar, 2010). The instrument comprised three sets of questionnaires, 1) Managers' questionnaire: Captured demographic data, factory size, and attitudes toward occupational safety policies, rules, support, and planning. 2) Safety officers' questionnaire: Focused on demographic data and practical safety management activities, including hazard identification, preventive measures, and legal compliance. 3) Employees' questionnaire: Assessed demographic data and perceptions of safety management, safety surveys, and preventive practices in the workplace. Items used a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5), a scale suitable for measuring attitudes and perceptions (Likert, 1932). Content validity was established by review from an expert panel, including a provincial labor safety officer. Reliability was tested through a pilot study with 50 employees from five factories not included in the final sample. Cronbach's alpha was 0.914, exceeding the acceptable threshold of 0.70 (Nunnally & Bernstein, 1994), confirming strong internal consistency. Data Collection, Primary data were collected through on-site surveys in sampled

factories. Researchers and trained undergraduate assistants administered the questionnaires, ensuring that respondents clearly understood the items. Participation was voluntary, and anonymity was assured to minimize response bias. Data collection adhered to ethical research practices, emphasizing informed consent and confidentiality (American Psychological Association [APA], 2020). Data Analysis, Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic variables and general safety perception levels. Cutoff criteria followed Likert-based interpretive ranges: 1.00–1.80 = very low, 1.81–2.60 = low, 2.61–3.40 = moderate, 3.41–4.20 = high, and 4.21–5.00 = very high (Sekaran & Bougie, 2016). Inferential analyses tested relationships between independent variables (managers' attitudes, safety management practices, safety surveys, and prevention measures) and the dependent variable (employees' perceptions of safety management). Pearson's correlation coefficients assessed bivariate relationships, while multiple regression analysis using the stepwise method identified the most influential predictors. Statistical significance was set at the 0.05 level, in line with conventional practice (Field, 2018). By employing a rigorous quantitative methodology, this study ensures valid and reliable findings. The integration of managerial, officer, and employee perspectives provides a comprehensive view of safety management in the plastic manufacturing sector. The use of validated tools and robust analyses strengthens the credibility of the results, which can inform safety practices, policy design, and future research in industrial safety management.

RESEARCH RESULTS

This section presents the empirical findings of the study, "Factors Influencing Employees' Perceptions of Occupational Safety Management in Plastic Manufacturing Factories in Lamphun Province." Results are organized to mirror the study objectives and to align with contemporary safety-management frameworks (ISO 45001:2018; ILO, 2018). 1) Sample characteristics. Factory size. The Lamphun plastic-manufacturing sample comprised mostly large factories (27; 46.60%), followed by medium (25; 43.10%) and small factories (6; 10.30%). This structure reflects the province's role as a northern industrial base with sizable, process-intensive plants. Managers. Respondents were predominantly male (n = 48; 82.80%). A majority were ≥41 years (53.44%); the remainder were 20–40 years (46.56%). Most held a bachelor's degree (65.50%). Tenure skewed experienced: ≥5 years (55.20%) vs. <5 years (44.83%). Professional safety officers. Most were male (81%). Age clustered at ≥41 years (36.20%) and 31–40 years (34.60%). Nearly all held at least a bachelor's degree (≈81%). Tenure centered at 4–5 years (36.33%) and 3–4 years (34.60%), suggesting established practice routines in safety administration. Production employees. Most were male (74.50%), aged 30–40 (49.25%) or 20–30 (40.50%). Education was mainly below upper secondary (36.75%) or upper secondary (33.75%). Tenure centered at 3–4 years (36.75%) and 2–3 years (25.75%). This profile indicates a mid-career, operationally experienced workforce an important backdrop because tenure often predicts safer work behaviors through tacit knowledge (Neal & Griffin, 2006). 2) Managers' attitudes toward industrial safety, Managers reported high overall safety attitudes (Mean = 4.34, SD = 0.31). Subdimension means were all high: policy (M = 4.52, SD = 0.40), safety rules (M = 4.14, SD = 0.60), support (Mean = 4.39, SD = 0.35), and planning (Mean = 4.35, SD = 0.43). Item patterns point to strong endorsement of formal policy statements, explicit assignment of safety responsibilities in job descriptions, compliance with statutory requirements, annual health checks, new-hire safety orientation, and pre-placement medical exams plus post-incident recovery planning. From a safety-climate perspective, these findings are consistent with evidence that leadership signals policy clarity, visible support, and compliance expectations—anchor the "shared perceptions" that constitute safety climate (Zohar, 2010; Clarke, 2013). They also echo ISO 45001's emphasis on leadership commitment, worker participation, and planning as system pillars. 3) Safety officers' safety-management practices, Safety officers' overall practice was moderate (Mean = 3.20, SD = 0.30) despite several high subdomain scores: Safety management (Mean = 4.34, SD = 0.30): frequent actions included establishing safety committees and delivering safety training, with formal, signed OHS policy in place. Safety surveying (Mean = 4.32, SD = 0.41): routine accident investigations, identification of "hazard hotspots," and updates to lists of high-risk tasks were prevalent. Prevention (Mean = 4.19, SD = 0.63): adequate fire-fighting equipment and annual health screening featured most prominently. Legal compliance (Mean = 4.00, SD = 0.83): officers emphasized compliance with ministerial regulations on heat, illumination, and noise, and with electrical safety requirements. The mix of high domain-specific practices with moderate overall performance suggests uneven maturity across processes common in laboratories and process industries where formal structures may precede full behavioral institutionalization (Bryce et al., 2020; Bevilacqua et al., 2018). The relative strength of incident investigation and risk mapping aligns with best practice in hazard identification and operational control (Reason, 1997, 2016; ISO 45001, 2018). 4)

Employees' perceptions of safety management, Employees reported high overall perceptions of company safety management (Mean = 4.06, SD = 0.50). Subdimensions were also high: Perceived safety management (PSM: Mean = 4.04, SD = 0.52): the most salient item was "every accident is investigated," followed by "new-hire safety orientation." Perceived safety surveying (PSS: Mean = 4.05, SD = 0.64): "monitoring hazardous areas" and "surveying hazardous task steps" were highly recognized. Perceived prevention (PSP: Mean = 4.10, SD = 0.46): employees most recognized annual health examinations and access to medical services. These results indicate that front-line workers can see and experience core elements of the OHS program an important validation because perceptions of system reliability and responsiveness are strong antecedents of safety compliance and participation (Vinodkumar & Bhasi, 2010). 5) Correlation analysis, Pearson correlations examined associations among managers' attitudes, safety-officer practices, and employees' perceptions: Managers' overall attitudes (ATT) correlated positively with safety-officer practice domains management (ACM), surveying (ACS), prevention (ACP), and legal (ACL) with moderate magnitudes (r = .38–.52, p ≤ .01). Employees' overall perception (PST) correlated positively with ACM, ACS, ACP, and ACL (see Tables 4.19 and 4.28 in the technical appendix). The pattern suggests a cascading chain: leadership attitudes → safety-officer practices → worker perceptions consistent with multilevel models of safety climate (Zohar & Luria, 2005) and research linking leadership to safety citizenship via system supports (Clarke, 2013; Mullen et al., 2017). 6) Multiple regression analyses, 6.1 Predicting employees' overall perception (PST), A stepwise multiple regression with ATT, ACM, ACS, and ACP as predictors identified ACM as the sole significant predictor of PST: b = 0.226, β = 0.194, t = 2.22, p = .027; model F = 2.93, p = .021; R^2 = .029, adj. R^2 = .019. Interpretation: when day-to-day safety management actions are more visible/consistent (e.g., committee operation, routine training, documented responsibilities), workers report stronger perceptions that "the company manages safety well." The explained variance is modest typical in perception models with multiple unmeasured influences (e.g., peer norms, production pressure) but the directional clarity aligns with safety-system theory that management controls are proximal levers for front-line perceptions (Reason, 2016). 6.2 Which managerial attitudes shape officers' practices? 6.2.1 Predicting officers' overall safety-management practice (ACT). Significant predictors were safety rules attitude (ATL) (b = .443, β = .528, p < .001), support attitude (ATS) (b = .514, β = .344, p < .001), and planning attitude (ATP) (b = −.231, β = −.197, p = .001); F = 78.93, R^2 = .374, adj. R^2 = .369. The positive effects of ATL and ATS indicate that managerial insistence on legal/standard compliance and resource backing translate into stronger officer execution. The negative coefficient for ATP likely reflects planning that is formalistic or misaligned with operational realities—an implementation gap noted in safety-culture maturity models (Fleming & Wentzell, 2008; Hale & Borys, 2013). 6.2.2 Predicting ACM (management subdomain). ATL (b = .209, β = .424, p < .001) and ATS (b = .376, β = .428, p < .001) positively predicted ACM, while ATP was negative (b = −.119, β = −.173, p = .004); F = 71.03, R^2 = .350, adj. R^2 = .345. Thus, visible legal compliance and managerial support are the engines of day-to-day safety management; over-planned or prescriptive schemes may impede execution if they are not resourced or adapted to shop-floor constraints (Reason, 1997). 6.2.3 Predicting ACS (surveying). ATL (b = .274, β = .424, p < .001), ATS (b = .421, β = .365, p < .001), ATP (b = −.159, β = −.176, p = .005), and ATM (b = .105, β = .103, p = .016) entered; F = 43.39, R^2 = .305, adj. R^2 = .298. Legal-rule orientation and support again drive hazard identification, while a negative planning coefficient suggests a tension between planning formality and agile risk-scanning. 6.2.4 Predicting ACP (prevention). ATL (b = .422, β = .409, p < .001) and ATS (b = .747, β = .407, p < .001) were positive; ATP was negative (b = −.303, β = −.210, p = .001); F = 55.33, R^2 = .295, adj. R^2 = .290. Prevention strengthens when managers enforce rules and provide resources; again, planning that is not integrated with operations may crowd out practical preventive actions. 6.2.5 Predicting ACL (legal). Only ATL predicted ACL (b = .857, β = .451, p < .001); F = 101.58, R^2 = .203, adj. R^2 = .201. This is intuitive: managerial emphasis on regulatory compliance cascades into officer compliance activities. 7) Hypothesis testing, H1. Managers' overall attitudes (ATT) were not significantly correlated with employees' overall perception (PST): r = .026, p = .603 (Table 4.26). However, ATT correlated moderately and significantly with officers' practices ACT overall (r = .52), and within ACM (r = .52), ACS (r = .48), ACP (r = .44), ACL (r = .38), all p ≤ .01 (Table 4.27). In short, the leadership effect appears indirect: managers shape systems, which then shape perceptions/behaviors a pathway widely reported in safety-climate research (Zohar, 2010; Clarke, 2013). H2 (and H2.1–H2.3). Correlations showed that ACM, ACS, and ACP each related positively to PST (Table 4.28), but the stepwise regression retained only ACM as a significant predictor of PST (adj. R^2 = .019). Thus, H2.1 is supported (management predicts perception), whereas H2.2 and H2.3 are not supported in multivariable models. The result suggests that visible, routine

management actions committees, training, clear responsibility are what employees most readily perceive and use as cues about the organization's safety seriousness (DeJoy, 2005; Vinodkumar & Bhasi, 2010). 8) Robustness and interpretation, The pattern strong managerial attitudes, high officer activity in specific domains, and high employee perceptions is directionally consistent with mature but uneven safety systems: policy, rules, and support are in place; hazard surveying and prevention are active; but the translation of these inputs into uniformly high system performance varies (Bryce et al., 2020). The negative coefficients for the planning attitude (ATP) across several models warrant attention: they likely reflect over-formalized planning or planning decoupled from resources and line-level constraints (Hale & Borys, 2013). In practice, this finding argues for leaner, participatory planning tied to operational realities, with feedback loops from shop floor to management (Reason, 2016; ISO 45001, 2018). Finally, the relatively small variance explained in PST underscores that employees' perceptions are multifactorial shaped not only by formal systems but also by peer leadership, production pressures, contractor interfaces, and near-miss learning factors future research in Lamphun could address with longitudinal and multilevel designs and as show Table 1.

Table 1: Summary of Key Findings: Managerial Attitudes, Safety Officers' Practices, and Employees' Perceptions.

Variable / Relationship	Key Findings	Statistical Evidence	Interpretation
Managers' overall attitudes (ATT) → Employees' perceptions (PST)	No direct effect	r = .026, p = .603	Leadership impact is indirect, operating through safety officers rather than directly shaping employees' views.
Managers' attitudes (ATT) → Safety officers' practices (ACT overall)	Positive association	r = .52, p ≤ .01	Strong managerial attitudes toward safety rules, support, and compliance translate into more active officer practices.
Safety officers' practices (ACM: management subdomain) → Employees' perceptions (PST)	Significant predictor	β = .194, t = 2.22, p = .027	Routine, visible safety management actions (e.g., committees, training, clear responsibilities) strongly shape worker perceptions of safety management quality.
Planning attitude (ATP) → Officers' practices (multiple domains)	Negative coefficients across models	e.g., β = −.197 to −.210, p < .01	Over-formalized or misaligned planning may weaken effective implementation, reflecting a gap between strategic plans and operational realities.
Employees' perceptions (PST) overall	High	M = 4.06, SD = 0.50	Workers recognized accident investigations, safety orientations, hazard surveys, and health checks, validating that formal systems are visible at the operational level.

Note. ATT = overall managerial attitudes; ACT = safety officers' practices overall; ACM = management subdomain; PST = employees' perceptions of safety management. Results align with ISO 45001 (2018) and safety-climate theory (Zohar, 2010; Clarke, 2013).

DISCUSSION & CONCLUSION

The present study examined the factors influencing employees' perceptions of occupational safety management in plastic manufacturing factories in Lamphun Province. The findings provide important insights into the multi-level relationships among managerial attitudes, safety officers' practices, and employees' perceptions, thereby contributing to the literature on occupational health and safety (OHS) management and safety climate. First, the results indicate that managers in Lamphun's plastic factories demonstrated highly positive attitudes toward safety, particularly regarding policy, compliance with rules, and organizational support. This aligns with ISO 45001:2018 and ILO (2018) guidelines, which emphasize leadership commitment as a cornerstone of effective OHS management systems. Prior studies have consistently shown that managerial prioritization of safety shapes organizational norms and expectations (Clarke, 2013; Zohar, 2010). However, the present findings also reveal that managerial attitudes were not directly associated with employees' perceptions of safety management. Instead, the

effect was mediated through safety officers' practices. This underscores the critical role of middle-level actors who operationalize strategic intentions into day-to-day safety routines, consistent with multilevel models of safety climate (Zohar & Luria, 2005). Second, safety officers' practices were uneven across domains. While safety management, accident investigation, and hazard surveying scored high, the overall practice level was only moderate. This suggests that while formal systems exist, behavioral institutionalization remains incomplete. The observed strength in incident investigation and hazard mapping reflects best practices in hazard identification (Reason, 2016), but the weaker consistency across domains supports prior research showing that formal structures often precede full cultural embedding of safety (Bryce et al., 2020; Bevilacqua et al., 2018). Importantly, multiple regression results identified managerial attitudes toward rules and support as positive predictors of officers' practices, whereas planning attitudes yielded negative coefficients. This paradox suggests that over-formalized or top-down planning, when not aligned with shop-floor realities, may hinder effective safety practices a phenomenon also noted in safety-culture maturity studies (Hale & Borys, 2013). Third, employees reported high perceptions of safety management, with strong recognition of accident investigation, hazard surveying, and health checks. This validates that OHS systems were not only implemented but also visible to frontline workers. According to Vinodkumar and Bhasi (2010), employees' perceptions of system reliability and responsiveness are crucial antecedents of compliance and participation. Regression analyses further demonstrated that only the management subdomain of officers' practices significantly predicted employees' perceptions, highlighting the salience of routine, visible actions such as safety committees, training, and responsibility assignment. These findings reinforce DeJoy's (2005) argument that workers' safety perceptions are shaped by tangible management actions rather than abstract policy statements. In conclusion, the study contributes evidence that safety in Lamphun's plastic manufacturing sector is best understood as a cascading chain: managerial attitudes influence safety officers' practices, which in turn shape employees' perceptions. While leadership commitment is necessary, it is insufficient without translation into consistent, visible practices at the operational level. The negative effect of planning attitudes highlights the importance of aligning strategic planning with real workplace conditions through participatory and adaptive approaches. Practically, the results suggest that factories should strengthen participatory planning, invest in officer training, and ensure that managers' commitments are resourced and operationalized. For policymakers, the findings support promoting ISO 45001-aligned systems that encourage both leadership accountability and worker participation. Limitations include the cross-sectional design and focus on a single province, which may restrict generalizability. Future research should adopt longitudinal and multilevel approaches to capture dynamic interactions among leadership, systems, and perceptions. Overall, this study affirms that robust OHS management requires not only formal structures but also the everyday practices that make safety visible and credible to employees, thereby fostering a strong safety climate and contributing to safer, more sustainable industrial development.

Recommendations
1. Practical Recommendations
Based on the findings, managers in plastic manufacturing factories should prioritize visible, routine safety management practices—such as establishing active safety committees, conducting regular safety training, and ensuring transparent accident investigations. These actions significantly shape employees' perceptions of safety reliability and encourage proactive compliance. Furthermore, planning processes should be streamlined to avoid overly formalized approaches that may create implementation gaps. Integrating participatory planning, with feedback from front-line workers, can enhance alignment between managerial strategies and operational realities.
2. Recommendations for Future Research
Future research should employ longitudinal and multilevel designs to capture dynamic relationships among managerial attitudes, safety officer practices, and employee perceptions over time. Investigating moderating factors such as production pressures, peer leadership, and contractor involvement would provide a deeper understanding of safety climate formation. Comparative studies across different industrial sectors and provinces in Thailand could also validate generalizability and inform broader occupational safety policies.

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