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Assessing Health, Safety, and Environmental Culture in One of Iran's Gas Companies Using the HSE Culture Ladder Model

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Abstract

Health, Safety, and Environment (HSE) culture has emerged as a critical organizational asset within the subsidiaries of the Ministry of Petroleum, underpinning efforts to safeguard human capital and ensure sustainable operations. This study aims to systematically assess and strengthen the HSE culture of a selected organization by applying the HSE Culture Ladder framework, identifying areas for improvement, and guiding strategic interventions to enhance the organization's HSE culture. Employing a cross-sectional, descriptive-analytical, and applied methodology, the research targeted both permanent and contract employees across operational and administrative divisions. The customized assessment tool was developed following a comprehensive literature review and consultations with academic and statistical experts, based on the validated structure of the HSE Culture Ladder. This model conceptualizes safety culture as a five-tier continuum, ranging from pathological to generative, with each level representing distinct organizational mindsets and behaviors toward risk and safety. Based on the results of the internal assessment, the organization is currently situated at the calculative level, characterized by a compliance-driven, procedure-oriented approach to HSE. However, with the implementation of targeted improvement strategies and the adoption of recommended best practices, the organization demonstrates clear potential to progress to the proactive level and eventually achieve a generative culture. A noteworthy inverse correlation was observed between the organization's composite HSE culture score and managerial assertions regarding the prioritization of safety, highlighting a perceptual gap that warrants attention. These findings underscore the need to cultivate a more deeply embedded safety mindset at all organizational levels. Promoting a dynamic and resilient HSE culture among both employees and leadership will be instrumental in advancing the organization's alignment with international safety standards and fostering a proactive approach to risk management.

Keywords: HSE culture, Safety culture ladder, Organizational safety assessment, Oil and gas industry, Proactive risk management.

1 | Introduction

The accelerating shift toward industrialization, particularly in developing countries, has often occurred without sufficient attention to fundamental safety principles, leading to a rising incidence of occupational accidents [1]. In the modern era, despite significant advances in technology and industry, the unintended

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consequences of these developments continue to pose serious threats to human life and the environment [2]. Catastrophic events such as the Feyzin disaster in France, the Piper Alpha explosion in the UK, and the Chernobyl nuclear meltdown in the former Soviet Union have drawn global attention to the devastating human and ecological toll of neglecting Health, Safety, and Environment (HSE) standards [3].

Key contributing factors in such disasters include human error, overreliance on the assumed safety of installations, design flaws, lack of emergency preparedness, and, in developing nations, inadequate adaptation of transferred technologies. These issues are equally prevalent within the industrial sectors of our country, and have led to several major incidents [4]. Notably, safety experts have increasingly recognized that a significant proportion of accidents stem from unsafe human behavior. Despite continuous engineering improvements and the implementation of safety regulations, the economic and social costs of accidents remain burdensome for many nations. This has led to growing interest in the cultivation of a robust and proactive HSE culture [3], [5].

HSE culture can be broadly defined as the shared values, attitudes, competencies, and behavioral patterns that collectively shape an organization's commitment to and implementation of HSE policies and programs [6]. An organization with a positive HSE culture actively fosters engagement at all levels, encouraging individuals and teams to anticipate and manage risks, continuously improve safety standards, and contribute to overall organizational effectiveness [7], [8].

However, attempts to enhance HSE culture are likely to fail if they focus solely on altering employee behavior without addressing motivational drivers, or if they seek to change organizational systems without considering the psychological and sociocultural dynamics that influence behavior [9]. Establishing a resilient and deeply rooted HSE culture is essential across all tiers of the workforce, from laborers to executives, and requires parallel efforts by government bodies, employers, and employees.

Preventive strategies in the HSE domain have proven highly effective in reducing the frequency and severity of workplace accidents. Among the most impactful of these strategies is the promotion of HSE culture [10]. A rigorous self-assessment of HSE culture enables a comprehensive and systematic evaluation of organizational practices and outcomes in this field. Through this process, organizations can identify both their current strengths and areas that require improvement.

Initially, HSE self-assessments serve as internal benchmarks for continuous improvement over successive operational cycles. At more advanced stages, they facilitate benchmarking against local competitors and global industry leaders. These assessments not only evaluate historical performance but also provide strategic insights into future planning. Conducting such evaluations plays a vital role in motivating employee participation and engagement in safety initiatives, thereby enhancing overall organizational performance [11], [12].

This study was conducted with the recognition that adherence to HSE standards is a core priority within the organization, particularly among senior management. The company considers the development of a robust HSE culture to be a fundamental organizational value. Given that HSE culture models serve as essential frameworks for evaluating and assessing safety culture within organizations, the necessity and relevance of this research are self-evident. Accordingly, this study aimed to evaluate the HSE culture of this company, utilizing the HSE Culture Ladder as the primary assessment tool.

To this end, a structured questionnaire was developed, standardized, and validated through consultation with senior safety advisors within the organization. The finalized questionnaire was distributed among both permanent and temporary employees, in alignment with the target population defined for this research. Using statistical formulas implemented in Microsoft Excel, the collected data were analyzed to determine the organization's position on the HSE Culture Ladder. The final analysis revealed that the organization currently resides at the 'Calculative' level. However, with the adoption of the proposed strategic measures, the organization is well-positioned to advance toward the 'Proactive' level in the near future.

2 | Materials and Methods

This research is a descriptive-analytical study of a cross-sectional nature. The study population consists of all senior officials and non-official personnel of the Company. The primary tool used in this research is a self-assessment questionnaire based on the HSE Culture Ladder. The questionnaire was developed with the guidance of academic advisors and statistical consultants, and was customized to meet the study's specific needs. After receiving approval from relevant experts in safety and health, it was distributed to the selected participants within the defined target population. The data collected through this questionnaire were analyzed and scored, with the results being processed using statistical formulas in Excel to determine the organization's position within the HSE culture framework. The scoring method for this questionnaire is provided in *Table 1*.

The HSE culture assessment questionnaire includes 30 questions, and its distribution among employees was carried out as follows:

- *The study population represents 10% of the total workforce of the company (Both official and non-official employees), with a maximum of 400 individuals.*
- *Of these, 60% are official employees, and 40% are non-official employees.*
- *In the official population, 20% of the questionnaires were completed by managerial and supervisory personnel, 50% by operational staff, 20% by non-operational (Administrative) employees, and 10% by personnel in HSE roles.*
- *Similarly, in the non-official group, the same distribution applies, with 20% from managerial and supervisory staff, 50% from operational employees, 20% from non-operational staff, and 10% from personnel responsible for health, safety, and the environment.*

The best way to understand the HSE culture is by using the HSE Culture Ladder. Each level of the ladder has unique characteristics and builds on the previous level. This ladder serves as a roadmap, guiding organizations in determining their current HSE culture status and when they will progress to the next level. The five levels of the HSE Culture Ladder are as follows:

- I. **Pathological:** At this level, individuals are indifferent to health, safety, and the environment, merely following regulations without truly understanding or internalizing HSE concepts [1].
- II. **Reactive:** At this level, safety is only taken seriously after an incident occurs. Individuals may say things like, "This is a dangerous business," or "You have to be careful," or "Those who are injured are to blame." Safety is taken seriously by management, but there is a belief that employees are not following the instructions [1].
- III. **Calculative:** At this level, HSE management is well-established, with a focus on data collection and analysis. Numerous audits are conducted, but fatalities still occur. When a fatality happens, the organization is surprised and shocked [1].
- IV. **Proactive:** At this level, HSE management is based not only on past incidents but also on preventing future potential errors. In proactive organizations, employees are actively involved in HSE matters. At this stage, the number of HSE professionals decreases, with their role mainly advisory. As the organization matures, awareness and trust grow, and individuals are more willing to take responsibility [1].
- V. **Creative organizations** have extremely high standards and strive to exceed mere compliance with regulations. They are candid about their shortcomings and use them as an opportunity for improvement rather than blaming individuals. In these organizations, management recognizes that employees trust them and are willing to share issues openly [1].

Table 1. Scoring Guidelines for the health, safety, and environment culture ladder questionnaire.

Row	Question	Answer				
		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	In my workplace, there are instances where, to maintain production, it becomes necessary to overlook HSE regulations.	4	3	2	1	0
2	The senior management of this organization regards HSE as a matter of utmost seriousness.	0	1	2	3	4
3	Supervisors consistently keep their subordinates informed about HSE issues and concerns.	0	1	2	3	4
4	Senior management places greater emphasis on showcasing HSE through organizing seminars, delivering speeches, and installing posters, rather than ensuring its practical implementation.	4	3	2	1	0
5	Workers and employees within this organization have easy access to their managers and can readily communicate their concerns and issues with them.	0	1	2	3	4
6	The manager of this organization makes prompt and decisive decisions when addressing HSE-related concerns and issues.	0	1	2	3	4
7	All efforts by managers and supervisors to support HSE are primarily aimed at achieving a top HSE ranking at the end of the year.	4	3	2	1	0
8	HSE training programs are structured in a way that allows individuals to freely express their opinions and contribute suggestions for improving conditions.	0	1	2	3	4
9	In the case of working safely and adhering to HSE regulations, I am recognized and appreciated for my efforts.	0	1	2	3	4
10	The company I work for primarily focuses on maintaining a strong HSE record, with the intention of ensuring the safety and well-being of individuals within the workplace.	4	3	2	1	0
11	In my work environment, based on incident reports, solutions are provided to prevent the recurrence of similar accidents.	0	1	2	3	4
12	Employees working here, if they feel that a task or duty is unsafe, refrain from performing it.	0	1	2	3	4
13	In my work environment, employees tend to attribute the blame for an accident to others after it occurs.	4	3	2	1	0

Table 1. Continued.

Row	Question	Answer				
		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
14	Employees are fully familiar with the HSE regulations and guidelines related to their respective jobs.	0	1	2	3	4
15	Supervisors exert all their efforts to implement measures that elevate the level of HSE performance.	0	1	2	3	4
16	Investigation and analysis of incidents, or events typically referred to as accidents, are conducted for the purpose of ultimately attributing the fault to an individual.	4	3	2	1	0
17	The employees working in this organization are so skilled that it is unlikely for them to encounter accidents.	0	1	2	3	4
18	Employees, even in situations where no one supervises them, adhere to HSE principles.	0	1	2	3	4
19	Before starting their work in this organization, individuals receive HSE training.	0	1	2	3	4
20	Employees are encouraged to present their ideas for improving the HSE conditions.	0	1	2	3	4
21	Colleagues respond to individuals who disregard the HSE rules and regulations by taking appropriate action.	0	1	2	3	4
22	Despite the increased efforts to promote HSE awareness, the importance of safety issues remains greater than that of occupational health and environmental matters.	4	3	2	1	0
23	Employees in this organization, when committing mistakes or errors, are reminded to avoid repeating the same mistake again instead of just being reprimanded.	0	1	2	3	4
24	The management of this organization is ready to receive employees' opinions and suggestions regarding HSE.	0	1	2	3	4
25	In my work environment, carrying out certain tasks in a safe manner and in compliance with HSE regulations and procedures is challenging and requires significant effort.	4	3	2	1	0
26	In my work environment, accidents and incidents that are typically classified as minor are always reported.	0	1	2	3	4
27	The HSE training I have received covers all health-related issues and hazards associated with my work.	0	1	2	3	4

Table 1. Continued.

Row	Question	Answer				
		Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
28	Workers in this organization are forced to disregard rules and regulations due to the pressure from management.	4	3	2	1	0
29	Adhering to HSE principles is the top priority for workers when performing their tasks.	0	1	2	3	4
30	In certain cases, the management of the organization overlooks the HSE laws and guidelines when addressing employee mistakes.	4	3	2	1	0

3 | Research Findings

The scoring system for the output data, used to determine the levels of the HSE Culture Ladder, is defined based on *Table 2*. After the questionnaires were completed by 400 personnel and the scores for each question were entered, the final output was presented as a report, interpreting the signs of implementation across 10 sections, as shown in *Table 3*.

Upon data collection and analysis, the HSE culture of the company was found to be at the Calculative stage. With the implementation of the necessary actions, the organization can move beyond this stage and transition to the Proactive stage.

Table 2. Score ranges for the different levels of the cultural ladder.

Levels of the HSE Culture Ladder	Score
Pathological	0-0.75
Reactive	0.751-1.5
Calculative	1.51-2.99
Proactive	3-3.75
Generative	3.76-4

Table 3. Final Results of the health, safety, and environment culture assessment.

Row	Indicators of Establishment	Evaluation of the HSE Culture Level	Results
1	A planned process in which 'problem prevention and process review' are incorporated, and the level of commitment and care among all managers and employees is high.	Calculative	2.35
2	Senior management is among those who become directly involved after the occurrence of an incident.	Calculative	2.68
3	Managers create conditions that enable employees to address the challenges they face.	Calculative	2.49
4	Overall, there is minimal bureaucracy and a significant emphasis on critical thinking.	Calculative	2.13
5	The issue of assigning blame is no longer a consideration.	Calculative	2.46
6	There is a clear, two-way communication flow between management and employees, whereby management directly obtains information about what has been planned.	Calculative	2.53

Table 3. Continued.

Row	Indicators of Establishment	Evaluation of the HSE Culture Level	Results
7	Among the employees, trust has been established that they are capable of identifying situations and effecting change through systematic follow-ups.	Calculative	2.55
8	Employees are apprehensive about discussing risks.	Calculative	2.50
9	Employees are trusted to carry out most of the planning activities.	Calculative	2.35
10	All levels are actively accessible, and the information derived from reports is utilized on a daily basis.	Calculative	2.48
Final result of the HSE Culture Evaluation		Calculative	2.45

4 | Conclusion

The results of this study indicate that, in evaluating the culture of health, safety, and the environment, employees show little interest in the educational topics. Furthermore, it appears that the mandatory nature of the training sessions, organized solely to fulfill the requirements of the HSE department, reduces the employees' willingness to participate. Employees are primarily motivated by the need to secure a passing grade to maintain their employment. To address this issue, it is recommended that collaboration with other organizations, such as the Fire Department, Red Crescent, and Ministry of Health, be sought to deliver training sessions with a more practical focus, tailored to the actual work environment.

Despite the COVID-19 pandemic and the shift to online education, many of the HSE courses at this company continue to be conducted virtually, which undermines the importance of hands-on training in the workplace. Additionally, greater accountability is required for the periodic drills. In the event of deficiencies in their execution, they should be canceled and rescheduled promptly. The superficial execution of these drills, combined with the unjustified approval of them by HSE experts, often results in unnecessary administrative formalities. In the event of an actual emergency, no coordination or preparedness exists, not only within the organization but also with external agencies such as the water and wastewater company, electricity provider, fire department, and emergency services.

Moreover, during incidents, senior management is directly involved, and all employees feel a personal responsibility when others experience accidents. However, such behavior keeps the organization at the "calculative" stage of safety culture, preventing employees from actively engaging in safety practices and responsibility in normal circumstances. The lack of attention from management to unannounced inspections and oversight of the workforce leads to poor communication between safety leadership, safety culture, and safety performance.

This study reveals that this company currently operates at the "calculative" stage of the safety culture ladder. While management has ample information to share, the opportunities for bottom-up communication at lower levels are limited. One strategy for progressing to the "preventative" stage is encouraging management to engage in continuous dialogue with employees. In addition, involving employees in decision-making processes and soliciting their solutions can foster a sense of ownership, which, in turn, can lead to safer behaviors, a more positive environment, and an enhanced safety culture within the organization.

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