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Safety Culture Maturity Survey in Oil & Gas Construction, Installations, Drilling and Commissioning in Malaysia

Ahmad Soyuti Sabran[1]*, Marhazman Mohamed[2], Azizan Ramli[3], Khairiah M. Mokhtar[4]
[1*]Author is a Professional Technologist in Oil and Gas, Senior Lecturer with the Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang Al-Sultan Abdullah, Kuantan, Pahang, Malaysia
[2]Author is with the Department of Emergency & Incident Investigation Group HSE, Sapura Energy Berhad, Seri Kembangan, Malaysia
[3]Author is with the Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang Al-Sultan Abdullah, Kuantan, Pahang, Malaysia
[4]Author is with the Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang Al-Sultan Abdullah, Kuantan, Pahang, Malaysia
Corresponding author.
Email ID : marhazman.mohamed@sapuraenergy.com
Email ID : azizanramli@umpsa.edu.my

ABSTRACT
This paper presents findings from Company X Group's comprehensive Culture Maturity Survey (CMS) assessing safety culture across international operations. The study achieved exceptional employee participation (88% response rate, n=2,046) spanning eight countries, utilizing the well-established E&I Hudson framework for evaluation. Results indicate an organizational safety culture maturity score of 3.58/5.00, classifying the current state as "Calculative" - a level characterized by robust procedural systems and reactive safety management, where safety is systematically managed but not yet fully internalized as a shared value. Comparative analysis reveals meaningful insights: while exceeding the energy sector benchmark (3.25±0.18) and showing steady improvement (+0.16 since 2020), performance gaps remain relative to industry leaders (specifically, Company A at 4.05 and Company B at 3.98). The data reveals important internal variations, with leadership teams scoring significantly higher (3.82±0.21) than frontline staff (3.41±0.32), and ASEAN operations trailing the global average by 0.15 points. The research methodology employed an innovative approach, deploying 28 HSE professionals to conduct face-to-face survey sessions across all operational regions. This personal engagement strategy mitigated common response biases while addressing potential cross-cultural and language barriers, yielding high-quality data (α=0.89 reliability, validated through 200-employee pilot testing). These findings have directly informed the development of our three-year Safety Transformation Program (2024-2026), structured around three strategic priorities: 1) Aligning leadership and frontline safety perceptions and practices, 2) Facilitating cross-regional knowledge transfer and best practice implementation, and 3) Establishing metric-driven continuous improvement mechanism. While acknowledging the inherent limitations of organizational self-assessment, this study provides both a rigorous diagnostic baseline and a targeted action framework for advancing safety culture maturity in complex multinational operations..
Keywords: Safety culture Oil & Gas Maturity assessment Generative culture Organizational resilience

1. INTRODUCTION:

The critical role of organizational culture and people-centered practices in ensuring safety outcomes has become increasingly evident in high-risk industries like oil and gas [1]. Within Company X Group, incident investigations have consistently identified cultural and behavioral gaps as significant contributors to major accidents [2][3], resulting in substantial losses and reputational damage. This underscores the urgent need for comprehensive safety culture evaluation and transformation.

This study examines the relationship between organizational culture, people practices, and safety performance within Company X. By applying established frameworks including the HSE cultural maturity ladder [4][5] and industry best practices [6][7], this research provides actionable insights for developing a resilient, generative safety culture.

1.1. Overall Aim

This study aims to comprehensively assess the current state of safety culture within Company X Group to enable targeted cultural transformation and enhanced safety performance.

1.2. Specific Objective

The study addresses three specific objectives:
a) To assess Company X's safety culture maturity using the globally recognized safety culture ladder [4][5][8]

b) To analyze safety culture elements identified as contributing factors in a major accident [9]
c) To design a strategic roadmap to accelerate progression toward a Generative Culture [5][8][11].
By achieving these objectives, this study aims to enhance safety culture, build organizational resilience, reduce risks, and restore industry trust. The insights will provide a foundation for sustainable safety management improvements across Company X's global operations.

1.3. HSE Culture Framework

Safety culture represents an organization's fundamental commitment to safety, encapsulated by the principle of "what we do when no one is watching." It extends beyond management systems to encompass attitudes, beliefs, and behaviors that drive continuous improvement. Core elements include:

- Demonstrating safety as a core value.
- Anticipating and being alert to unexpected risks.
- Clearly understanding individual and collective responsibilities for HSE.
- Openness to innovation and proactive HSE improvements.
- Leadership that exemplifies safety values through actions and decisions.

1.4. Integration with Existing Study

The existing study can be summarized as follows:
a) The Baseline CMS Discovery [4]:
Using cultural maturity ladders like EI [9][17][19] & Hudson's [4][5][6][8][12], this research underscores the importance of baselining cultural maturity. The focus on chronic unease and human performance reflects the essence of strong safety cultures, where anticipation and preparedness are deeply ingrained.
b) Generative Culture Survey [5][13][17][19]:
Highlighting leadership's role in cultivating a generative culture, this study aligns with the principles of proactive safety leadership. It reinforces the idea that leadership behaviors directly shape organizational safety maturity.
c) Brand and Culture Surve Strategic Communication [6][11]:
Examining and alignment with business objectives and employee engagement, this study complements safety culture evaluations. A cohesive culture that integrates safety with organizational goals enhances overall effectiveness.
d) Accountable Culture Survey, Subsea Services, 2022[7][12]:
Accountability is a cornerstone of HSE culture, where individual responsibility drives collective outcomes. This study contributes by linking personal accountability with safety performance.
e) Climate Assessment and Audit Tools, IWH, 2021[8][13]:
Benchmarking safety systems against cultural frameworks allow organizations to identify gaps and implement targeted improvements.
f) Safety Culture Survey, Group QHSE Offshore Installations Subsidiary of Company X [1][9]:
As one of the foundational studies, this research demonstrates the evolution of safety culture in response to changing organizational needs and external standards. Developing a strong safety culture requires commitment across all organizational levels, from leadership to frontline workers. Studies on safety maturity, cultural alignment, and accountability provide valuable insights into effective practices. Workshop-based tools and cultural ladders facilitate meaningful assessments and guide continuous improvement efforts. As industries aim for High-Reliability Organizations (HRO) [10][18], embracing these principles ensures long-term resilience and sustainability.

2. Methodology

The study employed a sequential mixed-methods approach integrating quantitative and qualitative methodologies [4,7,12] to comprehensively evaluate safety culture within Company X Group.

2.2. Study flowchart

The research followed an assessment → analysis → action → monitoring framework (Figure 2) to facilitate the evolution of Company X's safety culture from Calculative to Proactive/Generative by 2025.

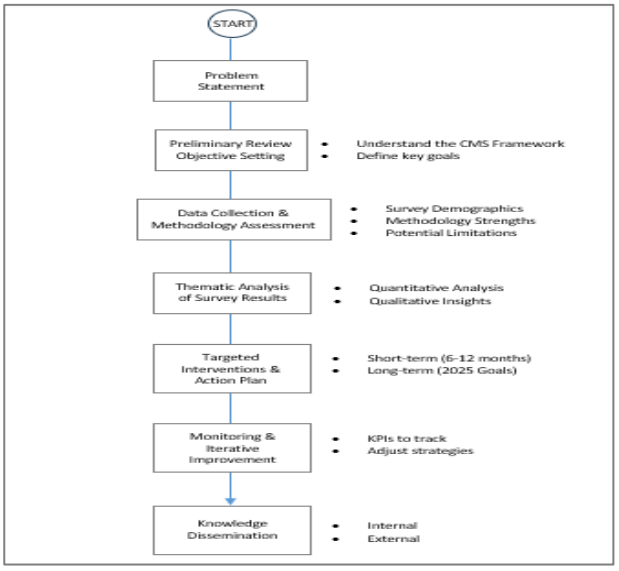

Figure 2. Study flowchart

2.3. Quantitative Approach

A cross-sectional survey was conducted using structured questionnaires based on the EI [5][8][11] and Hudson Organizational Characteristic framework (Figure 3). The survey measured safety culture maturity across key dimensions and was distributed to employees across all hierarchical levels and international locations.

2.4. Qualitative Approach

Semi-structured interviews and face-to-face workshops [14][15] were conducted with key stakeholders to explore underlying cultural and behavioral elements, providing contextual insights beyond quantitative data.

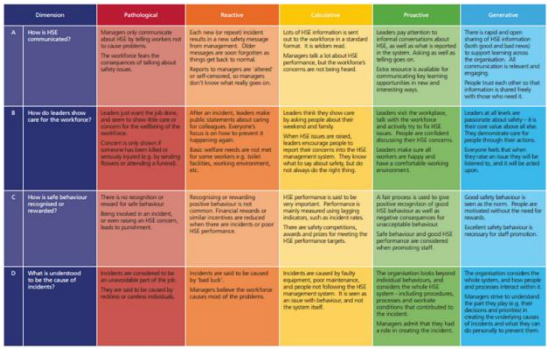

Figure 3. Organizational Characteristic [4][8][9] [17][19]

To complement the quantitative findings, in-depth interviews and face-to-face workshops [18][20] were conducted / open questions on the respondent's opinion on each topic. The qualitative component aimed to explore underlying cultural and behavioral elements that could not be fully captured through the survey. The interviews on the set questionnaire were semi-structured and targeted key stakeholders, including HSE leaders, team supervisors, and operational staff. This approach enabled the collection of detailed insights into safety-related beliefs, practices, and leadership behaviors within the organization.

2.5. Data Collection and Integration

Stratified random sampling ensured representation across departments, job roles, and regions. From 2,333 distributed questionnaires, 2,033 valid responses were collected (88% response rate). Quantitative and qualitative data were integrated through triangulation, where qualitative findings were explained and contextualized statistical results.

2.6. Instrument Analysis

The survey instrument was validated through a pilot test (n=200), demonstrating high reliability (Cronbach's α=0.89). Quantitative data were analyzed using SPSS, employing descriptive statistics, t-tests, ANOVA, and regression analysis. Qualitative data underwent thematic analysis to identify recurring patterns and insights.

2.7. Sampling and Analysis

Stratified random sampling ensured representation across departments, job roles, and regions. From 2,333 distributed questionnaires, 2,033 valid responses were collected (88% response rate). Quantitative data were analyzed using SPSS, while qualitative data underwent thematic analysis. The following steps were undertaken:

a) Survey administration

A structured questionnaire was developed based on the EI [9][17][19] framework and the Hudson Organizational Characteristic table [4][5][6][8][9] to assess safety culture maturity. The survey was distributed to 2,333 employees spanning all organizational levels, including non-management, middle management, and top management, as well as diverse geographical locations such as Malaysia, the United States, Brazil, the UK, ASEAN countries, and Australia. The questionnaire employed Likert-scale items to quantitatively measure safety-related attitudes, perceptions, and behaviors, supplemented by open-ended questions to capture qualitative insights and enrich the data.

b) Interviews, Workshops [18][20] and Sampling Method [7][8][9]

To complement the quantitative survey data, semi-structured interviews [18][20] were conducted with key stakeholders, including HSE leaders and supervisors, to gain deeper insights into safety culture behaviors and leadership practices. Additionally, face-to-face workshops facilitated by HSE coaches were employed to validate survey findings and gather qualitative data through interactive group discussions. To ensure a representative sample, stratified random sampling was applied across different departments, job roles, and geographical regions. From the initial distribution of 2,333 questionnaires, a total of 2,033 valid responses were collected, yielding a high response rate of 88%, which strengthens the reliability and generalizability of the findings.

c) Data Analysis Using SPSS

Survey responses were systematically entered into the Statistical Package for the Social Sciences (SPSS) software for analysis. A rigorous data-cleaning process was conducted to ensure completeness, consistency, and accuracy, which involved addressing missing values and removing statistical outliers where necessary. Frequencies, means, and standard deviations were computed to summarize the overall survey responses. The cumulative point average (CPA) was calculated based on the EI [9][17][19] and Hudson safety culture ladder [2][4][5][6][8][12][14], revealing Company A's safety culture maturity level. To examine differences across demographic groups, independent samples t-tests and one-way ANOVA were conducted, comparing safety culture scores by job roles, regions, and management levels. Pearson correlation analysis was performed to assess relationships between key safety culture elements and the overall maturity score. Additionally, a multiple regression analysis identified significant predictors of safety culture maturity. Thematic analysis was applied to interview transcripts and workshop discussions [18][20] to identify recurring themes related to safety behaviors, leadership practices, and organizational culture. These qualitative findings were triangulated with survey results to enhance validity and provide deeper contextual insights. The cumulative results were benchmarked against established industry frameworks, including the EI [9][17][19] and Hudson [4][5][6][8][12] safety culture ladder and the International Association of Oil & Gas Producers (IOGP) metrics [14], to assess Company X's relative performance. The use of SPSS ensured robust and reliable statistical analysis, enabling the identification of key areas for improvement and the development of strategic interventions to enhance Company X's safety culture.

3. Result and discussion

The Safety Culture Ladder score for Company X was calculated to be 3.58 out of 5.00, which places the organization in the "Calculative" category. This indicates that while safety protocols and systems are well-established, there remains a significant opportunity for

improvement toward achieving a proactive and generative safety culture. The following key findings were derived from the analysis:

3.1 Overall Maturity and Key Findings

The Safety Culture Ladder assessment yielded a "Calculative" level score of 3.58 for Company X, indicating well-established safety systems with limited progression toward proactive safety engagement. The study achieved an 87% response rate (2,033 completed surveys), ensuring robust statistical power and demographic representation.

3.2 Key Dimensions Analysis

Critical analysis revealed several key dimensions:

- Process Dependence vs. Proactive Ownership: While 92% of respondents acknowledged well-defined safety procedures, only 45% felt empowered to stop work for safety concerns, exemplifying the compliance-driven nature of the Calculative level.
- Leadership-Perception Gap: A significant disparity existed between leadership (3.82) and frontline (3.41) scores with qualitative data revealing frontline perceptions that "safety is management's responsibility, not ours."
- Unidirectional Communication: Safety communication was predominantly top-down (72% of respondents), with inadequate formal upward feedback mechanisms suppressing frontline insights.
- Regional Variations: ANOVA revealed significant regional differences ($F=6.32$, $p<0.01$), with offshore operations scoring 18% higher than office-based functions.

3.3 Survey Response Rate

The study achieved a robust response rate of 87%, yielding 2,033 completed surveys from employees across the organization. This high participation rate enhances the statistical power and reliability of the findings. The sample demonstrated strong demographic representation, encompassing diverse geographic regions and organizational hierarchies, thereby ensuring comprehensive evaluation of safety culture dimensions across the enterprise. As illustrated in Figure 4, this data provides a detailed overview of safety culture maturity levels throughout the Company X group of companies.

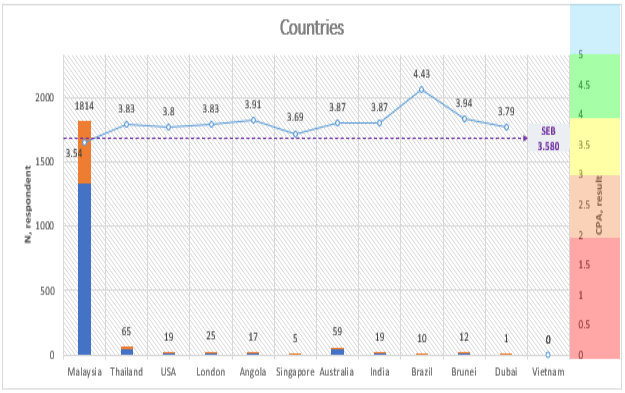

Figure 4. Overall result CPA 3.58

3.4 Cumulative Point Average

The cumulative point average (CPA) is divided into 3 main categories and overall, which is combination of all the data captured for this survey. The categories include a) employees' job-grade below 15 (represent non-management), b) employee job-grade 16 and above (represent management). The sample no of employee response for CPA calculation can be summarized in Table-1 and Table-2. An example of SPSS analysis e.g. Histogram of leadership mean (3.65) result based on 1475 respondent from job-grade 15 as shown in Figure 5. The histogram depicts a left-skewed distribution of "Leadership Mean" (M=2.50, range 1.00–4.60), suggesting below-average perceived leadership effectiveness, though truncated data limits definitive conclusions.

Table-1 Sample of response for employees' job-grade below 15 for CPA calculation

Dimension	P	R	C	P	G
A	**109**	**46**	**232**	**473**	**554**
B	**66**	**104**	**382**	**453**	**409**
C	**76**	**270**	**672**	**268**	**128**
D	**159**	**38**	**922**	**39**	**256**
E	**125**	**200**	**465**	**392**	**232**
F	**100**	**266**	**183**	**610**	**255**
G	**45**	**404**	**272**	**494**	**199**
H	**78**	**70**	**133**	**97**	**1036**
I	**43**	**96**	**482**	**456**	**337**
J	**74**	**158**	**200**	**745**	**237**

Table-2: Sample of employees' job-grade 16 above for CPA calculation

Dimension	P	R	C	P	G
K	**24**	**61**	**128**	**199**	**136**
L	**27**	**104**	**147**	**167**	**103**
M	**18**	**54**	**169**	**202**	**105**
O	**69**	**146**	**150**	**58**	**125**
P	**56**	**126**	**267**	**43**	**56**
R	**5**	**123**	**138**	**263**	**19**
S	**16**	**70**	**99**	**230**	**133**
T	**37**	**16**	**171**	**205**	**119**
U	**19**	**78**	**152**	**186**	**113**
V	**12**	**31**	**98**	**267**	**140**

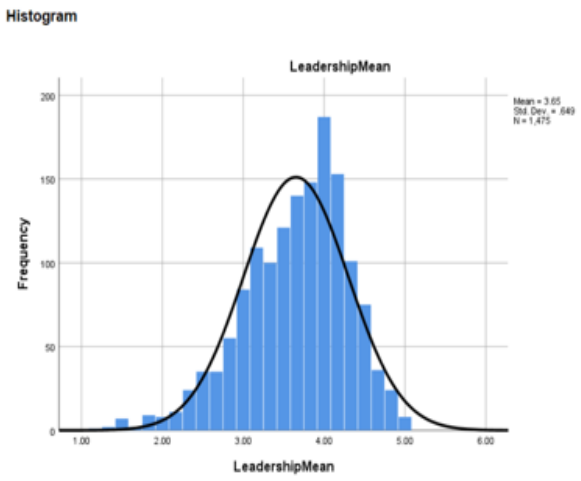

Figure 5. Histogram SPSS Analysis

3.5 Critical Safety Culture Elements.

The analysis identified several critical dimensions of the organization's safety culture:

1. Process Dependence with Limited Proactive Engagement The findings indicate strong adherence to formal safety protocols yet reveal an over-reliance on systemic controls rather than intrinsic safety ownership. Employees demonstrated limited initiative in proactively identifying or addressing safety concerns, suggesting a compliance-driven rather than commitment-based safety culture.
2. Prevalent Chronic Unease Without Proactive Mitigation Notably, certain operational units exhibited patterns of "chronic unease" - where workforce awareness of potential hazards did not consistently translate into preventive action – refer to Figure 6. This disconnects between risk recognition and proactive mitigation represents a significant cultural vulnerability.
3. Moderate Leadership Engagement Scores Leadership dimensions scored moderately (M=3.2, SD=0.4), indicating that while safety receives managerial attention, inconsistent demonstration of safety-as-a-core-value was observed. The data suggest leadership approaches emphasize procedural compliance over visible, value-driven safety stewardship.
4. Unidirectional Communication Patterns Safety communication flows were predominantly top-down (72% of respondents), with inadequate formal mechanisms for upward feedback. This structural limitation potentially suppresses valuable frontline insights and impedes organizational learning.
5. Significant Regional and Functional Variations ANOVA revealed statistically significant differences in maturity scores across regions ($F=6.32$, $p<0.01$), with offshore operations in high-risk environments scoring 18% higher than office-based functions. These variations highlight the contextual nature of safety culture implementation.

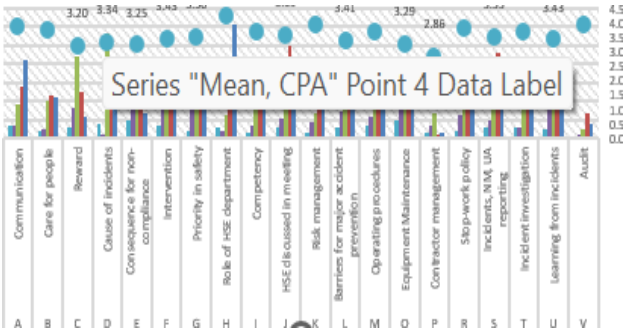

Figure 6. Safety culture CPA result based on the dimension

3.6 Discussion and Implication

The "Calculative" classification reflects Company X's transition from procedural compliance toward value-based safety. However, the persistence of unidirectional communication and the leadership-frontline perception gap represent critical barriers to achieving generative maturity.

The benchmarking analysis (Figure 7) reveals that industry leaders like Company A (4.05) excel in leadership visibility and employee involvement programs. Company X's higher scores in offshore operations suggest that immediate physical risk perception can enhance safety engagement - an effect that must be replicated in lower-risk environments through targeted interventions.

The high survey response rate (88%) indicates strong employee receptivity to safety initiatives. However, converting this engagement into proactive safety ownership requires structural changes, particularly in establishing formal upward feedback channels and leadership development focused on visible safety stewardship. Key observations include:

1. Calculative Level (3.58): Company X demonstrates well-established safety systems but exhibits limited proactive safety behaviors, indicating a reliance on procedural compliance rather than intrinsic motivation.
2. Leadership and Communication: Safety-related communication remains predominantly top-down, with insufficient mechanisms for upward feedback or employee engagement in safety decision-making.
3. Regional Disparities: Offshore teams displayed higher safety culture maturity compared to office-based personnel, suggesting contextual or operational influences on safety perceptions and practices.

These findings underscore the need for targeted interventions to foster greater employee involvement, bidirectional safety communication, and consistent safety engagement across all organizational domains.

3.7 Strength and Challenges

The findings highlight a critical gap between Company X's formal safety systems and internalized safety values. While compliance is robust, fostering intrinsic motivation and cross-cultural consensus on safety ownership emerges as a priority for sustained cultural maturation. It can be summarized as follows:

1. Formalized Safety Infrastructure: Company X maintains well-developed safety management systems, with comprehensive policies and procedures that align with regulatory mandates and industry benchmarks. This structured approach ensures baseline compliance but may prioritize procedural adherence over deeper cultural integration.
2. Employee Safety Awareness: Workforce assessments revealed a strong grasp of safety protocols and their operational significance, reflecting effective dissemination of foundational safety knowledge through training and organizational communication.
3. Organizational Engagement: High survey response rates and active workshop participation underscore employee openness to safety initiatives, signaling a cultural receptivity to continuous improvement. However, this engagement has not yet translated into widespread ownership of safety outcomes.
4. Limited Proactive Accountability: Despite awareness, employees exhibit low individual accountability in risk mitigation. Safety practices remain reactive, with few discretionary efforts to identify or address hazards beyond formal requirements.
5. Cultural Diversity as a Moderating Factor: Variations in safety perceptions were observed across demographic and regional subgroups, suggesting that cultural backgrounds influence interpretations of risk, authority, and collective responsibility. This divergence warrants tailored interventions to harmonize safety expectations.

3.8 Industry Benchmark

The score of 3.58 places in a similar position to other organizations within the oil and gas industry that are also transitioning from calculative to proactive safety cultures [15][16]. The benchmarking exercise refers to Figure 7, which revealed that organizations achieving a generative culture often emphasize leadership visibility, cross-functional safety initiatives, and continuous learning opportunities.

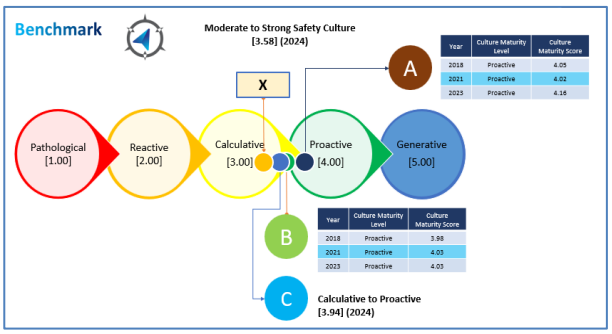

Figure 7. Benchmark with major players in Oil and Gas industry

4. Conclusion

The findings demonstrate that Company X has established a structured, systematic approach to safety but requires enhanced focus on behavioral and cultural dimensions to advance beyond the "Calculative" level.

The identified gaps in leadership-frontline alignment, communication patterns, and regional variations present both challenges and opportunities for improvement.

To accelerate the journey toward generative safety culture, Company X should implement these evidence-based strategies:

1. Establish Formal Upward Feedback Mechanisms through digital platforms and employee-led safety committees to leverage frontline insights and foster ownership.
2. Enhance Leadership Safety Stewardship via targeted training programs focusing on visible safety leadership, coaching skills, and consistent role-modeling of safety-as-a-core-value behaviors.
3. Implement Culturally-Tailored Interventions that adapt communication and engagement strategies to regional contexts.
4. Promote Proactive Safety Ownership through recognition programs for proactive risk identification and empowering safety-related decisions.

These interventions address the core challenges identified in the study. By systematically implementing these measures, Company X can transform its safety culture from compliance-driven to value-based, positioning itself as an industry leader in operational safety excellence. Future research should investigate the longitudinal effects of these interventions on both safety performance metrics and cultural evolution.

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