



Employees' Perceptions of Workplace Safety Culture: A Case Study of a Polyester Company

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Abstract

Safety culture is a crucial component of ensuring workplace safety and preventing accidents. This study aimed to assess the safety leadership and safety culture of a polyester company in Thailand. Data gathering was conducted utilizing survey forms developed by the study team, including the 360-degree safety leadership survey and the 36-question safety culture survey. The sample group, comprising 1,286 individuals, consisted of management, employees, and independent contractors from a polyester company with four business units. Both the safety leadership and the safety culture perception surveys were provided with average values, thorough descriptions, graphical representations, and visuals. The study revealed that the perceptions of safety leadership and safety culture among the employees aligned with the standard level. However, certain issues, including off-the-job safety, communicating about safety, empowering other employees, setting safety standards and expectations, and promoting safety improvements and sharing, placed the organization's safety culture at the foundational level, requiring management commitment and awareness development. For further actions, the company should emphasize the value of strategic workers' involvement in programs that empower employees, such as visible safety leadership for all management levels, notification and reporting programs, and safety sharing among business partners, to establish a world-class safety culture as the company's goal.

Keywords:

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1- Introduction

Safety culture has gained significant recognition as a critical element in ensuring workplace safety and accident prevention [1, 2]. High-risk industries, including construction, manufacturing, transportation, and healthcare, require an effective safety culture to be established and maintained [3–5]. Thailand, as a rapidly developing country with a diverse industrial landscape, has experienced substantial growth in its industrial sectors. However, this growth has also posed various safety challenges, necessitating the implementation of effective safety culture frameworks to minimize accidents and foster a safe working environment [6]. Although work-related accidents are currently less frequent than in the past, the statistical injury rate per 1,000 employees has declined between 2017 and 2021 by 2.82, 2.57, 2.53, 2.45, and 2.49, respectively [7]. It is important to note that workplace accidents have significantly affected fatalities, with no corresponding decline in line with the accident rate. The data reveal a consistent number of fatalities during 2017–2021, with recorded figures of 570, 568, 639, 588, and 602 fatalities, respectively [8]. Evidence shows that over 90% of work

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accidents nowadays result from unsafe conduct, drawing the attention of numerous establishments toward taking action to encourage and promote safe behavior [9–11].

Shupmahasan & Sirisuwan showed that safety attitude and work behavior, related to personal characteristics and influential factors on work behavior and safety attitudes, affected the accidents resulting from the operation of the operators [12]. Additionally, Sooklamai & Jiracheewanun revealed that the working environment and operator conduct were the primary factors contributing to accidents among employees. Their study also demonstrated that experience, education, and knowledge of safety policies and regulations improved safety conditions [13]. Klunbut et al. found that accidents among construction workers had a statistically strong relationship with their work-safety behaviors [14].

Over a three-decade period, the concept of safety culture was vigorously addressed and quickly came to the attention of various industries [15]. Several studies indicate the importance of developing a safety-oriented culture in companies in an attempt to mitigate accidents and improve safety performance. Boonyaphisompan et al. (2021) introduced organizational learning and continuous improvement (89.57%) and feedback and communication about errors (92.63%) as the strengths of safety culture. Conversely, the frequency of the reported events (44.20%), staffing (40.70%), and non-punitive response to errors (38.93%) were identified as the weaknesses of the safety culture [16]. Lee et al. (2016) found that establishing a culture of safety where disaster and safety-related policies were managed and integrated across departments could reduce the accident rate [17]. Solmaz et al. (2020) also revealed that a positive safety culture contributed positively to preventing accidents [18]. Saedi et al. (2020) contributed to the relationship between employee engagement in plant safety and the safety climate, as well as employee perceptions of their participation in plant safety [19]. Safety culture is considered a socially constructed component encompassing shared assumptions, values, perceptions, attitudes, and behavioral norms related to safety in the workplace [20]. However, Aburumman et al. (2019) state that the conceptual foundations of safety culture are still unclear, as safety culture intervention studies tend to focus on multifaceted strategies that address various facets of behavioral change [21]. Luo (2020) listed several factors potentially affecting the safety climate of a company, including the attitudes of senior supervisors, the level of safety supervision, the characteristics of the production environment, and the implementation of safety instruction and training. Safety regulations, safety programs, management behavior, and safety attitude behavior are crucial company constituents that, conceptually, influence the safety climate. Research has highlighted that safety awareness entails following legal requirements, keeping a responsible safety attitude, being informed of safety procedures, and having respectable psychological perspectives [22]. Additionally, the level of safety culture and climate can be raised, which can reduce incidences and improve safety indicators [23]. A safe and healthy workplace must also have a strong safety culture, climate, and employee participation to further improve safety performance [1].

Because polyester is a thermosetting plastic, a form of liquid plastic, it gives the impression of being thick, like motor oil. It is a specific class of odoriferous liquid combustible substance, which releases large amounts of solid, liquid, and gaseous waste into the environment. The main source of volatile organic compounds (VOCs), a common waste gas, is the volatilization of surfactants, detergents, and solvents used in the polyester manufacturing process [24–27]. Working in these industries may expose employees to chemicals and waste, necessitating risk considerations in safety culture. The assessment of safety culture primarily relies on qualitative methods. Several approaches, such as interviews, questionnaires, observations, and document reviews, are commonly utilized internationally for assessing safety culture [28]. The highest priority in these industries and the best course of action for enhancing system safety were strengthening the safety apparatus and implementing different protective designs. Large organizations working on safety culture in Thailand frequently compare the level of safety culture in their organization using the Bradley curve of the DuPont model for safety culture development. The Bradley Curve is a diagram that shows the relationship between workplace accidents and corporate culture, outlining the four steps of successful safety culture creation, which consist of the reactive, dependent, independent, and interdependent stages [29]. Hence, the safety perception questionnaire and leadership on safety management were developed using the results of this study to make them suitable for use in the polyester organizational environment and to account for possible risks. According to previous studies, there is a shortage of knowledge to enhance the safety environment and culture in the polyester industry, motivating the researcher to evaluate the organization's safety leadership and level of safety culture to establish a safety culture in an organized way and appropriately ascertain a program that can adequately mitigate accidents and potential hazards.

2- Material and Methods

2-1-Population and Sample

This cross-sectional descriptive study surveyed participants' perceptions of the organization's safety leadership and safety culture between December 2022 and June 2023. The population comprised 1,413 individuals from a polyester company with 4 business units.

The sample population, divided into two sections, voluntarily participated in the project and stayed within the area during the entire survey across all 4 business units. Among them, 1286 participants from management, employees, and contractors responded to the survey questions about safety culture. Only 64 out of 121 managers responded to the leadership questions. The study sample consisted of 65.24% men, 34.67% women, 56.45% employees, 21.70% engineers and supervisors, and 12.44% contractors. In total, 34.14% of the sample group had been employed by the same employer

for over ten years, whereas 26.75% had a work history of five to ten years with the employer. Furthermore, 84.91% of the workers who participated in the project were employed in business unit 1 (Table 1).

Table 1. Demographic data of participants (n=1286)

Characteristics	Number	Percentage
<i>Gender</i>		
Male	839	65.24
Female	447	34.76
<i>Position</i>		
Top & middle management	121	9.41
Supervisor	279	21.70
Employee	726	56.45
Contractor	160	12.44
<i>Years of experience (in years)</i>		
<1	213	16.56
1-4	290	22.55
5-10	344	26.75
> 10	439	34.14
<i>Business unit</i>		
Unit 1	1,092	84.91
Unit 2	47	3.66
Unit 3	83	6.45
Unit 4	64	4.98

2-2- Research Tool

1) The safety culture perception survey consisting of 36 questions was developed by examining the existing literature on safety culture and aimed to evaluate how employees perceived the safety management system. The questions were divided into eight elements, including leadership & commitment (6 items), policy & strategic objectives (6 items), organization resource & documentation (6 items), evaluation & risk management (2 items), implementation & operation control (5 items), monitoring & measurement (8 items), audit & review (2 items), and off-the-job safety program (1 item), represented through Q1 to Q8, respectively, leading to a total number of 36 items (Appendix I).

2) The 360-degree safety leadership survey was utilized for safety leadership appraisal within the organization. The survey consisted of a total of nine questions for management regarding specific aspects of safety leadership: (1) setting safety standards and expectations, (2) demonstrating safety practices, (3) demonstrating safety visibility, (4) addressing safety challenges, (5) empowering other employees, (6) communicating about safety, (7) providing safety guidance, (8) promoting safety improvements and sharing, and (9) establishing a vision for safety (Appendix I)

There were five response options to answer the questions in both surveys, including practicing safety until it becomes routine, taking safety practices seriously, adhering to safety protocols due to regulations, following safety protocols when needed, and disregarding safety protocols. The researcher interpreted the survey results individually, considering each specific aspect to calculate the average score for each item or section based on the responses. The items were rated as follows: practicing safety until it becomes routine = 5, taking safety practices seriously = 4, adhering to safety protocols due to regulations = 3, following safety protocols when needed = 2, and disregarding safety protocols = 1.

Based on the interpretation, safety culture is classified into 5 levels:

1. Emerging safety culture with an average score ranging from 1.0 to 1.9. At this level, safety might not be the foremost concern, productivity may be the primary focus of the business.
2. Foundational safety culture with an average score ranging from 2.0 to 2.9. At this level, safety is important, but safety measures are often taken reactively rather than proactively.
3. Standard safety culture with an average score ranging from 3.0 to 3.9. At this level, there is a system in place to manage all hazards.
4. Advanced safety culture with an average score falling between 4.0 and 4.9. At this level, safety, leadership, and values play a pivotal role in propelling continuous improvement.
5. World-class safety culture with an average score of 5. At this level, a safety program is integrated into regular business operations with active involvement of all employees.

2-3- Research Tool's Quality Assessment

After three experts confirmed the content validity, the quality of the tools was assessed using an index of item objective congruence (IOC) ranging between 0.67 and 1.00.

2-4- Data Analysis

Demographic data are depicted using frequencies and percentages, while the outcomes of the safety culture perception survey and the safety leadership survey are presented with average values, accompanied by descriptions, graphs, and visuals.

2-5- Workflow Flowchart

Figure 1 displays the flowchart of the approach framework

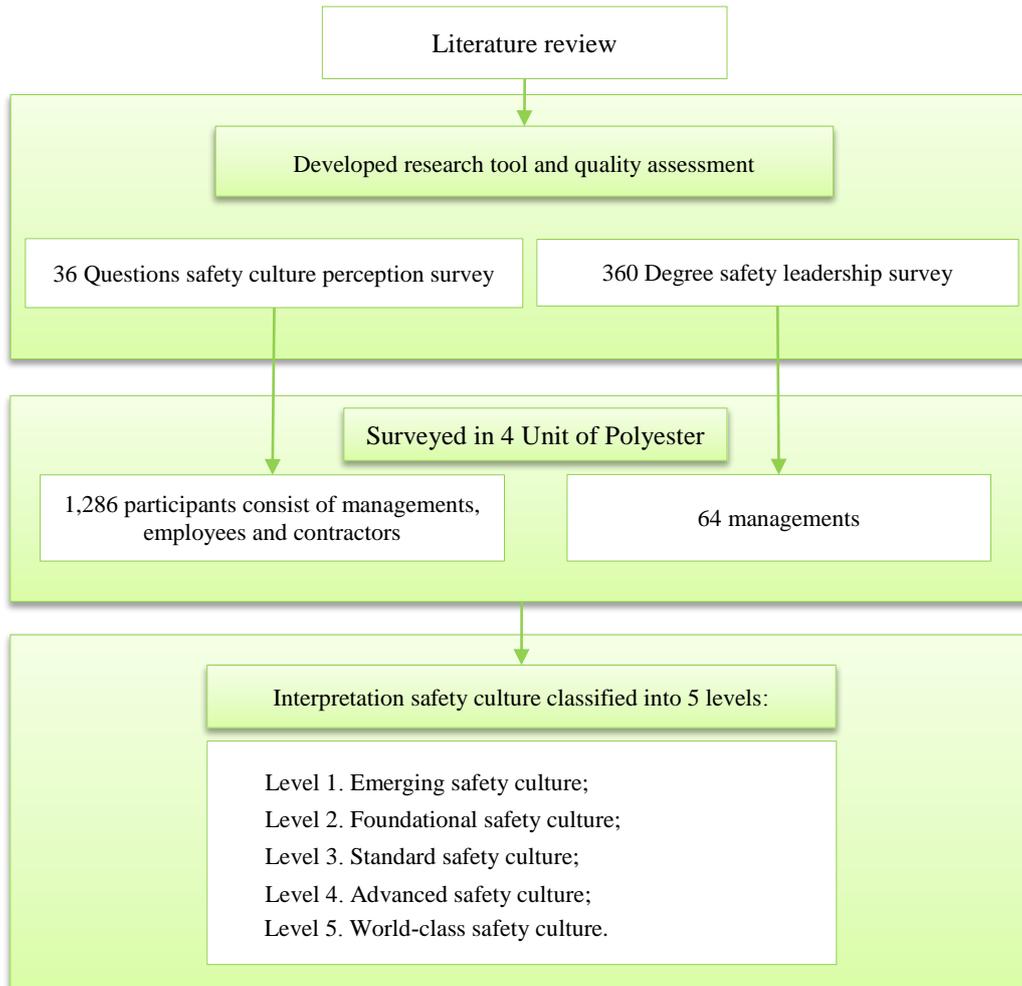


Figure 1. The research methodology flowchart

3- Results and Discussion

3-1- Safety Culture Study

Based on the results of the safety culture perception survey categorized by work positions, safety culture was rated at the standard level for all managers, supervisors, employees, and contractors. However, when evaluating all elements, each work position demonstrates an average safety culture, particularly in element 8, off-the-job safety, which corresponds to the foundational level (Table 2). The company is potentially still developing its off-the-job safety program. Most organizations place an initial emphasis on process safety when they systematically control their safety systems. As a result, the delayed implementation of the off-the-job safety program might be one of the factors contributing to the employees' lack of awareness and comprehension of off-the-job safety across the company. More than 95% of worker fatalities and 86% of injuries requiring medical attention in 2021 happened outside the job setting. Besides, the production time lost due to off-the-job injuries reached over 540000000 days in 2021 compared to 70000000 days lost due to on-the-job injuries, indicating a significant increase in the number of off-the-job injuries [30]. This is in

line with a study by Chantith et al. (2021), revealing that off-the-job injuries from traffic accidents alone caused a total amount of productivity loss at the end of 2017, equal to approximately 121 billion Baht (45 billion for fatalities, 7 billion for disabilities, 67.5 billion for serious injuries, and 1.5 billion for minor injuries), which is nearly 0.8% of the nation's GDP [31]. As a result, employers must give off-the-job and on-the-job safety programs equal consideration.

Table 2. Safety culture survey score (n=1,286)

Elements	Average Score		
	Management (n=121)	Supervisors (n= 279)	Employees & Contractors (n=886)
Q1 Leadership & commitment	3.80	3.61	3.54
Q2 Policy & strategic Objectives	3.84	3.67	3.75
Q3 Organization resource & documentation	3.51	3.43	3.63
Q4 Evaluation & risk management	3.64	3.43	3.55
Q5 Implementation & operation control	3.48	3.50	3.66
Q6 Monitoring & measurement	3.40	3.22	3.42
Q7 Audit & review	3.05	2.88	3.26
Q8 Off-the-job safety	2.24	2.26	2.49
Total Score	3.53	3.40	3.53
Safety Culture Level	Standard	Standard	Standard

Based on the results of the study on safety culture by business units, each of the business units achieved an average safety culture score that aligned with the standard level (Figure 2). Thus, employees in each unit acknowledged that the company had a process in place to manage all risks.

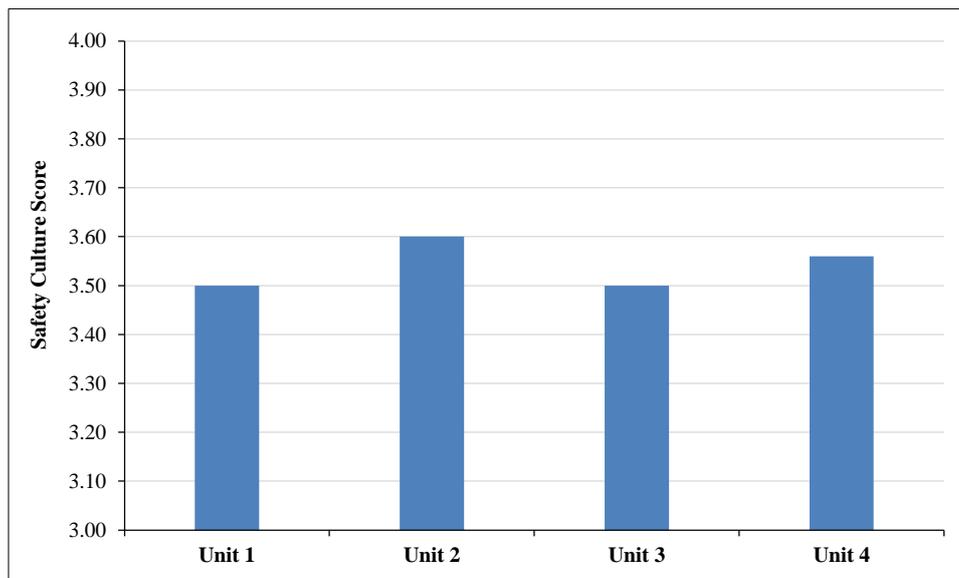


Figure 2. Safety culture survey score by business units

3-2- Safety Leadership Study

According to the assessment of 64 managers regarding their leadership in organizational safety, the overall leadership across nine categories was rated at the standard level. Notably, the aspects of empowering other employees, communicating about safety, and providing safety guidance received the lowest average scores of 3.43, 3.45, and 3.48, respectively (Figure 3). Empowering other employees refers to the organization's distinct approach to setting safety standards and objectives, assisting team members in meeting those standards and goals, encouraging them to take initiatives to enhance safety, and providing them with the confidence they need to intervene in any activity they perceive as unsafe. According to research conducted by Phourai & Samukkethum (2023), the success of the healthy community project in Phongsathue showed how it used a constructive form of power-over by encouraging the council members and villagers to participate in thinking, idea-exchanging, operating their own activities, commenting on the results, and improving the projects [32]. As for safety communication, team members are given regular feedback on their safety performance, safety discussions are carefully prepared, and workplace communication tools like message boards are used to convey safety objectives effectively. In addition, when it comes

to providing safety guidance, the management must offer the necessary constructive criticism and conduct audits and observations as required. They should be good listeners while speaking with team members regularly and promote problem-solving techniques rather than offering solutions. This study is incongruent with the findings of Boonyaphisompan et al. (2022), who revealed that the primary components of safety culture in healthcare settings were feedback and communication regarding errors, accounting for 92.63% [16]. According to Zara et al. (2023), effective communication dimensions contribute significantly to ensuring workers possess the necessary skills, information, and attitudes regarding occupational safety and health procedures [33].

The key components of a successful safety culture establishment in an organization are communication about safety and providing safety guidance. It is essential to gain an understanding of barrier effectiveness and health. The management should provide team members with the necessary support to help them meet safety standards and goals. They should also encourage them to take initiatives to improve safety, make them feel comfortable, and intervene in the face of unsafe conditions. Safety discussions are clearly planned. Safety goals are effectively communicated in the workplace through means such as communication boards and consistently updated information. If the management has a low score on this issue, the implementation of the safety culture in the organization will not be able to achieve the desired results [34]. Communication about safety and providing safety guidance are the starting points for an effective safety culture development in the organization because it is essential to gain an understanding of barrier effectiveness and health [35, 36]. According to the research by Naji et al. (2022), the association between safety culture and performance is partly mediated by safety communication [37].



Figure 3. Safety leadership survey score

Concerning organizational leadership safety among the management, the study revealed that Business Unit 3 had an average safety culture score of 2.71, 2.82, and 2.87 for empowering other employees, setting safety standards and expectations, and promoting safety improvements and sharing, respectively. These scores correspond to the range of foundational safety culture (Figure 4), potentially because the unit began its production in 2018 and the establishment of its safety leadership for corporate executives is still in progress. As a result, people at the executive and managerial levels might be less aware of and attentive to risk factors than they should be. Past studies have found that employee empowerment creates an intense emotional connection that significantly lowers a worker's desire to leave the company, especially when the ideals and standards between employees and their firm are aligned [38]. Additionally, as stated by Abdelwahed et al. (2023), safety commitment and standards affect employee safety [39]. Chan et al. (2023) revealed that the two underlying components of management commitment and information sharing and utilization had the greatest effects on enhancing workers' safety performance [40]. As leaders and managers may encourage a positive safety culture by demonstrating a commitment to safety, they have greater authority to ensure that all operations are carried out safely in the organization [41]. Therefore, safety leaders should show a strong commitment to safety by motivating and working with others to set good examples that promote safety. Consequently, as long as safety leaders maintain consistent efforts, it is possible to change the safety culture [42–44].

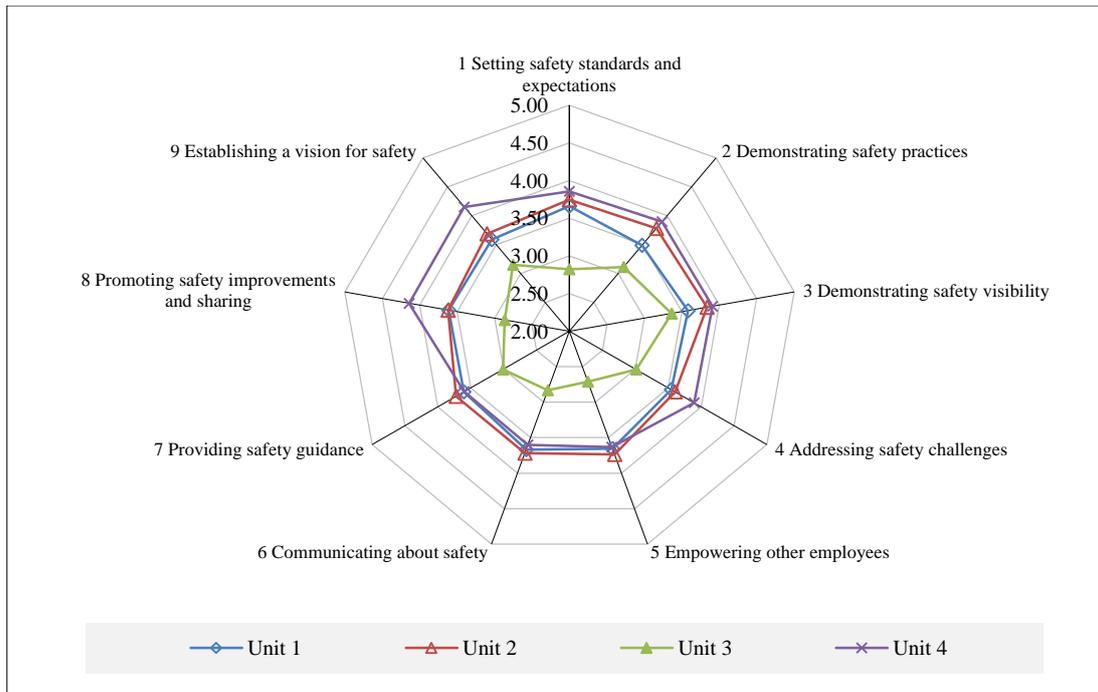


Figure 4. Safety leadership survey score by business units

4- Conclusion

This study found that the overall perception of safety leadership and safety culture among polyester employees was at the standard level, indicating that the company had a system in place to manage all hazards. However, some issues raise concerns regarding the organization's leadership safety culture, such as empowering other employees, communicating about safety, and offering safety guidance. Noteworthy, the management of Business Unit 3 also scored weakly when it came to encouraging safety improvements and sharing, setting safety standards and expectations, and empowering employees. Additionally, the foundational level of the safety culture perception survey relates to off-the-job safety. Using the novel data and comprehensive comprehension of safety work processes to develop a safety culture of exceptional quality, the organization must engage in effective communication with safety-related matters, provide guidance on safety concerns, delegate authority to employees, establish safety standards and performance goals, and encourage the exchange of safety enhancements and knowledge with business partners. For further action, the company should implement three safety culture strategies, the first of which concerns fostering a safety culture. All employees should be encouraged to respect safety rules and regulations while realizing that their roles and responsibilities in terms of safety are crucial to safety performance evaluation. The second strategy involves empowering all employees by cultivating safety leadership through safety leadership programs to ensure a safety mind-set. The last strategy concerns the management of safety performance. All data related to safety performance must be analyzed and shared with relevant employees. The safety internal audit program must be carried out periodically to monitor compliance with the safety management program. Moreover, benchmarking safety performance against comparable businesses is an essential way to ensure that the organization can improve safety performance and culture and drive toward the company's goal of achieving a world-class safety culture level.

5- Declarations

5-1-Author Contributions

Conceptualization, T.J. and L.B.; methodology, L.B.; software, T.J., S.P., and P.H.; validation, L.B., P.R., and T.J.; formal analysis, L.B., T.J., S.P., and P.H.; investigation, T.J., S.P., and P.H.; resources, T.J., S.P., and P.H.; data curation, L.B.; writing—original draft preparation, L.B.; writing—review and editing, L.B., P.R., and T.J.; visualization, L.B.; supervision, P.R.; project administration, T.J., S.P., and P.H.; funding acquisition, T.J. All authors have read and agreed to the published version of the manuscript.

5-2-Data Availability Statement

The data presented in this study are available on request from the corresponding author.

5-3-Funding

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5-4-Acknowledgements

We appreciate the cooperation of the management and every member of the polyester workers in completing the survey. The knowledge gained from this research will be utilized for cultivating safety cultures within industries.

5-5-Institutional Review Board Statement

The Human Research Ethics Committee of Ubon Ratchathani University approved this project on November 14, 2022, determining that it complies with the criteria for ethical conduct in human research (Code UBU-REC-150/2565).

5-6-Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

5-7-Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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Appendix I

Table A-1. The 360-degree safety leadership survey

ID	Question	Practicing Safety Until It Becomes Routine (5)	Taking Safety Practices Seriously (4)	Adhering to Safety Protocols Due to Regulations (3)	Following Safety Protocols when Needed (2)	Disregarding Safety Protocols (1)
1	Q1: leadership & commitment					
1.1	How important is senior management (Deputy Director up) in communicating safety to operators?					
1.2	How do senior managements and operators care about Safety?					
1.3	What is the rewards on the safety performance?					
1.4	What is the point of view of senior management to the person who caused the accident?					
1.5	How the area supervisor takes their responsibilities for the injuries and incidents in the area?					
1.6	Do you have the right to take action to keep you and your colleagues' safe at work?					
2	policy & strategic objectives					
2.1	What is the balance between "safety" and "productivity" in your organization?					
2.2	Do you agree that driving an excellent safety performance resulting in excellence in other matters as well, such as quality, production, price and profit?					
2.3	What is the effectiveness of safety communication in your organization?					
2.4	What is your understanding about a Safety moments/safety talk, and how to conduct a Safety moments / Safety Talk before meeting or before work?					
2.5	Choose the best answer that demonstrate your understanding of your organization's safety targets and performance?					
2.6	What are the consequences of violating safety rules in your organization? When safety rules are violated or not followed, Have the punishments were divided into different levels, ranging from verbal warnings to more severe punishments such as dismissal.					
3	organization resource & documentation					
3.1	How the organization sets the budget and resources necessary to manage safety?					
3.2	What are the workers' interests in competency and training?					
3.3	Have you obtained occupational health and safety training in the last 12 months?					
3.4	How does the organization manage contractors?					
3.5	What size and status do you think of the Safety department in your organization?					
3.6	What you think about the effectiveness of the safety elements in your organization?					
4	evaluation & risk management					
4.1	What is the work plan and guideline of safety management?					
4.2	How the safety technics have been applied during work?					
5	implementation & operation control					
5.1	What is the purpose of having the safety procedure?					
5.2	In your opinion, what is the quality of the safety rules in your workplace?					
5.3	How is compliance with safety rules in your workplace?					
5.4	How is the house keeping in your organization?					
5.5	According to the existing safety programs, how it can prevent harm to all employees who work every day?					
6	monitoring & measurement					
6.1	In your opinion, what do you think about reporting, investigation, and analysis of the accident in your organization?					
6.2	What is the program of observing and reporting safety conditions and behaviors (Unsafe Act / Unsafe Condition / Near miss)?					
6.3	What happens after an accident? What are the steps to follow and address the problem?					
6.4	Who performs the safety audit in daily work?					

6.5	Is the safety meeting held continuously in the workplace? What is the frequency?
6.6	Do you attend the safety meeting regularly?
6.7	What was the atmosphere like at the safety meeting?
6.8	What is your understanding of Behavior Based Safety (BBS)?
7	audit & review
7.1	How about the safety inspection and safety review?
7.2	How does the safety performance and accident statistics compare with other companies?
8	off-the-job safety program
8.1	Could you please rate the "off-the-job" safety implementing in your organization?

Table A-2. Safety Leadership Barometer Survey

Item	Survey Criteria	Detail	Excellent	Good	Fair	Poor	Very Poor
			5	4	3	2	1
Q1	Setting safety standards and expectations	The assessed person is in compliance with the policy. Regularly conduct safety procedures and guidelines. Demonstrate sincere care for the people that he/she work with. He/she is committed to continuously improving productivity so that everyone can return home safely every day.					
Q2	Demonstrating safety practices	The assessed person always searching/investigating and talking about safety. Actively participate in meetings and initiate improvements in safety and demonstrate that he/she is a role model in safety as required by standards.					
Q3	Demonstrating safety visibility	The assessed person always conducts regular on-site walks to conduct safety-related behavioral inspections, as well as discussing safety issues and opportunities for improvement in the area. Lead team members in following safe work procedures and demonstrate genuine care to employees.					
Q4	Addressing safety challenges	The assessed person has the ability to solve problems or intervene in safety solutions. See challenges as positive and creative. Responsible for decision-making and leadership in discussing safety-related issues.					
Q5	Empowering other employees	The assessed person has the following characteristics: Be clear about standards and requirements in terms of safety goals, provide support to team members to help them meet standards and meet safety goals. Drive team members to initiate safety improvements. Make team members feel comfortable and confident in stopping what they deem unsafe.					
Q6	Communicating about safety	The assessed person is characterized by providing regular feedback to team members about safety performance. There is a clear plan to discuss safety. Safety goals are clearly communicated in the workplace, such as communication boards, and are always updated.					
Q7	Providing safety guidance	The assessed person is characterized by giving advice both positively and in case of need of correction. Audits and Safe work observation (SWO) are conducted regularly with team members and the assessed person is a good listener. Asking open-ended questions (to get feedback) makes people think of solutions for themselves rather than suggesting solutions.					
Q8	Promoting safety improvements and sharing	The assessed person can analyze and share the information learned from near-miss reporting and safety audits, as well as review incident report and communicate it to team members. Learn about safety issues in other areas, conduct the safety meetings every month, or bring safety issues as part of meeting agenda.					
Q9	Establishing a vision for safety	The assessed person has characteristics that can clearly indicate that "Zero Accident" is a possibility, and good safety is good business practice. People are encouraged to pay attention to themselves, family and colleagues, and it is a valuable asset of the organization. Attend various meetings related to the safety vision, Safety Activities, Safety systems and safety procedures to increase his /her understanding.					
Q10	Feedback / Comment (If Any)						