

Employee Perception as a Mediator Between Safety and Security Management Practices and Investigation Efficiency, with Organisational Culture as a Moderator in the UAE Energy Sector

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Abstract

This study examines employee perception as a mediator between safety and security management practices and investigation efficiency, with organisational culture as a moderator in the UAE energy sector. The study addresses the need for efficient, fair, and learning-oriented investigation processes in high-risk energy organisations where safety incidents, security threats, regulatory obligations, and operational disruptions require timely and reliable responses. A quantitative research design was adopted, and data were collected using a structured questionnaire distributed to employees who were directly involved in, affected by, or formally expected to cooperate with internal investigation processes. From 520 distributed questionnaires, 426 valid responses were retained after data screening and outlier removal. The proposed framework was analysed using Partial Least Squares Structural Equation Modelling. The measurement model confirmed satisfactory reliability, convergent validity, and discriminant validity for all constructs. The structural model showed strong explanatory and predictive power, with Safety Management Practices and Security Management Practices explaining 60.0% of the variance in Employee Perception. Employee Perception, Organisational Culture, and their interaction explained 62.7% of the variance in

Investigation Efficiency. The findings revealed that both safety and security management practices significantly influence Employee Perception, with Safety Management Practices showing the stronger effect. Employee Perception had a significant positive effect on Investigation Efficiency. The mediation analysis confirmed that Employee Perception significantly mediates the relationships between both management practices and Investigation Efficiency. The moderation analysis showed that Organisational Culture significantly moderates the relationship between Employee Perception and Investigation Efficiency. The study concludes that investigation efficiency is shaped by formal management systems, employee perceptions, and cultural conditions within the organisation.

Keywords: employee perception, safety management practices, security management practices, investigation efficiency, organisational culture, UAE energy sector, mediation, moderation, PLS-SEM

1. Introduction

Efficient investigation processes are essential for organisational integrity, regulatory compliance, employee protection, operational continuity, and stakeholder confidence. In the United Arab Emirates energy sector, investigation efficiency is particularly important because organisations operate in safety-sensitive and security-sensitive environments where incidents can affect employees, assets, critical infrastructure, the environment, and business continuity. Energy-sector organisations are therefore expected to manage occupational safety risks, physical security risks, cybersecurity threats, and operational resilience in an integrated manner (Marquez Tejon et al., 2023; Oginni et al., 2023; Zhang et al., 2024).

In the United Arab Emirates, incident reporting and investigation are embedded within occupational safety and health governance and sector-specific regulation. The Abu Dhabi Occupational Safety and Health System Framework and related guidance emphasise structured occupational safety and health management, including incident notification, investigation, reporting, recording, and corrective action requirements (Abu Dhabi Department of Municipalities and Transport, 2024; Abu Dhabi Public Health Center, 2024). At the federal level, employers are required to manage occupational safety and health risks and implement corrective and preventive measures after workplace incidents (Ministry of Human Resources and Emiratisation, 2023). In the energy sector, these expectations are further reinforced by incident reporting regulations issued by the Department of Energy in Abu Dhabi (Department of Energy, 2025). These regulatory requirements show that investigation efficiency is not only an internal management concern, but also a compliance and governance priority.

Despite the existence of formal reporting and investigation systems, organisations may still experience weaknesses in investigation efficiency. Investigations may be delayed, evidence may be incomplete, findings may remain descriptive rather than causal, and corrective actions may fail to produce meaningful organisational learning. Research on learning from incidents shows that organisations often struggle to convert incident reporting and investigation into sustained improvements in safety performance and organisational reliability (Guan et al., 2024; Serou et al., 2021). Effective incident response therefore requires more than procedural compliance. It requires fair processes, reliable information flow, employee participation, and learning-oriented corrective action (Cribb et al., 2022; NHS England, 2022; Santos et al., 2025).

Safety Management Practices provide one important foundation for investigation efficiency. These practices include safety policies, procedures, training, reporting systems, hazard controls, risk assessments, emergency preparedness, and management commitment to employee protection. Prior studies show that safety management practices and safety climate can influence employee attitudes, safe behaviour, psychological safety, and willingness to speak up about risks (Draghici et al., 2022; Sun et al., 2022; Vu et al., 2022). In high-risk sectors such as energy, strong safety practices can improve employees' confidence in organisational systems and increase their willingness to participate in incident reporting and investigation processes.

Security Management Practices also play an important role in investigation efficiency. These practices include organisational procedures, controls, technologies, and protective systems used to manage physical security, cybersecurity, asset protection, access control, and operational threats. Security management is increasingly linked with organisational resilience because modern risks often connect safety, security, cyber systems, and operational continuity (International Organization for Standardization & International Electrotechnical Commission, 2022; National Institute of Standards and Technology, 2024; Zhou et al., 2021). Research further suggests that employees' trust in organisational security practices can influence their security-related attitudes and precautionary behaviour (Greulich et al., 2024). Therefore, effective security practices may strengthen employee confidence in the organisation and support more reliable investigation processes.

However, formal safety and security practices do not automatically produce efficient investigations. Their effectiveness depends partly on how employees perceive and experience them. Employee Perception refers to employees' views about the fairness, reliability, transparency, consistency, and supportiveness of organisational systems. If employees perceive safety and security systems as fair and trustworthy, they are more likely to report incidents, provide accurate information, cooperate during investigations, and support corrective actions. Studies on organisational justice show that perceptions of fairness influence employee attitudes, trust, and behavioural responses (Adamovic, 2023). Similarly, research on employee silence indicates that employees may withhold information when they perceive organisational systems as unfair, unsafe, or punitive (Adamska, 2021).

Employee Perception is also closely linked to employee voice and participation. Investigation efficiency depends on employees' willingness to speak up, share evidence, report hazards, and engage honestly with investigators. Inclusive leadership and employee voice research suggests that employees contribute more openly when they feel respected, included, and psychologically safe (Korkmaz et al., 2022; Qi et al., 2023). Safety voice research also shows that employees are more likely to raise safety concerns when the organisational environment supports openness and reduces fear of negative consequences (Sun et al., 2022). Therefore, Employee Perception can be understood as a key psychological and behavioural pathway through which safety and security practices influence investigation efficiency.

Organisational Culture is another important factor in this relationship. Organisational Culture refers to the shared values, assumptions, norms, and behavioural expectations that shape how employees act within an organisation. In investigation contexts, culture influences whether employees feel safe to speak up, whether managers respond fairly to incidents, and whether investigations are treated as learning opportunities or blame-seeking exercises. Studies on organisational culture and high reliability show that culture plays an important role in promoting openness, reliability, safety learning, and continuous improvement (Churruca et al., 2023; Dwyer et al., 2023; Rotteau et al., 2022). Thus, Organisational Culture may strengthen or weaken the relationship between Employee Perception and Investigation Efficiency.

The literature shows that safety management, security management, employee perception, organisational culture, and incident investigation have each received attention in previous

studies. However, limited empirical work has integrated these elements into a single framework within the United Arab Emirates energy-sector context. Existing research has examined incident learning and investigation quality (Guan et al., 2024; Patterson et al., 2024), safety climate and employee behaviour (Draghici et al., 2022; Sun et al., 2022), security practices and employee precautionary behaviour (Greulich et al., 2024), and integrated safety and security management (Marquez Tejon et al., 2023; Ylönen & Björkman, 2023). Yet there remains limited understanding of how Safety Management Practices and Security Management Practices influence Investigation Efficiency through Employee Perception, and how Organisational Culture moderates the effect of Employee Perception on Investigation Efficiency.

Accordingly, this study examines Employee Perception as a Mediator Between Safety and Security Management Practices and Investigation Efficiency, with Organisational Culture as a Moderator in the UAE Energy Sector. The study positions Safety Management Practices and Security Management Practices as independent variables, Employee Perception as the mediating variable, Investigation Efficiency as the dependent variable, and Organisational Culture as the moderating variable. The study aims to determine whether safety and security management practices improve employee perception, whether employee perception enhances investigation efficiency, whether employee perception mediates the relationships between management practices and investigation efficiency, and whether organisational culture moderates the relationship between employee perception and investigation efficiency.

This study contributes to the literature by developing and testing an integrated framework that connects safety management, security management, employee perception, organisational culture, and investigation efficiency. It also contributes practically by offering insights for United Arab Emirates energy-sector organisations seeking to improve investigation quality, employee cooperation, reporting confidence, corrective action effectiveness, and organisational learning. The study argues that investigation efficiency is best achieved when formal safety and security systems are not only implemented, but also positively perceived by employees and supported by a culture of fairness, trust, openness, and learning.

2. Development of Conceptual Framework

The conceptual framework for this study was developed through a systematic synthesis of literature related to safety management, security management, employee behavioural responses, organisational culture, and investigation effectiveness within high-risk industries. The framework was not constructed merely by combining variables frequently used in prior studies; rather, it emerged from a critical evaluation of gaps, inconsistencies, and limitations within existing literature concerning incident investigations and organisational learning in the energy sector. Existing research has extensively examined safety management systems, safety climate, and organisational compliance mechanisms, yet comparatively limited attention has been given to the behavioural and perceptual processes through which these systems influence investigation outcomes (Draghici et al., 2022; Sun et al., 2022). Moreover, many previous studies have treated investigation effectiveness primarily as a technical or procedural issue while underestimating the social and organisational dynamics that shape

employee participation, reporting transparency, and learning behaviour (Cribb et al., 2022; Patterson et al., 2024).

The framework was therefore designed to address three major limitations identified in the literature. First, previous studies have often examined safety or security management practices independently despite the increasing operational integration of safety, security, and resilience within high-risk industries (Marquez Tejon et al., 2023; Zhang et al., 2024). Second, many existing models assume direct relationships between management systems and organisational outcomes without adequately explaining the behavioural mechanisms through which such effects occur (Adamska, 2021; Qi et al., 2023). Third, although organisational culture is widely acknowledged as important, it is frequently discussed conceptually rather than empirically integrated into explanatory models of investigation effectiveness (Churruca et al., 2023; Dwyer et al., 2023). Consequently, this study incorporates both mediation and moderation mechanisms to provide a more comprehensive explanation of how management practices influence investigation efficiency within the UAE energy sector.

The selection of constructs was guided by both theoretical relevance and contextual suitability to the UAE energy industry. The UAE energy sector represents a highly regulated, technologically intensive, and operationally hazardous environment where incident prevention, security protection, and effective investigations are critical organisational priorities. Regulatory frameworks in the UAE strongly emphasise occupational safety, incident reporting, compliance obligations, and risk management systems (Abu Dhabi Department of Municipalities and Transport, 2024; Ministry of Human Resources and Emiratisation, 2023). However, evidence from organisational and safety research suggests that compliance-oriented systems alone do not necessarily produce meaningful learning outcomes or effective investigations. Formal systems may exist primarily for regulatory legitimacy while employees remain reluctant to report incidents openly due to fear, mistrust, or blame-oriented organisational practices (Serou et al., 2021; Sherratt et al., 2023). Therefore, the framework critically recognises that investigation efficiency depends not only on procedural structures but also on employee interpretation and organisational context.

Safety Management Practices (SaMP) and Security Management Practices (SMP) were selected as the independent variables because they represent two foundational organisational systems that directly shape operational control, risk management, and employee interaction within the energy sector. The inclusion of both constructs reflects the increasing convergence of safety and security management in modern high-risk industries, where operational disruptions, cyber threats, physical hazards, and organisational continuity risks are deeply interconnected (National Institute of Standards and Technology, 2024; Zhang et al., 2024). Existing literature demonstrates that organisations increasingly adopt integrated approaches to safety, security, and resilience management rather than treating them as isolated functions (Marquez Tejon et al., 2023).

Safety Management Practices include policies, procedures, training systems, risk assessments, emergency preparedness, reporting mechanisms, and managerial commitment designed to minimise workplace hazards and prevent incidents. These practices were selected because

safety systems are highly visible to employees and directly influence daily operational experiences. Previous studies have shown that safety leadership, safety climate, and management commitment can influence employee trust, behavioural compliance, safety participation, and psychological safety (Draghici et al., 2022; Vu et al., 2022). However, the literature also reveals important criticisms of formal safety systems. In some organisations, safety practices become excessively bureaucratic, compliance-driven, or symbolic, creating “paper safety” rather than meaningful operational protection. Employees may formally comply with safety procedures while privately distrusting managerial intentions or perceiving investigations as punitive exercises (Sun et al., 2022; Patterson et al., 2024). Therefore, this study critically positions Safety Management Practices not as automatically effective mechanisms but as organisational practices whose effectiveness depends on employee interpretation and organisational implementation quality.

Similarly, Security Management Practices were included because security-related risks in the energy sector extend beyond physical protection to include cybersecurity, operational continuity, access control, infrastructure protection, and crisis preparedness. The increasing digitalisation of energy infrastructure has intensified organisational reliance on integrated security systems (National Institute of Standards and Technology, 2024). Nevertheless, security systems may produce contradictory employee responses. While well-designed systems may enhance employee confidence and organisational trust, highly restrictive or surveillance-oriented practices may also increase fear, distrust, or perceptions of managerial control. Existing research on resilience and organisational security suggests that security effectiveness depends significantly on employee engagement, communication quality, and organisational trust rather than purely technological controls (Marquez Tejon et al., 2023; Zhang et al., 2024). Therefore, the inclusion of Security Management Practices reflects the need to examine how employees interpret organisational protection systems rather than assuming uniformly positive effects.

Employee Perception (EP) was selected as the mediating construct because the literature consistently demonstrates that employees respond primarily to how organisational systems are experienced rather than how they are formally designed. Existing studies on organisational justice, employee voice, psychological safety, and employee silence indicate that employee perceptions strongly influence reporting behaviour, trust, participation, and organisational cooperation (Adamovic, 2023; Korkmaz et al., 2022). The mediation role of Employee Perception is particularly important because many organisations assume that implementing policies, technologies, or reporting systems will automatically improve employee behaviour and investigation outcomes. However, employees may withhold information, avoid reporting incidents, or disengage from investigations if they perceive systems as unfair, inconsistent, blame-oriented, or politically motivated (Adamska, 2021; Qi et al., 2023). Consequently, Employee Perception was incorporated to explain the underlying behavioural mechanism through which management practices influence investigation effectiveness.

Investigation Efficiency (IE) was selected as the dependent variable because effective investigations are essential for organisational learning, operational improvement, and risk

prevention within high-risk industries. Existing incident investigation literature increasingly criticises traditional investigation approaches for focusing excessively on technical failures while neglecting systemic, behavioural, and organisational dimensions of incidents (Cribb et al., 2022; Guan et al., 2024). Efficient investigations require not only technical competence but also truthful disclosure, employee cooperation, reporting transparency, and organisational trust. Studies on incident learning and organisational reliability demonstrate that investigation effectiveness depends heavily on fairness, openness, employee participation, and learning-oriented processes (Patterson et al., 2024; Thallapureddy et al., 2023). Therefore, Investigation Efficiency was conceptualised as a multidimensional outcome involving timeliness, accuracy, objectivity, documentation quality, and learning effectiveness rather than merely procedural completion.

Organisational Culture (OC) was incorporated as the moderating variable because literature consistently identifies culture as one of the most influential contextual factors shaping organisational behaviour, safety performance, and incident learning. Organisational culture influences whether employees feel psychologically safe to report concerns, challenge decisions, disclose mistakes, or participate honestly in investigations (Churruca et al., 2023; Rotteau et al., 2022). While many organisations publicly promote “learning cultures” or “just cultures,” actual workplace practices may continue to reinforce hierarchy, blame, silence, or fear of reputational consequences. Research on high-reliability organisations and safety culture demonstrates that organisational culture significantly shapes trust, openness, communication quality, and learning behaviour (Dwyer et al., 2023; Rotteau et al., 2022). Consequently, Organisational Culture was positioned as a moderator because the positive effect of Employee Perception on Investigation Efficiency is unlikely to occur uniformly across all organisational environments. In cultures characterised by trust, fairness, and openness, positive employee perceptions are expected to strengthen investigation efficiency. Conversely, in blame-oriented or highly hierarchical cultures, even positive employee perceptions may not fully translate into effective investigation participation. Figure 1 presents the conceptual framework developed for this study.

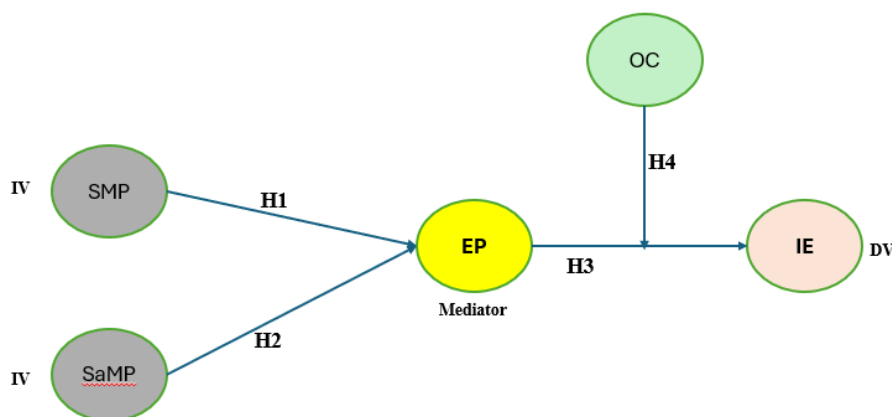


Figure 1. Conceptual framework showing employee perception as a mediator and organisational culture as a moderator

Based on the conceptual framework, the following hypotheses are proposed:

H1: Security Management Practices have a positive significant effect on Employee Perception.

H2: Safety Management Practices have a positive significant effect on Employee Perception.

H3: Employee Perception has a positive significant effect on Investigation Efficiency.

H4: Organisational Culture moderates the relationship between Employee Perception and Investigation Efficiency.

H5: Employee Perception mediates the relationship between Security Management Practices and Investigation Efficiency.

H6: Employee Perception mediates the relationship between Safety Management Practices and Investigation Efficiency.

Overall, the conceptual framework was developed through a critical synthesis of organisational behaviour, safety management, security management, and incident investigation literature. The framework moves beyond simplistic linear assumptions by recognising that formal management systems influence organisational outcomes indirectly through employee interpretation processes and that these relationships are further conditioned by organisational culture. By integrating mediation and moderation mechanisms, the framework provides a more comprehensive explanation of investigation efficiency within the UAE energy sector and addresses important theoretical and practical gaps in existing literature.

3. Methodology

This study was conducted among employees of a UAE energy-sector organisation who were directly involved in, affected by, or formally expected to cooperate with internal investigation processes. The target population included employees whose roles were connected to safety, security, operational risk, compliance, emergency response, asset integrity, and investigation-related decision-making.

A proportionate stratified sampling approach was adopted to ensure adequate representation across the major organisational functions relevant to the study. These functions included health, safety, and environment; security and cybersecurity; operations and maintenance; line management; risk and compliance; asset integrity; emergency response; and middle or senior management. This sampling approach was appropriate because it allowed the study to capture views from different employee groups that may experience safety practices, security practices, and investigation processes in different ways.

Data were collected using a structured questionnaire designed to measure the main constructs of the study: Safety Management Practices, Security Management Practices, Employee Perception, and Investigation Efficiency. A total of 520 questionnaires were distributed, of which 483 were returned. After removing incomplete responses, 441 complete questionnaires remained. Further screening was then conducted to identify and remove outliers, resulting in

426 valid responses for final analysis.

The collected data were used to model the proposed conceptual framework. Partial Least Squares Structural Equation Modelling was employed to assess the validity of the measurement model and to examine the relationships among the constructs. This approach enabled the study to evaluate both the direct effects of Safety Management Practices and Security Management Practices on Employee Perception, and the mediating role of Employee Perception in the relationship between management practices and Investigation Efficiency.

4. Modelling of Conceptual Framework

The proposed conceptual framework was modelled using Partial Least Squares Structural Equation Modelling. The purpose of the modelling process was to examine how Security Management Practices and Safety Management Practices influence Employee Perception, how Employee Perception affects Investigation Efficiency, and whether Organisational Culture moderates the relationship between Employee Perception and Investigation Efficiency. The model also tested the mediating role of Employee Perception in the relationships between management practices and Investigation Efficiency.

PLS-SEM was considered appropriate for this study because the framework includes multiple latent constructs, direct effects, mediating effects, and a moderating effect. PLS-SEM is widely used for predictive models that examine complex relationships among latent variables and is suitable for assessing measurement quality, structural paths, mediation, and moderation effects (Hair et al., 2022; Hair & Alamer, 2022; Ringle et al., 2023). Following standard PLS-SEM procedures, the analysis was conducted in two main stages. First, the measurement model was assessed to establish reliability, convergent validity, and discriminant validity. Second, the structural model was assessed to examine collinearity, explanatory power, effect size, predictive relevance, direct relationships, moderation, and mediation effects (Hair et al., 2022; Hair et al., 2026).

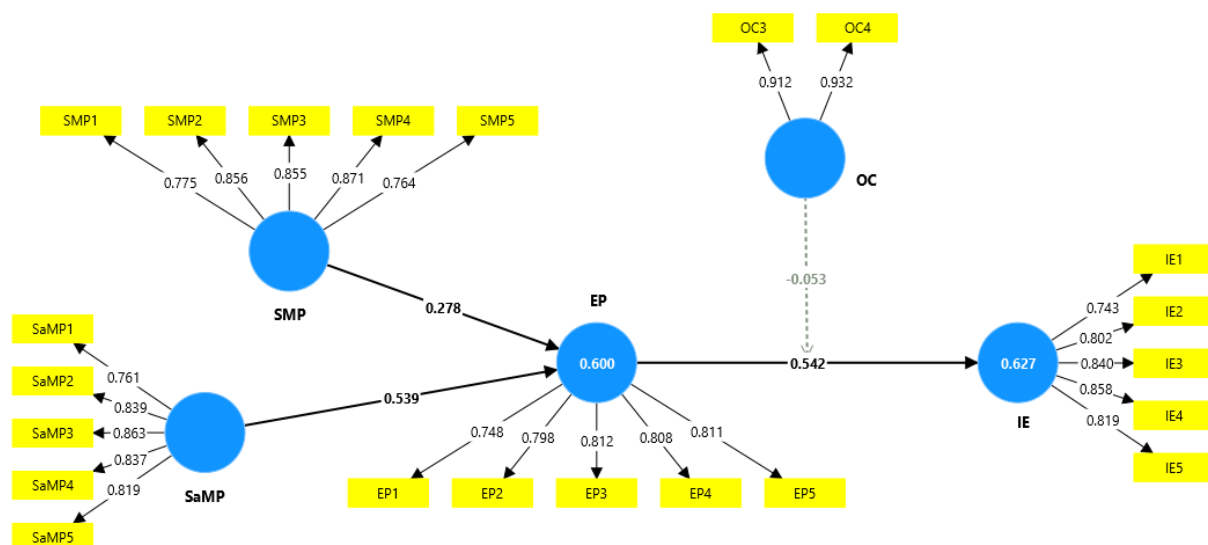


Figure 2. Model after PLS Algorithm procedure

4.1 Modelling of Conceptual Framework

The measurement model was assessed to determine whether the constructs were measured reliably and validly. Internal consistency reliability was examined using Cronbach's Alpha, Composite Reliability rho_c. Convergent validity was assessed using the Average Variance Extracted. Establishing reliability and validity is necessary before interpreting structural relationships because latent constructs must be measured accurately and consistently (DeVellis & Thorpe, 2022; Goodfellow, 2023; Hair et al., 2022).

Table 1. Construct Reliability and Convergent Validity

Construct	Cronbach's Alpha	Composite Reliability rho_c	Average Variance Extracted
EP	0.855	0.896	0.633
IE	0.872	0.907	0.662
OC	0.825	0.919	0.851
SMP	0.882	0.914	0.681
SaMP	0.882	0.914	0.680

As shown in Table 1, all Cronbach's Alpha values ranged from 0.825 to 0.882, exceeding the recommended threshold of 0.70. The Composite Reliability rho_c values ranged from 0.896 to 0.919, also exceeding the recommended threshold. In addition, all AVE values were above 0.50, ranging from 0.633 to 0.851. These results confirm that the constructs demonstrate satisfactory internal consistency reliability and convergent validity (Hair et al., 2022; Hair & Alamer, 2022).

Discriminant validity was assessed using the Heterotrait-Monotrait ratio. HTMT is commonly used in PLS-SEM to determine whether constructs are sufficiently distinct from one another (Hair et al., 2022; Hair & Alamer, 2022).

Table 2. HTMT results

Construct	EP	IE	OC	SMP	SaMP	OC x EP
EP						
IE	0.872					
OC	0.741	0.742				
SMP	0.797	0.772	0.682			
SaMP	0.859	0.848	0.666	0.879		
OC x EP	0.716	0.679	0.741	0.609	0.633	

As presented in Table 2, all HTMT values were below the more liberal threshold of 0.90. This indicates that the constructs are empirically distinct. Although some values are close to the

stricter threshold of 0.85, particularly the relationship between Safety Management Practices and Security Management Practices, this is understandable because safety and security practices are conceptually related in high-risk energy-sector environments. Integrated safety and security management is increasingly important in complex industries where physical safety, cybersecurity, organisational resilience, and operational continuity are closely connected (Marquez Tejon et al., 2023; Oginni et al., 2023; Ylönen & Björkman, 2023; Zhang et al., 2024; Zhou et al., 2021).

Table 3. Fornell-Larcker criterion

Construct	EP	IE	OC	SMP	SaMP
EP	0.796				
IE	0.760	0.813			
OC	0.623	0.632	0.922		
SMP	0.695	0.677	0.581	0.825	
SaMP	0.754	0.747	0.567	0.773	0.825

Further evidence of discriminant validity was obtained through the Fornell-Larcker criterion. As shown in Table 3, the square root of the AVE for each construct, represented by the diagonal values, was greater than its correlations with other constructs. This confirms that each construct shares more variance with its own indicators than with other constructs in the model (Hair et al., 2022; Ringle et al., 2023). Overall, the measurement model results confirm that the constructs used in this study were reliable, valid, and suitable for structural model assessment.

4.2 Structural Model Assessment

After establishing the adequacy of the measurement model, the structural model was assessed. The assessment included collinearity, explanatory power, effect size, and predictive relevance. These procedures are recommended in PLS-SEM to determine whether the hypothesised relationships can be interpreted meaningfully (Hair et al., 2022; Hair & Alamer, 2022; Ringle et al., 2023).

First, collinearity was examined using the Variance Inflation Factor. As shown in Table 4, all VIF values ranged from 1.983 to 2.480, which is below the recommended threshold of 3.0. This indicates that collinearity was not a critical issue in the structural model (Hair et al., 2022).

Table 4. Inner VIF values

Path	VIF
EP -> IE	1.983
OC -> IE	2.037
SMP -> EP	2.480
SaMP -> EP	2.480
OC x EP -> IE	2.214

The explanatory power of the model was assessed using R-square values. As shown in Table 5, Security Management Practices and Safety Management Practices jointly explained 60.0% of the variance in Employee Perception. This indicates that the two management practice constructs have substantial explanatory power in predicting how employees perceive the organisation's safety and security environment. This is consistent with research showing that safety management practices, safety climate, and security-related trust influence employee attitudes and behaviour (Draghici et al., 2022; Greulich et al., 2024; Sun et al., 2022; Vu et al., 2022).

The model also explained 62.7% of the variance in Investigation Efficiency. This shows that Employee Perception, Organisational Culture, and the interaction term between Organisational Culture and Employee Perception provide strong explanatory power for Investigation Efficiency. This supports the view that investigation outcomes are shaped not only by formal systems, but also by employee trust, organisational culture, fairness, participation, and learning-oriented practices (Adamovic, 2023; Cribb et al., 2022; Guan et al., 2024; Serou et al., 2021).

Table 5. R-square values

Endogenous Construct	R-square	Adjusted R-square
EP	0.600	0.598
IE	0.627	0.624

Effect size was assessed using f-square values. As shown in Table 6, Employee Perception had a strong effect on Investigation Efficiency, with an f-square value of 0.397. Organisational Culture had a small effect on Investigation Efficiency, with an f-square value of 0.052. The interaction effect between Organisational Culture and Employee Perception also had a small effect on Investigation Efficiency, with an f-square value of 0.025. For the predictors of Employee Perception, Safety Management Practices had a stronger effect than Security Management Practices, with f-square values of 0.293 and 0.078 respectively. These findings are consistent with the view that safety practices are often more visible to employees in daily operations, while security practices also contribute to employee trust and organisational preparedness (Greulich et al., 2024; Vu et al., 2022; Ylönen & Björkman,

2023).

Table 6. f-square values

Construct	EP	IE	OC	SMP	SaMP	OC x EP
EP		0.397				
IE						
OC		0.052				
SMP	0.078					
SaMP	0.293					
OC x EP		0.025				

Predictive relevance was assessed using cross-validated redundancy and cross-validated communality values. Q^2 values greater than zero indicate that the model has predictive relevance for the relevant construct (Hair et al., 2022; Hair & Alamer, 2022; Ringle et al., 2023). As shown in Table 7, the cross-validated redundancy Q^2 values for Employee Perception and Investigation Efficiency were greater than zero. Employee Perception recorded a Q^2 value of 0.365, while Investigation Efficiency recorded a Q^2 value of 0.404. These results indicate that the structural model has predictive relevance for the endogenous constructs.

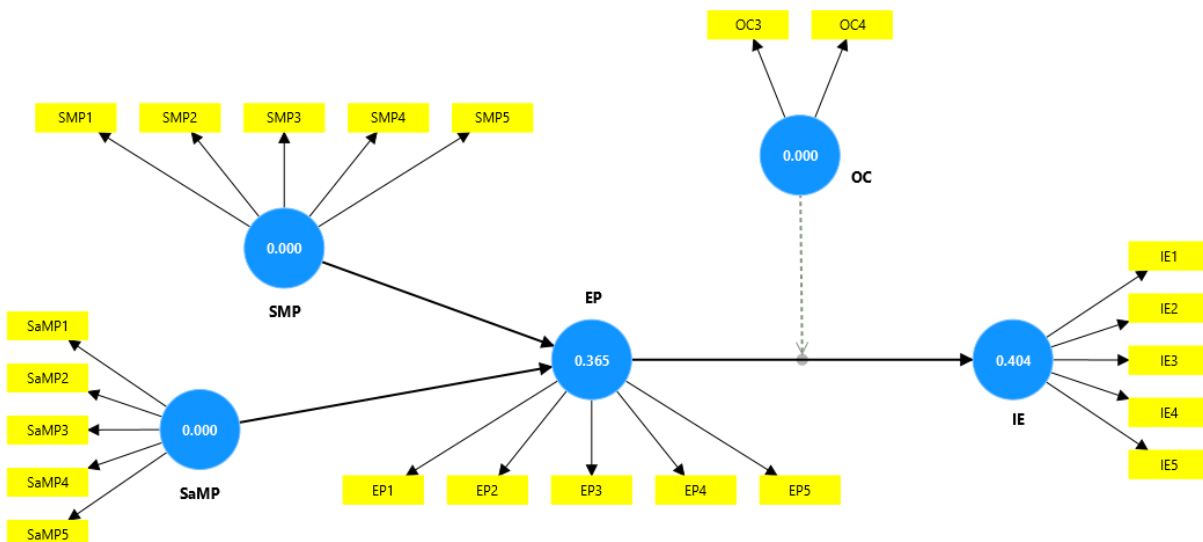


Figure 3. Model after blindfolding procedure

The Q^2 values for Organisational Culture, Security Management Practices, and Safety Management Practices were 0.000 in the cross-validated redundancy results. This is expected because these constructs are exogenous variables and are not predicted by other constructs in

the model.

Table 7. Cross-validated redundancy values

Construct	SSO	SSE	Q² = 1 - SSE/SSO
EP	1990.000	1263.946	0.365
IE	1990.000	1186.814	0.404
OC	796.000	796.000	0.000
SMP	1990.000	1990.000	0.000
SaMP	1990.000	1990.000	0.000

The cross-validated communality results are presented in Table 8. All Q² values were positive, ranging from 0.444 to 0.517. These results confirm that the measurement model has strong predictive quality across all constructs (Hair et al., 2022; Ringle et al., 2023).

Table 8. Cross-validated communality values

Construct	SSO	SSE	Q² = 1 - SSE/SSO
EP	1990.000	1107.097	0.444
IE	1990.000	1020.727	0.487
OC	796.000	421.421	0.471
SMP	1990.000	960.468	0.517
SaMP	1990.000	967.639	0.514

Overall, the structural model results show that the model has acceptable collinearity levels, strong explanatory power, meaningful effect sizes, and satisfactory predictive relevance.

4.3 Direct Path and Moderating Effect Assessment

The direct relationships and moderating effect were assessed using bootstrapping. Bootstrapping is commonly recommended in PLS-SEM because it allows the significance of path coefficients to be evaluated without assuming normal data distribution (Hair et al., 2022; Hair & Alamer, 2022).

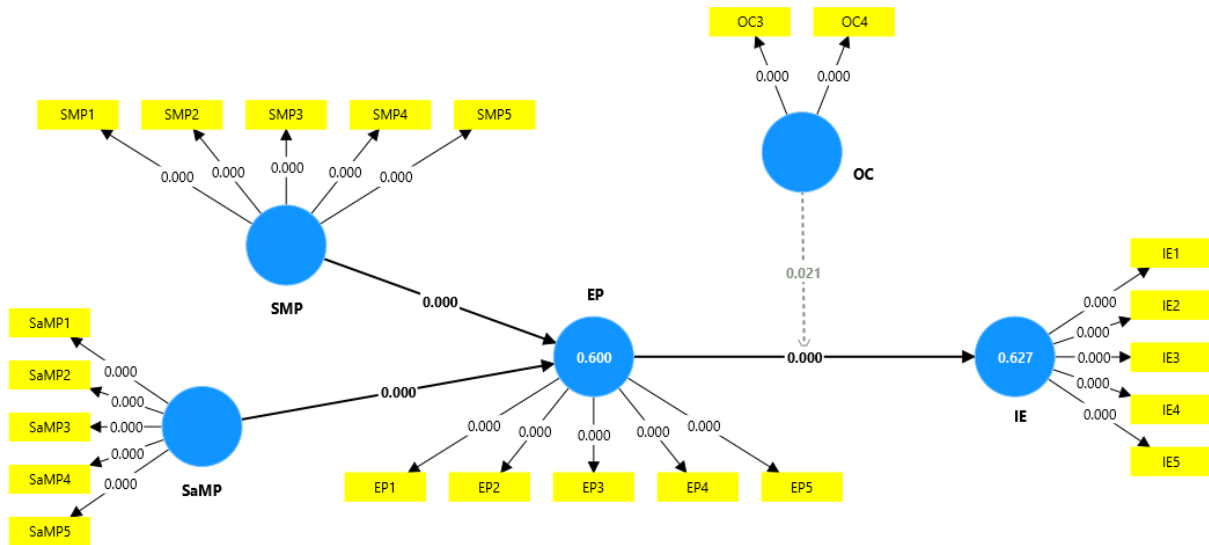


Figure 4. Model after bootstrapping procedure

The results of bootstrapping are presented in Table 9 where **H1** proposed that Security Management Practices have a positive significant effect on Employee Perception. The result shows that Security Management Practices had a positive and significant effect on Employee Perception, with a path coefficient of 0.278, a t-statistic of 3.582, and a p-value of 0.000. Therefore, **H1 is supported**. This indicates that reliable and well-managed security practices can strengthen employee perceptions of organisational preparedness, protection, and trust. This finding is consistent with research showing that trust in organisational security practices influences employees' security-related attitudes and precautionary behaviour (Greulich et al., 2024).

H2 proposed that Safety Management Practices have a positive significant effect on Employee Perception. The result shows that Safety Management Practices had a positive and significant effect on Employee Perception, with a path coefficient of 0.539, a t-statistic of 7.287, and a p-value of 0.000. Therefore, **H2 is supported**. The path coefficient also shows that Safety Management Practices have a stronger influence on Employee Perception than Security Management Practices. This is consistent with research showing that safety climate, safety leadership, workplace safety practices, and perceived organisational support can shape employee attitudes, safety voice, and safety-related behaviour (Draghici et al., 2022; Sun et al., 2022; Vu et al., 2022).

H3 proposed that Employee Perception has a positive significant effect on Investigation Efficiency. The result shows that Employee Perception had a positive and significant effect on Investigation Efficiency, with a path coefficient of 0.542, a t-statistic of 9.644, and a p-value of 0.000. Therefore, **H3 is supported**. This finding suggests that employees who perceive safety and security systems as fair, reliable, transparent, and supportive are more likely to cooperate with investigations, provide accurate information, and support corrective actions. This aligns with literature showing that organisational justice, employee voice, openness, and trust influence participation in organisational processes and incident learning

(Adamovic, 2023; Adamska, 2021; Cribb et al., 2022; Guan et al., 2024; Qi et al., 2023).

H4 proposed that Organisational Culture moderates the relationship between Employee Perception and Investigation Efficiency. The result shows that the interaction effect of Organisational Culture and Employee Perception on Investigation Efficiency was statistically significant, with a path coefficient of -0.053, a t-statistic of 2.314, and a p-value of 0.021. Therefore, **H4 is supported**. However, the negative path coefficient indicates that Organisational Culture weakens the positive relationship between Employee Perception and Investigation Efficiency in this model. This suggests that the nature of organisational culture may reduce or condition the extent to which positive employee perception translates into investigation efficiency. This finding is relevant because organisational culture can shape whether employees experience investigations as learning-oriented, just, open, or blame-focused (Churruca et al., 2023; Cribb et al., 2022; Dwyer et al., 2023; Rotteau et al., 2022).

Table 9. Direct path and moderating effect assessment

Hypothesis	Direct Effect	Path Strength	T-statistics	P-values	Decision
H3	EP -> IE	0.542	9.644	0.000	Supported
H1	SMP -> EP	0.278	3.582	0.000	Supported
H2	SaMP -> EP	0.539	7.287	0.000	Supported
H4	OC x EP -> IE	-0.053	2.314	0.021	Supported

The direct path results confirm that both management practice constructs significantly shape Employee Perception, and that Employee Perception significantly improves Investigation Efficiency. The moderation result further shows that Organisational Culture plays a significant role in conditioning the relationship between Employee Perception and Investigation Efficiency.

4.4 Mediating Assessment

The mediating role of Employee Perception was assessed to determine whether Employee Perception explains the relationship between management practices and Investigation Efficiency. Mediation analysis is useful for explaining how and why an independent variable influences an outcome variable through an intervening mechanism (Hair et al., 2022; Hair et al., 2026). The results are presented in Table 10.

H5 proposed that Employee Perception mediates the relationship between Security Management Practices and Investigation Efficiency. The indirect effect from Security Management Practices to Investigation Efficiency through Employee Perception was positive and statistically significant, with a path coefficient of 0.151, a t-statistic of 3.250, and a p-value of 0.001. Therefore, **H5 is supported**. This means that security practices improve investigation efficiency partly by shaping how employees perceive organisational protection, preparedness, fairness, and trust. This finding supports the view that security management

should not be treated only as a technical or compliance function, but also as a trust-building organisational practice (Greulich et al., 2024; Marquez Tejon et al., 2023; National Institute of Standards and Technology, 2024).

H6 proposed that Employee Perception mediates the relationship between Safety Management Practices and Investigation Efficiency. The indirect effect from Safety Management Practices to Investigation Efficiency through Employee Perception was also positive and statistically significant, with a path coefficient of 0.292, a t-statistic of 5.883, and a p-value of 0.000. Therefore, **H6 is supported**. This indicates that safety practices improve investigation efficiency by strengthening employee perceptions of fairness, support, consistency, and management commitment. This finding is consistent with studies showing that safety climate, psychological safety, and safety voice can act as mechanisms through which safety practices influence employee behaviour and organisational outcomes (Draghici et al., 2022; Sun et al., 2022; Vu et al., 2022).

Table 10. Mediating assessment

Hypothesis	Indirect Effect	Path Strength	T-statistics	P-values	Decision
H5	SMP -> EP -> IE	0.151	3.250	0.001	Supported
H6	SaMP -> EP -> IE	0.292	5.883	0.000	Supported

The mediation results confirm that Employee Perception is an important mechanism through which Safety Management Practices and Security Management Practices influence Investigation Efficiency. The indirect effect of Safety Management Practices was stronger than the indirect effect of Security Management Practices, indicating that safety practices have a greater influence on investigation efficiency through employee perception. These results are consistent with incident-learning literature showing that effective investigation and organisational learning depend on fairness, openness, information flow, reporting quality, employee participation, and learning-oriented corrective action (Cribb et al., 2022; Guan et al., 2024; NHS England, 2022; Santos et al., 2025; Serou et al., 2021; Zhang et al., 2023).

Overall, the results support the proposed conceptual framework. Security Management Practices and Safety Management Practices significantly improve Employee Perception, Employee Perception significantly improves Investigation Efficiency, and Employee Perception significantly mediates the relationship between both management practices and Investigation Efficiency. In addition, Organisational Culture significantly moderates the relationship between Employee Perception and Investigation Efficiency, although the negative interaction coefficient suggests that the moderating effect reduces the strength of this relationship. In the UAE energy sector, these findings are especially relevant because organisations operate within formal occupational safety, security, and incident-reporting requirements, but regulatory compliance alone may not be sufficient to achieve efficient investigations unless employees trust and positively perceive the systems in place (Abu Dhabi Department of Municipalities and Transport, 2024; Abu Dhabi Public Health Center,

2024; Department of Energy, 2025; Ministry of Human Resources and Emiratization, 2023).

5. Discussion of the Findings

The findings of this study provide empirical support for the proposed conceptual framework titled **Employee Perception as a Mediator Between Safety and Security Management Practices and Investigation Efficiency, with Organisational Culture as a Moderator in the UAE Energy Sector**. Overall, the results demonstrate that safety and security management practices are important organisational mechanisms that shape employee perception, and that employee perception subsequently influences investigation efficiency. The findings also show that organisational culture plays a significant moderating role in the relationship between employee perception and investigation efficiency. This confirms that investigation efficiency is not determined only by formal systems, procedures, and regulatory requirements. It is also shaped by how employees perceive those systems and by the cultural environment in which investigations are conducted.

The measurement model results confirmed that all constructs used in the study were reliable and valid. Cronbach's Alpha, Composite Reliability, and Average Variance Extracted values met the recommended thresholds, indicating satisfactory internal consistency and convergent validity. This means that the indicators used to measure Employee Perception, Investigation Efficiency, Organisational Culture, Security Management Practices, and Safety Management Practices adequately captured the intended constructs. This is important because the framework depends on latent variables that cannot be observed directly but must be measured using reliable and valid indicators. These findings are consistent with methodological guidance on scale development and PLS-SEM, which emphasises the need to establish reliability and validity before interpreting structural relationships (DeVellis & Thorpe, 2022; Goodfellow, 2023; Hair et al., 2022; Hair & Alamer, 2022).

The discriminant validity results also supported the adequacy of the measurement model. The Fornell-Larcker criterion confirmed that each construct shared more variance with its own indicators than with other constructs. The HTMT results were also acceptable because all values were below the more liberal threshold of 0.90. Although some HTMT values were close to the stricter threshold of 0.85, this is understandable in the context of the UAE energy sector, where safety, security, organisational culture, and investigation processes are conceptually related. In high-risk sectors, safety and security systems are increasingly integrated because physical safety, cybersecurity, operational continuity, resilience, and risk governance often overlap (Marquez Tejon et al., 2023; Oginni et al., 2023; Ylönen & Björkman, 2023; Zhang et al., 2024; Zhou et al., 2021). Therefore, the close relationship between Safety Management Practices and Security Management Practices reflects the practical reality of risk management in energy-sector organisations.

The structural model results showed that Security Management Practices and Safety Management Practices jointly explained 60.0% of the variance in Employee Perception. This indicates that employee perception is strongly shaped by the quality and visibility of organisational safety and security systems. When employees observe consistent safety procedures, effective security controls, transparent reporting systems, reliable communication,

and visible management commitment, they are more likely to develop positive perceptions of the organisation. This finding is consistent with previous studies showing that safety climate, safety management systems, perceived organisational support, and trust in security practices influence employee attitudes and behaviour (Draghici et al., 2022; Greulich et al., 2024; Sun et al., 2022; Vu et al., 2022).

The model also explained 62.7% of the variance in Investigation Efficiency. This indicates that Employee Perception, Organisational Culture, and the interaction between Employee Perception and Organisational Culture provide strong explanatory power for investigation outcomes. In practical terms, investigation efficiency is improved when employees trust the process, are willing to share information, participate openly, and believe that investigations are fair and learning-oriented. This supports the wider incident-learning literature, which argues that effective investigations require not only formal procedures, but also openness, fairness, information flow, employee participation, and organisational learning (Cribb et al., 2022; Guan et al., 2024; Patterson et al., 2024; Serou et al., 2021; Zhang et al., 2023).

The direct path results provide support for **H1, H2, and H3**. **H1** proposed that Security Management Practices have a positive significant effect on Employee Perception. The result supported this hypothesis, indicating that well-managed security practices improve how employees perceive the organisation. This suggests that when employees view security systems as reliable, protective, and well organised, they are more likely to trust the organisation and feel protected within the work environment. This is particularly important in the UAE energy sector, where security concerns may include physical security, cybersecurity, asset protection, access control, and operational disruption. The finding is consistent with research showing that trust in organisational security practices can influence employees' security-related attitudes and precautionary behaviour (Greulich et al., 2024). It is also aligned with security frameworks that emphasise structured and proactive information security and cybersecurity management (International Organization for Standardization & International Electrotechnical Commission, 2022; National Institute of Standards and Technology, 2024).

H2 proposed that Safety Management Practices have a positive significant effect on Employee Perception. This hypothesis was also supported, and the path coefficient showed that Safety Management Practices had a stronger effect on Employee Perception than Security Management Practices. This suggests that safety practices may be more visible and immediate to employees in their daily work experience. Employees in energy-sector organisations frequently interact with safety rules, risk assessments, toolbox talks, permit-to-work systems, training, emergency drills, and incident reporting processes. As a result, strong safety management practices may create a stronger sense of organisational care, protection, and support. This finding is consistent with research showing that safety leadership, safety climate, psychological safety, safety voice, and workplace safety management practices influence employee behaviour and organisational commitment (Draghici et al., 2022; Sun et al., 2022; Vu et al., 2022).

H3 proposed that Employee Perception has a positive significant effect on Investigation

Efficiency. This hypothesis was strongly supported. The finding confirms that employees' interpretation of safety and security systems directly affects investigation outcomes. When employees perceive organisational systems as fair, reliable, transparent, and supportive, they are more likely to cooperate with investigators, provide accurate information, report incidents, and support corrective actions. Conversely, when employees perceive investigations as punitive, biased, or inconsistent, they may withhold information or disengage from the process. This finding is consistent with organisational justice and employee silence literature, which shows that perceptions of fairness influence whether employees speak up or remain silent (Adamovic, 2023; Adamska, 2021). It also supports research on employee voice and inclusive leadership, which suggests that employees contribute more openly when they feel respected, included, and psychologically safe (Korkmaz et al., 2022; Qi et al., 2023).

The moderation result provides support for **H4**, which proposed that Organisational Culture moderates the relationship between Employee Perception and Investigation Efficiency. The interaction effect between Organisational Culture and Employee Perception was statistically significant. However, the negative coefficient indicates that Organisational Culture weakens the positive relationship between Employee Perception and Investigation Efficiency in this model. This finding is important because it suggests that culture does not automatically strengthen the effect of positive employee perception. Rather, the type or quality of the prevailing culture may determine whether employee perception is effectively translated into efficient investigation outcomes. For example, if the culture is hierarchical, blame-oriented, inconsistent, or resistant to learning, positive employee perception may have less influence on investigation efficiency. This is consistent with literature showing that organisational culture shapes safety learning, incident response, openness, reliability, and the effectiveness of organisational improvement processes (Churruca et al., 2023; Cribb et al., 2022; Dwyer et al., 2023; Rotteau et al., 2022).

The mediation findings provide strong support for **H5 and H6**. **H5** proposed that Employee Perception mediates the relationship between Security Management Practices and Investigation Efficiency. The significant indirect effect confirms that Security Management Practices improve Investigation Efficiency partly through their influence on Employee Perception. This means that security practices are more likely to support efficient investigations when employees perceive them as credible, fair, protective, and trustworthy. In the UAE energy sector, this is especially relevant because security-related investigations may involve sensitive operational information, cybersecurity incidents, asset protection issues, and regulatory reporting obligations. Therefore, security management should not be treated only as a technical or compliance function. It should also be understood as a trust-building organisational practice that shapes employee willingness to cooperate with investigations (Greulich et al., 2024; Marquez Tejon et al., 2023; Patterson et al., 2024).

H6 proposed that Employee Perception mediates the relationship between Safety Management Practices and Investigation Efficiency. This hypothesis was also supported, and the indirect effect was stronger than the indirect effect of Security Management Practices. This indicates that Safety Management Practices have a stronger influence on Investigation Efficiency through Employee Perception. The finding suggests that safety practices improve

investigation efficiency not only by preventing incidents or providing formal procedures, but also by shaping employee willingness to report, participate, and learn. When safety practices are perceived as consistent, fair, supportive, and improvement-oriented, employees are more likely to engage honestly in investigation processes. This aligns with research showing that safety climate and psychological safety influence safety voice and safety-related behaviour (Draghici et al., 2022; Sun et al., 2022), and with incident-learning literature that highlights the importance of just responses, openness, and employee participation in learning from incidents (Cribb et al., 2022; Guan et al., 2024; Serou et al., 2021).

The predictive relevance results further confirm the robustness of the model. The cross-validated redundancy Q^2 values for Employee Perception and Investigation Efficiency were greater than zero, indicating that the structural model has predictive relevance for the endogenous constructs. The cross-validated communality Q^2 values were also positive for all constructs, confirming the predictive quality of the measurement model. These results show that the model is not only statistically significant but also useful for predicting key organisational outcomes. In practical terms, the framework can help UAE energy-sector organisations understand how improvements in safety and security management practices may strengthen employee perception and, in turn, improve investigation efficiency.

From a regulatory perspective, the findings are highly relevant. UAE energy-sector organisations operate within a formal governance environment where occupational safety, incident reporting, investigation, corrective action, and compliance obligations are strongly emphasised (Abu Dhabi Department of Municipalities and Transport, 2024; Abu Dhabi Public Health Center, 2024; Department of Energy, 2025; Ministry of Human Resources and Emiratisation, 2023). However, the findings suggest that regulatory compliance alone is not sufficient to guarantee efficient investigations. Organisations may have investigation policies, reporting systems, and corrective action procedures in place, but these systems may not work effectively if employees do not trust them or perceive them as fair and useful. Therefore, improving investigation efficiency requires both procedural compliance and a positive employee experience of safety, security, and investigation systems.

The findings also make a theoretical contribution by extending the understanding of investigation efficiency as a socio-technical outcome. Previous research has examined incident learning, safety climate, organisational justice, employee voice, security management, high reliability, and integrated safety-security systems. This study brings these areas together by showing that Employee Perception is a key mediating mechanism through which Safety Management Practices and Security Management Practices influence Investigation Efficiency. It also shows that Organisational Culture can condition the strength of the relationship between Employee Perception and Investigation Efficiency. This supports the view that organisational systems produce stronger outcomes when they are supported by employee trust, fairness, voice, learning, and a culture that enables open participation (Adamovic, 2023; Churruca et al., 2023; Dwyer et al., 2023; Ylönen & Björkman, 2023).

Practically, the findings suggest that UAE energy-sector organisations should strengthen both the technical and human dimensions of investigation systems. Safety and security practices

should be clearly communicated, consistently implemented, and visibly supported by management. Investigation processes should promote fairness, confidentiality, transparency, and learning rather than blame. Employees should be encouraged to report concerns, participate in investigations, and provide feedback without fear of punishment. Organisations should also evaluate their culture to determine whether it encourages openness, trust, and learning or whether it weakens the ability of employees' positive perceptions to improve investigation efficiency.

Overall, the findings confirm that Employee Perception plays a central mediating role in the relationship between Safety and Security Management Practices and Investigation Efficiency. Strong safety and security systems improve investigation efficiency most effectively when they create positive employee perceptions of trust, fairness, protection, and organisational support. At the same time, Organisational Culture significantly moderates the relationship between Employee Perception and Investigation Efficiency, suggesting that cultural conditions influence whether positive perceptions are translated into efficient investigation outcomes. In the UAE energy sector, where regulatory expectations are high and operational risks are significant, these findings show that efficient investigations require more than formal compliance. They require employees who trust the system and an organisational culture that supports fairness, openness, participation, and learning.

6. Conclusion

This study investigated the mediating role of Employee Perception in the relationship between Safety Management Practices, Security Management Practices, and Investigation Efficiency, while also examining the moderating influence of Organisational Culture within the UAE energy sector. The study was motivated by the need to move beyond purely procedural explanations of investigation effectiveness by examining the behavioural and organisational conditions that influence investigation outcomes in high-risk environments.

The findings provide substantial empirical support for the proposed conceptual framework. The measurement model demonstrated satisfactory reliability and validity across all constructs, confirming that Employee Perception, Investigation Efficiency, Organisational Culture, Safety Management Practices, and Security Management Practices were measured appropriately. The structural model further revealed strong explanatory power, indicating that investigation efficiency is shaped not only by formal management systems but also by employee interpretations and organisational context.

The results showed that both Safety Management Practices and Security Management Practices positively influence Employee Perception. This suggests that employees are more likely to develop favourable perceptions when organisational systems are viewed as reliable, transparent, supportive, and consistently implemented. However, Safety Management Practices demonstrated a stronger influence than Security Management Practices, indicating that employees may interact more directly with safety-related systems in their daily operational activities. This finding highlights the greater visibility and immediacy of safety practices within the energy sector work environment.

A key contribution of the study is the confirmation that Employee Perception significantly influences Investigation Efficiency. The findings indicate that effective investigations depend not only on technical procedures, reporting mechanisms, or regulatory compliance, but also on employee trust in the investigation process. Employees who perceive organisational systems as fair and supportive are more likely to cooperate during investigations, provide accurate information, participate openly, and support corrective actions. This reinforces the argument that investigation efficiency is fundamentally influenced by human and behavioural factors rather than by procedural systems alone.

The mediation analysis further demonstrated that Employee Perception serves as an important explanatory mechanism linking management practices to investigation outcomes. Both Safety Management Practices and Security Management Practices indirectly improved Investigation Efficiency through their influence on Employee Perception. Nevertheless, the indirect effect associated with Safety Management Practices was stronger, suggesting that safety-related experiences may play a more influential role in shaping employee attitudes and behaviours toward investigations. This finding emphasises that management systems achieve effectiveness not simply through implementation, but through the way employees interpret and experience them in practice.

The moderation analysis revealed that Organisational Culture significantly influences the relationship between Employee Perception and Investigation Efficiency. However, the negative interaction effect indicates that organisational culture weakened the relationship in the tested model. This finding challenges the common assumption that organisational culture always strengthens positive organisational outcomes. Instead, the results suggest that culture can either support or constrain the translation of positive employee perceptions into effective investigation practices. In organisational environments characterised by hierarchy, blame, limited openness, or weak learning orientation, positive employee perceptions alone may not be sufficient to achieve highly efficient investigations. Consequently, the quality and characteristics of organisational culture become critical in determining whether employee trust and engagement can effectively contribute to investigation processes.

Overall, the study concludes that Investigation Efficiency in the UAE energy sector is a socio-technical outcome shaped by the interaction between organisational systems, employee perceptions, and cultural conditions. Formal safety and security practices remain important, but their effectiveness depends significantly on whether employees trust these systems and perceive them as fair, transparent, and supportive. Similarly, organisational culture plays a critical contextual role in determining whether positive employee perceptions can translate into meaningful investigative outcomes.

From a practical perspective, the findings suggest that organisations within the UAE energy sector should move beyond compliance-driven approaches to safety and security management. While technical systems and regulatory procedures are necessary, organisations must also strengthen employee trust, encourage open communication, reduce fear of blame, and promote participation in reporting and investigation activities. Investigation processes should therefore be designed not only for procedural accuracy but also to support fairness,

confidentiality, learning, and psychological safety. Additionally, organisations should critically assess whether their existing cultures genuinely encourage openness and learning or unintentionally discourage employee engagement during investigations.

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