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SYNERGIZING SAFE BEHAVIOUR, SAFETY LEADERSHIP, AND SAFETY COMMUNICATION: A SOCIOLOGICAL ANALYSIS OF SAFETY CULTURE FORMATION AND OPERATIONAL EXCELLENCE IN HIGH-RISK INDUSTRIES

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ABSTRACT

This study investigates the sociological dynamics shaping the formation of safety culture and its role in achieving operational excellence within high-risk industries. Despite widespread adoption of safety policies, organizations in Indonesia's oleochemical sector remain limited by compliance-based practices that neglect the social, cultural, and communicative dimensions of workplace safety. Adopting a post-positivist paradigm and a sequential explanatory mixed-methods design, the research integrates quantitative analysis using Structural Equation Modeling (SEM-Lisrel) of 421 employee responses with qualitative thematic analysis through MAXQDA. The results reveal that safe behaviour, safety leadership, and safety communication jointly explain 87.2% of the variance in safety culture and 91.3% in operational excellence, with safety communication emerging as the strongest determinant linking policy to practice. Qualitative findings highlight safety as a socially constructed system grounded in trust, dialogue, and shared meaning, reinforced through practices such as Gemba Walks, Safety Talks, and Toolbox Meetings. The study's novelty lies in its integrative sociological framework that unites behavioural, leadership, and communication dimensions of safety culture, traditionally treated separately, within a social systems perspective. Theoretically, it advances organizational and industrial sociology by conceptualizing safety culture as a dynamic interplay of structure, agency, and communication, offering both analytical depth and practical insight for sustainable safety management.

Keywords: *Leadership, Operational Excellence, Safety Culture, Social Systems Theory, Trust Theory*

INTRODUCTION

Workplace safety has become a fundamental issue in high-risk industries worldwide, including in Indonesia. Sectors such as mining, oil and gas, and the oleochemical industry face not only the threat of occupational accidents that endanger workers' lives but also risks to operational stability and organizational reputation (Bria et al., 2024; Kurnianto et al., 2023). Although various safety policies and procedures have been implemented, field realities show that accidents and operational disruptions continue to occur. In Indonesia, reports from the Social Security Agency for Employment recorded more than 280,000 occupational accidents in 2023, an increase from the previous year (Putri et al., 2019; Sultan, 2023). This fact indicates that formal policies alone do not guarantee safe behavior in the workplace. Many organizations still regard

safety as an administrative obligation rather than as a core value embedded in their work culture (Ramadhan et al., 2025; Siregar et al., 2024). This is a fundamental problem because, without understanding the social and cultural dimensions shaping safe behavior, safety will remain a slogan rather than a living practice at the operational level.

In high-risk industries, safety culture is not merely the result of technical compliance but rather a shared system of meaning developed through social interactions among leaders, workers, and their work environment. Macrae (2022) and Renn et al. (2022) argue that safety failures often arise not from individual weaknesses but from systemic failures in cultivating a participatory safety culture. Similarly, Jackson et al. (2022) and Rhaiem and Amara (2021) suggest that organizational culture evolves from collective patterns of assumptions learned as groups face problems of external adaptation and internal integration. Thus, building a safety culture is not only a managerial issue but also a sociological one, concerned with how values, norms, and meanings are constructed through communication and leadership.

Previous studies have highlighted the importance of safe behavior as a key factor in preventing workplace accidents. Dyreborg et al. (2022) and Meng et al. (2021) demonstrate that safe behavior is influenced by workers' perceptions of leadership and the organization's safety climate. Khalid et al. (2021) and Qiu et al. (2021) further emphasize that proactive safety leadership shapes collective perceptions of the importance of safety, thereby enhancing compliance with safety procedures. However, approaches that overemphasize individual behavior often neglect the social and communicative contexts underpinning such actions. In many cases, workers know what constitutes safe conduct but are influenced by social pressures, hierarchical relations, and workplace communication dynamics that determine whether they act accordingly.

Research on safety leadership has also contributed significantly to understanding how safety values are instilled. Cavazotte et al. (2021) and Liu et al. (2024) assert that transformational leadership styles have a significant impact on safety culture by fostering trust, motivation, and employee participation. Likewise, Bisbey et al. (2021) and Wu et al. (2021) find that effective safety leadership goes beyond giving instructions, it involves two-way communication and role modeling in daily practice. However, in Indonesia's still hierarchical industrial context, leadership practices tend to be top-down, impeding participatory safety communication. This creates a gap between managerial policies and actual field practices.

Safety communication has been widely recognized as a critical element in strengthening safety culture. Kakemam et al. (2021) show that open communication between managers and employees enhances safety perceptions and encourages incident reporting without fear of reprisal. Noviyanti et al. (2021) highlight that communication lies at the heart of organizational culture formation, as it is the medium through which values and norms are constructed and transmitted. Yazdi (2025) further notes that effective communication reshapes risk perceptions, builds shared meanings about safety, and reinforces collective responsibility. Nevertheless, studies in Indonesian industrial settings remain limited to the technical dimensions of

communication, such as reporting frequency or communication media effectiveness, without exploring the deeper social and symbolic meanings embedded in safety messages.

The relationship between safety culture and operational excellence has become increasingly relevant in industrial management studies. Chiarini and Kumar (2021) reveal that a strong safety culture positively correlates with operational efficiency and productivity by reducing accident-related disruptions and improving system reliability. Sahoo (2022) further argues that safety and operational performance are inseparable; a safe organization is one that adapts and learns from failure. However, many studies restrict their analyses to technical or economic aspects, overlooking how safety culture evolves through social and communicative processes.

Sociological studies on workplace safety remain relatively rare compared to technical or managerial approaches. Lameijer et al. (2021) emphasize that safety should be understood as a cultural phenomenon, where meanings and behaviors are shaped through social interactions within organizations. McDermott et al. (2021) add that a sociological perspective can reveal how power, identity, and symbols influence perceptions of risk and safety. In this regard, organizational communication studies, such as Carvalho et al.'s (2021) work on sensemaking, become relevant in understanding how workers construct meaning from risky situations through everyday narratives and dialogue. However, few studies in Indonesia integrate the three dimensions, behavior, leadership, and communication, into a comprehensive model explaining the formation of safety culture.

Moreover, research in occupational safety often attributes failures to human error while overlooking the complex social interactions shaping behavior. Faccio et al. (2023) contend that focusing on individual mistakes obscures the systemic roots of safety failures. Here, the industrial sociology perspective becomes crucial, viewing safety as a social construct in which safe behavior emerges through the internalization of values via communication and leadership. Within the framework of social systems theory (Nicolaidou et al., 2021; Pollini et al., 2022), safety can be understood as a communicative system that produces meaning and coordinates action to avoid risk. This perspective reveals that safety is not merely a matter of compliance but a continuously reproduced social process.

The limited number of studies integrating safe behavior, safety leadership, and safety communication into a single sociological framework indicates a significant research gap. Most studies examine these variables separately, making it difficult to understand how they interact simultaneously to shape a dynamic and sustainable safety culture. Furthermore, the relationship between safety culture and operational excellence is often viewed linearly, whereas both are mutually constitutive within complex social dynamics. In Indonesia's high-risk industrial settings, characterized by collectivist, hierarchical, and harmony-oriented work cultures, a deeper understanding of social interaction and communication is essential to explain why some organizations successfully foster robust safety cultures while others fail to do so.

Against this backdrop, this study aims to explore the formation of safety culture from a sociological perspective by integrating three core dimensions: safe behavior, safety leadership, and safety communication. This approach enables a more holistic understanding of how safety values and meanings are constructed and internalized in daily work practices, and how these processes contribute to operational excellence. By combining quantitative methods based on Structural Equation Modeling (SEM) with thematic qualitative analysis, this study provides not only empirical validation of variable relationships but also an exploration of the social meanings underlying those relationships.

Ultimately, this study offers a novel perspective by conceptualizing safety as an expression of a communicative and reflective social system, rather than a mere outcome of regulation compliance. This approach enriches industrial and organizational sociology by demonstrating that operational excellence is unattainable without a safety culture rooted in participation, communication, and meaningful leadership. The study thus seeks to explain how the synergy among behavior, leadership, and communication can generate a strong safety culture that simultaneously supports organizational performance and sustainability in high-risk work environments.

RESEARCH METHOD

This study was designed to gain an in-depth understanding of how the interaction among safe behavior, safety leadership, and safety communication contributes to the formation of safety culture and the achievement of operational excellence in high-risk industries. To address the complex and multidimensional research questions, this study employed a post-positivist paradigm with a mixed-methods sequential explanatory design, which combines the analytical strength of quantitative and qualitative approaches in sequence. This design was deemed appropriate as it allows not only for the empirical testing of variable relationships but also for exploring the social meanings and cultural contexts underlying these relationships (Saraswati & Devi, 2023; Shan, 2022).

The post-positivist paradigm was selected because it provides a balance between scientific objectivity and the recognition of socially constructed realities. In this context, safety culture cannot be understood solely as a measurable phenomenon but also as a meaningful product of social interaction. Accordingly, the quantitative approach was used to statistically test the theoretical model, while the qualitative approach was employed to interpret how organizational actors construct and embody safety in their everyday work practices. This combination offers a robust foundation for understanding workplace safety as a complex social and communicative system (Bidwell & Báez, 2025; Mukumbang, 2023).

The first phase involved quantitative analysis using Structural Equation Modeling (SEM) with LISREL software, selected for its capability to test simultaneous relationships among multiple latent variables. Data were collected through a structured questionnaire distributed to 421

respondents working across various operational divisions of PT SC, a major oleochemical company in Indonesia operating within a high-risk environment. A stratified random sampling technique was employed to ensure representation across different levels of work risk and organizational functions. The research instrument utilized a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) to measure the dimensions of safe behavior, safety leadership, safety communication, safety culture, and operational excellence.

Instrument reliability and validity were rigorously tested. Internal reliability was assessed through Composite Reliability (CR), with a minimum acceptable threshold of 0.70 (and 0.60 in certain exploratory contexts). Convergent validity was confirmed when factor loadings exceeded 0.50 and the Average Variance Extracted (AVE) surpassed 0.50 (Leko et al., 2023; Mertens, 2024). Discriminant validity was examined by comparing AVE values with cross-loadings among constructs to ensure theoretical distinctiveness. Statistical significance was determined at $p < 0.05$ or $t >$ t-table, ensuring sufficient empirical robustness of the relationships tested. The quantitative analysis provided initial insights into the strength and direction of relationships among the study variables, forming the basis for deeper qualitative interpretation.

The second phase involved qualitative analysis aimed at elaborating and contextualizing the quantitative results. This phase utilized MAXQDA software to manage and analyze data derived from in-depth interviews and focus group discussions (FGDs) involving managers, supervisors, and field workers from various operational units. The analysis followed the six phases of thematic analysis as outlined by Hirose and Creswell (2023) and Proudfoot (2023): data familiarization, initial coding, theme searching, theme reviewing, theme defining and naming, and narrative reporting. Through these stages, the study examined how workplace narratives, symbols, and communication practices shape shared meanings of safety and how these meanings are internalized in daily leadership and behavioral practices.

The mixed-methods approach was applied not merely for data triangulation but to bridge two dimensions of reality, objective and subjective. The quantitative strand provided an empirical structure of how safety factors are statistically interrelated, while the qualitative strand revealed the “why” and “how” behind these relationships within the organization’s social and cultural context. In this way, the findings extended beyond numerical associations toward a deeper understanding of the social dynamics that nurture safety culture. As emphasized by Leko et al. (2023), the strength of mixed-methods research lies in its capacity to produce a comprehensive picture in which quantitative results are enriched by contextually grounded qualitative narratives.

Through the sequential explanatory design, the quantitative phase served as the empirical foundation for identifying significant patterns and relationships, while the qualitative phase functioned as a reflective and interpretive stage for explaining these findings. The integration of both approaches enabled a holistic understanding of safety culture as a living social phenomenon shaped through interaction, communication, and leadership practices.

RESULTS AND DISCUSSION

Overview of Quantitative Findings: Validating the Safety Culture Model

The quantitative analysis using the Structural Equation Modeling (SEM-Lisrel) approach revealed a strong and significant relationship among safe behavior, safety leadership, and safety communication in shaping safety culture, which, in turn, has a direct impact on achieving operational excellence in high-risk industrial environments. The structural model demonstrated that these three independent variables collectively explained 87.2% of the variance in safety culture and 91.3% in operational excellence, indicating an exceptionally robust model in both statistical and practical terms.

These findings suggest that workplace safety is not merely the outcome of formal policies and procedures but rather the product of a social synergy involving individual behavior, visionary leadership, and effective, meaningful communication. Thus, safety emerges not as an administrative construct but as a living social system operating through symbolic, narrative, and institutional interactions within the organization.

Table 1 Coefficient of Determination (R^2) of SEM-Lisrel Model

Model	Dependent Variable	Independent Variables	R^2	Interpretation
Model 1	Safety Culture	Safe Behavior, Safety Leadership, Safety Communication	0.872	87.2% of variance in Safety Culture explained by these three variables
Model 2	Operational Excellence	Safety Culture, Safe Behavior, Safety Leadership, Safety Communication	0.913	91.3% of variance in Operational Excellence explained by Safety Culture and its antecedent fa

Source: SEM-Lisrel Output, 2025

The results indicate that the combination of safe behavior, safety leadership, and safety communication forms an integrated and mutually reinforcing safety system. Within this system, leadership provides direction and values, behavior serves as a tangible manifestation of safety principles, and communication acts as the bridge linking policy to practice. These elements do not operate in isolation but rather interact dynamically to create a socially reinforcing cycle that produces a stable and sustainable safety culture.

This interpretation aligns with Yue et al. (2021), who conceptualize organizations as communicative systems that generate and reproduce social meaning through interaction processes. In the context of workplace safety, this communicative system coordinates actions, shapes expectations, and forms shared perceptions of what is considered “safe.” Hence, safety is not simply the outcome of technical procedures but the result of collectively constructed social meanings.

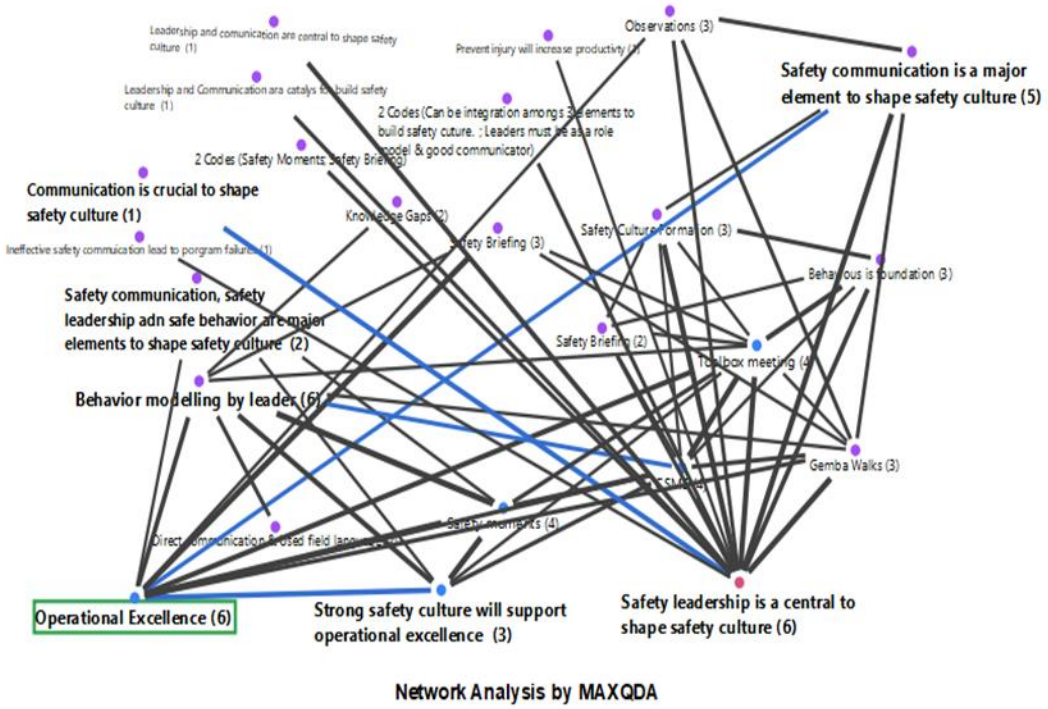

Figure 1 Proposal Model Operational Excellence by MAXQDA
Source: MAXQDA Analysis,2025

This interpretation is further supported by the Organizational Safety Networks theory proposed by Kou and Liu (2025), which emphasizes that the effectiveness of organizational safety depends on the quality of social relationships and communication networks linking all levels of the organization, from leadership to field workers. The SEM-Lisrel findings in this study confirm that safety communication serves as the primary connector between policy and practice, ensuring that safety messages are not only transmitted but also comprehended and internalized throughout the organization.

Among the three primary factors, safety communication emerged as the most dominant variable explaining the variance in safety culture. Its role is multifaceted, as a medium for disseminating values, reinforcing commitment, and fostering shared awareness. Safety communication serves as the arena where symbols, narratives, and organizational texts converge to construct a coherent meaning system. Practices such as Gemba Walks, Safety Talks, and Toolbox Meetings are not merely routine activities but ritualized communicative events that reproduce safety values and strengthen workers' collective identity toward a safe culture. This resonates with Yue et al. (2021), who argue that communication lies at the core of organizational culture because it builds meaning, relationships, and identity.

In the second model, the relationship between safety culture and operational excellence revealed a deeper influence. The R^2 value of 91.3% indicates that safety culture plays a significant mediating role in organizational performance. This suggests that safe behavior and safety leadership may not directly enhance performance; instead, through the establishment of a strong

safety culture, their effects become more profound and sustainable. These findings are consistent with Baedke et al. (2021), who argue that human behavior is shaped by reciprocal interactions among personal, environmental, and social factors. In high-risk industries, safe behavior cannot rely solely on technical training but must be embedded within a social system that values safety as both a moral and professional imperative.

Jankelová and Joniaková (2021) similarly assert that leadership and behavior are only effective when supported by consistent communication systems and a reinforcing organizational culture. This study extends Cooper's model by positioning communication not merely as a mediator but as a central mechanism of social coordination that connects behavior, leadership, and system. Moreover, Vuong et al. (2023) add an affective dimension, suggesting that effective safety communication must evoke empathy and foster interpersonal connectedness in the workplace.

The Central Role of Safety Communication: From Policy to Practice

In industrial organizations, particularly in high-risk sectors such as mining, construction, or manufacturing, safety communication plays a central role in bridging formal policy with everyday practice. Although companies may have comprehensive safety management systems, their effectiveness depends largely on how such policies are communicated, understood, and enacted across all organizational levels. Without effective communication, safety becomes a mere administrative discourse, well-documented but not lived in daily operations (Kou & Liu, 2025).

Safety communication functions as the "lifeline" connecting values, norms, and actions. It operates not only as a means of transmitting technical information but also as a medium for constructing social meaning around what safety is and why it matters. Through interactions such as safety talks, toolbox meetings, and Gemba walks, both workers and management continuously interpret and reaffirm safety values within their respective work contexts. Here, language, symbols, and shared experiences serve as vital mediums for translating formal policy into tangible practice. As Renn et al. (2022) note, safety cannot be instilled solely through regulations but through ongoing dialogue and collective reflection on workplace experiences.

Thus, safety communication is not merely an instructional activity but a social process that enables the internalization of safety values through repeated interaction and shared experience. Jankelová and Joniaková (2021) emphasize that organizations exist not only as formal structures or hierarchies but as communicative practices enacted daily. Within this framework, safety is not something imposed from above but co-created through conversation, symbols, and communicative practices among organizational members.

The Communicative Constitution of Organization (CCO) perspective shifts the traditional view of safety from mere rule compliance toward a dynamic process of social construction. Every time a supervisor emphasizes the importance of personal protective equipment or workers remind each other about safe procedures, they are actively "creating" the reality of safety. Safety

thus emerges as the outcome of continuous communicative coordination, a process in which language and action merge to shape collective norms and behaviors (Gabriella & Rengkung, 2025).

Previous studies confirm that participatory communication significantly enhances safety culture. Febrira et al. (2025) and Puspitasari and Ayustia (2024) found that open, dialogic supervisory communication fosters stronger safety perceptions among workers. Similarly, Pattiasina and Afdhal (2022) demonstrated that empathetic and trust-based communication strengthens "safety voice," the willingness of workers to speak up about potential hazards without fear of reprisal. Two-way, rather than one-way, communication promotes the emergence of a shared safety meaning system in which every individual feels responsible for collective safety.

Empirically, this study found safety communication to be the most influential factor compared to formal policy or technical training. This underscores that policy effectiveness depends not only on its design or documentation but on how it is communicated and socially constructed at the operational level. A well-written policy without effective communication risks becoming a "dead text," losing its social relevance. Conversely, when communication is participatory, safety policies become living systems embedded within the organizational culture.

Moreover, safety communication contributes to maintaining organizational resilience, the ability of an organization to adapt and recover from operational disruptions. When communication systems are open and adaptive, workers can exchange information rapidly, identify risks early, and coordinate responses effectively during emergencies. Thus, communication functions not merely as a message-delivery mechanism but as the organization's social defense system.

Safety Leadership as a Structural Anchor of Social Order

In high-risk organizations, safety leadership functions not merely as a supervisory mechanism but as a structural anchor that sustains social order and directs the moral trajectory of workplace safety values. Safety leaders play a dual role, as authoritative figures and moral agents who embed safety values into collective behavior. In this sense, leadership is not solely an instructive act but a social process that bridges organizational structures with the dynamic realities of everyday interaction (Mincu, 2022).

Field observations indicate that effective safety leadership is often characterized by a transformational approach. Supervisors and field managers do not simply issue directives; they act as living exemplars of safe practices. For instance, during a gemba walk, a manager was observed wearing complete personal protective equipment, inspecting the worksite while engaging in direct dialogue with operators about the risks they encountered. Such moments cultivate a more egalitarian work atmosphere in which safety is understood not as an individual obligation but as a shared responsibility enacted by all members of the organization, including leaders.

One informant, identified as R.H., explained that the effectiveness of safety messages "depends on how leaders treat the people under them." When supervisors engage workers respectfully and discuss safety without condescension, employees feel valued and become more motivated to comply with safety procedures. This finding underscores that communicative and empathetic safety leadership plays a vital role in building a trust climate that underpins organizational social stability (Mayer, 2023).

Transformational safety leadership, therefore, has both symbolic and social dimensions. Leaders not only "regulate safe behavior" but also communicate the moral value that safety is an expression of care for others. Consequently, safety leadership serves as a moral medium that strengthens workplace solidarity. When leaders demonstrate consistency between their words and actions, the legitimacy of safety as a shared organizational norm becomes reinforced. This aligns with Siregar et al. (2024), who emphasize that inclusive safety leadership fosters psychological safety, a condition where workers feel secure to speak up, ask questions, and acknowledge mistakes without fear of blame.

Field observations further revealed that morning briefings often serve as open forums for discussing safety ideas and experiences. For example, one operator shared an incident of almost slipping on a wet floor. Instead of reprimanding him, the supervisor appreciated his honesty and instructed the maintenance team to fix the area immediately. Such situations demonstrate that inclusive leadership fosters participation and strengthens ownership of the safety system. Safety voice, the courage to speak about potential hazards, emerges when leaders display empathy and active listening rather than one-way instruction.

Interviews also revealed a consistent narrative: workers are more likely to comply with safety rules when they "trust the leader's good intentions." A senior technician, S.T., remarked that when leaders "don't just command but are willing to listen," workers feel part of a team rather than subordinates. From a sociological perspective, this illustrates that safety leadership functions as an integrative mechanism that regulates interpersonal relations and reinforces social order through moral legitimacy rather than formal authority.

This analysis resonates with Bisbey et al. (2021), who argue that safety leadership not only upholds organizational structures but enacts them through communicative practice. When leaders speak, provide feedback, or model safe behavior, they are in fact "constructing the organization" in its social sense. Leadership thus becomes a means of producing and reproducing a social order oriented toward safety. This explains why in communicative and participatory work units, safety cultures tend to be more stable and enduring.

Field observations also indicate that interaction patterns between leaders and workers often determine the safety climate more strongly than the completeness of written procedures. For instance, in the heavy-equipment maintenance area, workers were observed reminding each other to check safety locks before beginning work. This culture of mutual vigilance emerged from the example set by the division head, who always began briefings with the simple message: "We are all responsible for each other's safety." Over time, this statement became a shared ritual,

repeated daily and reinforcing the collective meaning that safety is a shared, not merely individual, responsibility.

In this framework, safety leadership can be understood as a structural anchor of social order, a stabilizing force that ensures the organization's social system remains coherent amid operational pressures and workplace complexities. Leaders act as moral navigators, reminding the organization of its fundamental values: safety, care, and collective responsibility. In complex industrial systems, this anchor is essential to prevent the disintegration of safety meanings and practices. Without strong and communicative leadership, safety rules risk devolving into hollow routines devoid of social significance.

Safe Behaviour as the Manifestation of Internalized Safety Values

In high-risk organizational settings, safe behavior should not be understood merely as procedural compliance but as the concrete expression of internalized safety values and norms cultivated through communication and leadership. Workers' actions in the field often mirror how safety values are interpreted, translated, and enacted in daily work life. When safety becomes embedded in workers' social identity, safe behavior no longer depends on external supervision but grows from moral commitment and collective awareness.

Field observations revealed that in production and maintenance areas, workers who actively engaged in safety communication consistently exhibited spontaneous safe actions. Without instruction, they locked equipment before maintenance (lockout-tagout), checked their colleagues' protective gear, and reminded each other of potential hazards. These behaviors are not simply technical compliance but manifestations of social norms deeply integrated into the work culture. A technician, A.M., explained, "If someone forgets their helmet, it's not the boss who scolds them, it's their peers." This simple statement reflects that safe behavior has evolved into an informal social control system grounded in solidarity and shared responsibility rather than fear of punishment.

This finding aligns with Bisbey et al. (2021), whose concept of prosocial safety behavior emphasizes that safe actions are both individual and social. Workers embedded in trusting and respectful social networks are more likely to demonstrate prosocial behavior, helping, warning, and protecting colleagues from harm. From this perspective, safe behavior represents a manifestation of healthy social relationships founded on collective values rather than bureaucratic coercion.

Moreover, spontaneous safe behavior can be seen as the outcome of value internalization achieved through repetitive and participatory communication. In various observed toolbox meetings and safety talks, safety messages were conveyed not only instructively but dialogically. Workers were given opportunities to share experiences and contribute to safety policy discussions. Such communicative processes enable the formation of a shared safety meaning system, a collectively constructed understanding that frames safety as an ethical commitment rather than a formal obligation.

Leadership plays a critical role in shaping safe behavior through role modeling and positive reinforcement. During one gemba walk, for example, a supervisor momentarily halted production to demonstrate proper lifting techniques, then praised workers who followed procedures correctly. This simple act had a powerful symbolic impact: it signaled that safety is a priority and reinforced safe norms through social recognition. Field notes indicate that such actions often led to observable increases in spontaneous compliance in subsequent days, suggesting that social reinforcement has tangible effects on behavior.

An indirect interview with L.D., a production supervisor, revealed that "when team communication flows well, people become more courageous to speak up and watch out for each other." This statement highlights communication as a prerequisite for authentic safe behavior. When workers feel heard and respected, they more readily identify with safety values and incorporate them into everyday habits.

Safe behavior arising from value internalization also fulfills a broader social function, preserving order and balance within the work system. According to Marques and Manzanares (2022), such behavior represents a form of structural coupling between the individual and organizational systems. In this view, workers not only execute procedures but also align their personal meanings with the collective meaning of organizational safety. When these systems harmonize, operational stability is achieved because safe behavior becomes an integral component of the social structure itself.

Furthermore, SEM analysis indicates that safe behavior, together with safety leadership and safety communication, explains 87.2% of the variance in safety culture and 91.3% in operational excellence. These figures demonstrate that safe behavior is not a peripheral element but a central pillar of the organizational safety system. Empirically, its contribution becomes significant when reinforced by strong communication and inclusive leadership. In other words, safe behavior emerges from a sustained social process in which safety meanings are continuously created and reaffirmed through daily interaction.

In the studied organization, safe behavior has evolved into a moral and social indicator. Workers no longer perceive safety as a "top-down rule" but as a commitment to their colleagues and families. As one operator, R.Y., stated, "Working safely isn't just for myself, it's so I can go home safely every day." This expression encapsulates the transformation of safety from a technical procedure into a moral value that reinforces social solidarity in the workplace.

The Sociological Construction of Safety Culture: Trust, Symbol, and Shared Meaning

Safety culture in high-risk organizations is not a static entity or merely a set of policies regulating work behavior, but a product of continuous social construction that unfolds through interaction, symbolism, and shared meaning. Findings from this study indicate that the safety culture at PT SC is shaped through social practices imbued with symbolic meaning, such as gemba walks, safety talks, and toolbox meetings, which function as communicative rituals reinforcing collective values and fostering interpersonal trust. In this context, safety operates as a "social

language" expressed through action rather than as a slogan confined to procedural documents. This process reveals that safety culture functions as a living meaning system bridging organizational structures with workers' subjective experiences on the ground.

Field observations show that daily gemba walks serve as an intimate space of interaction between leaders and workers. These activities are not merely procedural audits but two-way communicative encounters. For instance, one operations manager was observed stopping in the production area to greet a technician conducting a valve pressure check. Instead of merely inspecting the task, he inquired about the technician's family and commended his attention to detail. Such simple moments create symbolic warmth, demonstrating that safety is not solely a technical concern but a human relationship embodied in everyday work. A similar sentiment was expressed by a supervisor (R), who noted, "Sometimes people become more careful not because they fear reprimand, but because they feel trusted and respected." This underscores that the meaning of safety is mediated through social trust rather than formal control structures.

In line with Yanuardi et al. (2022), work gains meaning when individuals connect their actions to broader social values and purposes. At PT SC, safety has emerged as one of those sources of meaning. Workers perceive safe practices not merely as procedural duties but as moral responsibilities toward their colleagues and families. In an informal interview, an operator (L) referred to a sign at the parking area reading, "Going home safely is a gift for your family." This simple message operates as a powerful symbol, marking safety as a moral commitment that binds individuals together and shapes a shared social identity among workers.

This phenomenon reinforces the view that safety culture is a social construct sustained through shared narratives and symbols. Safety-related symbols, such as posters, slogans, or even orange uniforms, function as nonverbal communication tools that reinforce collective awareness. Consistent with previous findings, participatory safety communication facilitates the internalization of values through what may be termed communicative rituals. For example, during weekly safety talks, managers do not merely deliver formal messages but also share personal reflections on minor accidents they have experienced and the lessons learned. These narratives, as observed in the field, evoke empathy and strengthen the symbolic understanding that safety emerges from shared reflection and collective awareness.

The construction of safety culture at PT SC can also be explained through the lens of symbolic interactionism, in which everyday exchanges generate a shared meaning system. Values such as vigilance, mutual reminder, and care do not exist independently, they are enacted through social interaction in the workplace. Each morning toolbox meeting, for instance, serves as a participatory arena where workers and supervisors discuss potential hazards and mitigation measures. While seemingly routine, these meetings carry deep social significance, they represent a collective process of constructing the social reality of safety. Field observations also revealed that senior workers often help newcomers understand risks in a friendly, informal manner, sometimes using humor. This indicates that safety is communicated not only in technical language but also through accessible social discourse.

Table 2 Social and Symbolic Practices in the Construction of Safety Culture

Social/Symbolic Practice	Main Sociological Meaning	Function for Safety Culture
Gemba Walks	Direct interaction between leaders and workers	Builds trust and leadership legitimacy
Safety Talks	Collective narratives and reflective experiences	Internalizes safety values through storytelling
Toolbox Meetings	Collaborative and participatory forum	Reinforces collective responsibility
Visual Symbols (posters, uniforms)	Visual identity of safety culture	Strengthens collective awareness
Organizational Narratives	Stories of success or failure in safety	Constructs meaning systems and social norms

Source: Field observation and qualitative analysis (2025)

From these findings, safety culture emerges as a social glue that unites individuals within the social system of high-risk industries. Trust serves as the primary foundation that enables open communication and cross-level collaboration. As one safety manager (D) remarked, “When people are not afraid to talk about mistakes, that’s when safety begins to grow.” This statement encapsulates a profound sociological insight, safety is not a product of hierarchical control but of a safe social space for knowledge sharing and experiential exchange. This aligns with the theory of psychological safety proposed by Cavazotte et al. (2021), emphasizing that a climate of trust enables active participation in risk communication and safety innovation.

Qualitative data also indicate that these symbolic practices strengthen workers’ social identity as members of a morally bound community. In many cases, workers identify themselves not merely as machine operators but as guardians of collective safety. This identity is not imposed through managerial command but grows organically from daily social experience. When a worker reminds a colleague to properly fasten a safety harness, the act is not simply compliance, it is an expression of social solidarity imbued with moral meaning.

CONCLUSION

This study demonstrates that the formation of safety culture in high-risk industries results from the dynamic interplay among safe behavior, safety leadership, and safety communication, each reinforcing the others within a coherent social system. Safety does not arise solely from procedural compliance but from social processes involving the internalization of values, the building of trust, and the co-construction of shared meanings through communicative and inclusive leadership practices. In this framework, safe behavior represents the manifestation of internalized safety values; leadership acts as a structural anchor maintaining moral and organizational legitimacy; and communication functions as the medium linking policy with practice while constructing a living system of shared meaning among workers. The study concludes that the synergy of these three elements generates a safety culture that not only protects workers but also sustains long-term operational excellence. Theoretically, this research

expands industrial sociology by positioning safety as a social construct arising from the interaction of structure, agency, and communication; practically, it offers a conceptual model for transforming safety from a technical obligation into a collective moral commitment that upholds sustainable organizational performance.

ETHICAL STATEMENT AND DISCLOSURE

This study was conducted in accordance with established ethical principles, including informed consent, protection of informants' confidentiality, and respect for local cultural values. Special consideration was given to participants from vulnerable groups to ensure their safety, comfort, and equal rights to participate. No external funding was received, and the authors declare no conflict of interest. All data and information presented were collected through valid research methods and have been verified to ensure their accuracy and reliability. The use of artificial intelligence (AI) was limited to technical assistance for writing and language editing, without influencing the scientific substance of the work. The authors express their gratitude to the informants for their valuable insights, and to the anonymous reviewers for their constructive feedback on an earlier version of this manuscript. The authors take full responsibility for the content and conclusions of this article.

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