



A Systematic Review for Enhancing Safety Culture in Industry

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Abstract: The purpose of this article is to investigate and evaluate the data from research about SC advancement in the industrial sphere. We conducted a bibliographic search using the phrases "Safety Culture" and "Improvement" across several databases. After removing duplicates and using the inclusion criteria, the authors analyzed thirteen articles, which allowed them to assess common themes and synthesize key findings. This analysis demonstrates that managing a reporting system and fear of punishment are the biggest obstacles to SC improvement. Communication is also a crucial component of SC development. In summary, this systematic study demonstrated that while there are many different views and methods for enhancing safety culture, some commonalities may be found. To expand the understanding of the subjects covered in this work, more research should be conducted.

Keywords: Safety culture Industry Improvement Systematic review

1 Introduction:

The definition of Safety Culture (SC), as well as the causes and effects connected to it, are still up for debate, according to Van Nunen et al. [1], despite several attempts to build the models and theories that the SC field required. [2]. Numerous researchers have published literature evaluations that integrate evidence about nature, the theoretical framework, the relationship with safety performance, and the influence of SC on organizational culture in an effort to close this gap [1-6]. In this context, it is confirmed that there are studies that are explicitly devoted to analyzing the improvement of CS, but only one review was discovered that dealt with this topic in detail, and it was created in the field of health [7]. As a result, there is a gap in this framework's systematisation of knowledge aimed at enhancing the safety culture in industry.

This systematisation is crucial because industrial accidents have significant negative effects on people, the environment, the economy, and society [8, 9]. Thus, this article aims to contribute to a better understanding of the factors that facilitate or hinder the development of SC, providing subsidies for the advancement of the SC assessment and intervention programmes, by examining how the improvement of safety culture has been approached in studies developed in the industrial area. This article intends to investigate and evaluate the data from research about SC advancement in the industrial field.

2 Method:

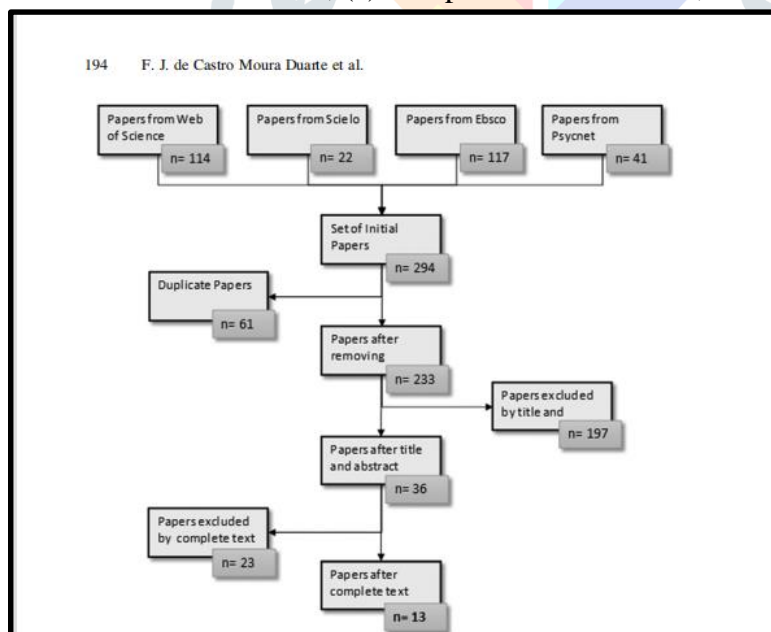
The literature on the creation and enhancement of safety culture has been thoroughly reviewed in this paper using the databases Web of Science, PsycNET, Scientific Electronic Library Online (Scielo), and Ebsco. The decision to employ a systematic review was chosen because it is applicable to research methods that aim to reduce bias in the selection of articles and critically evaluate them in order to synthesise pertinent studies on a certain subject [10].

What evidence has been created by research that have looked into the growth and enhancement of safety culture in industries? was the overarching question for this review. These were the inclusion criteria: without chronological restrictions, peer-reviewed published research in the languages of Portuguese, French, Spanish, and English that showed progress in the safety culture in business. The exclusion criteria take into account the type of document and the location where the studies were conducted. Essays, discussions, literature reviews, reports, and publications from research conducted in areas other than industry—such as safety culture in health or food safety—were all eliminated.

As a result, a thorough and exhaustive search was carried out in the databases using the phrases "Safety Culture" and "Improvement," which were merged using the Boolean operator "AND," and which the terms "FOOD" and "HEALTH," which were excluded using the operator "NOT," respectively. 294 articles were found using this search approach, and the flow diagram of the study search and selection is shown in Fig. 1.

The RAYYAN® programme, which "helps speed the initial screening of abstracts and titles utilising a semi-automated method while incorporating high level of usability," has received this outcome. In order to reduce bias brought on by this process being carried out by a single evaluator, the four authors of this study tracked the remaining 61 duplicate documents while acting in a blind manner. The following information was gathered from each study using the data collection form: Title, Journal, Study Setting, Study Objective, Author(s), Year of Publication, and Improvement Safety Culture Main Outcomes.

The thirteen articles that were reviewed in this review were examined to determine (a) common themes and significant differences between their findings; (b) key conclusions; (c) relationships between key concepts; (d) classification of themes and sub-themes; (e) interpretation of content; and (f) consistencies and inconsistencies.



3 Results

3.1 Characteristics of Studies Included in This Systematic Review

The investigations that made up this systematic review were carried out in the following nations: three in the Netherlands, one each in Belgium, Denmark, and Australia.

one in Sweden, one in the United Arab Emirates, two in the United Kingdom, three in the United States, and one publication that didn't mention where the study was conducted. No studies that expressly address the development of safety cultures were produced in Africa or South America, and just one was carried out in Asia, it has been noted.

According to a bibliometric study on safety culture conducted by Van Nunen et al. [1], South America, Africa, and Oceania are the regions that publish the least on the subject, whereas Europe and Asia conduct the most research on it. This frame suggests that SC has to be understood more generally throughout South America and Africa. However, this study increases the Fig. 1 in Asia. Study search and inclusion flowchart. The authors prepared this. 194 De Castro, F. J. Although there has been a sizable amount of academic work on SC in this area, it is not, according to Moura Duarte et al., explicitly focused on the evaluation of SC advancement.

Regarding the date of publishing, the earliest piece appeared in 1998, while the most current was published in 2016. Thus, it is noted that publications focusing on the process of enhancing safety culture appeared roughly ten years after the Chernobyl tragedy (1986), which gave rise to the phrase [9]. According to Van Nunen et al[1] .'s bibliometric analysis, SC publications generally started in 1991. It seems that in order for more concentrated talks on enhancing the SC to occur, there was a need for an initial phase of discussion concerning the term's meaning as well as the dissemination of this idea among scholars.

Three studies were conducted in the nuclear industry, three in the railroad sector, and the remaining studies were conducted in the following sectors: oil and gas, electric systems, metallurgy, mining, construction, industrial lifts, and chemistry, as indicated in Fig. 2.

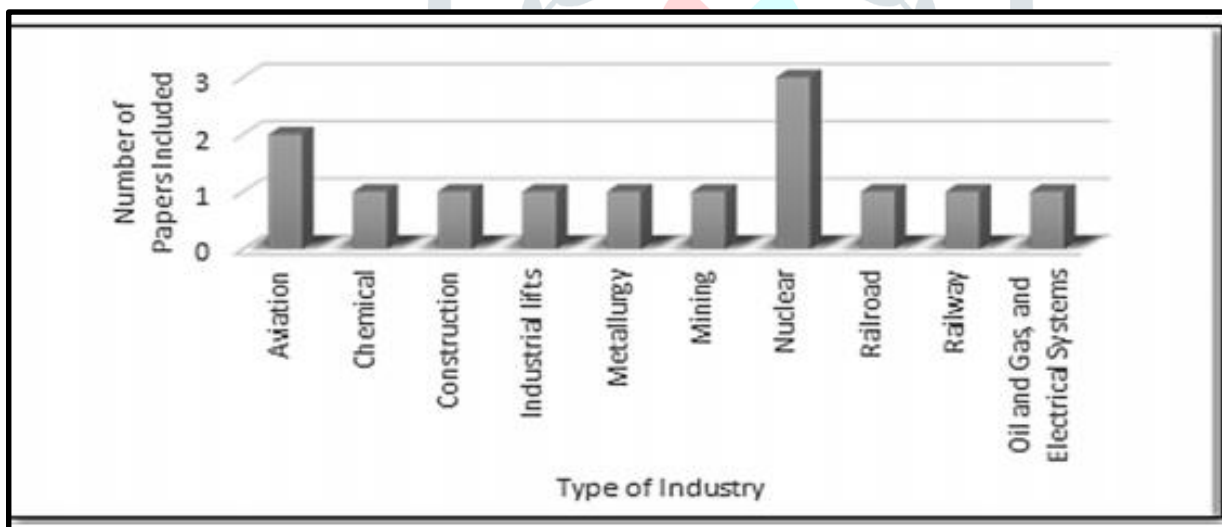


Fig. 2. Type of Industry where studies were conducted.

This demonstrates that even though the term "safety culture" was coined through the analysis of a nuclear industry accident, its significance has since spread to other industries, largely as a result of the major disasters that have occurred throughout history in a variety of industries, as summarised by Daniellou et al. [9]. In conclusion, Table 1 presents the data from the 13 research that were a part of this systematic review. The next section will go over the variables that either help or hinder the development of safety culture, as identified by the analysis of the findings and recommendations of the research that were included in this study.

Making the Required Changes Prior to Modifying Cultural Assumptions

The authors emphasize the need for investing resources for successful improvement initiatives in addition to the safety culture evaluation [18, 20, 21] as a prerequisite for employee engagement and faith in the safety management system. However, the straightforward acts and resulting behavioural changes are insufficient to declare a change in safety culture. Nielsen [15] emphasises that this can only be accomplished through a double-loop learning process, which is "defined as a strategy where the governing values behind actions are questioned and changed when actions fail and stand in contrast to single-loop learning where new actions are chosen within the same governing values." According to Nielsen [15], the Safety Culture is complex, necessitating a multimethod approach in order to evaluate the various changes that a cultural transformation entails.

Participating the workforce in the evaluation to enhance the safety culture

The only thing needed for this mechanical participation is the impression that safety-related questions should be asked and taken into consideration. This psychological drive facilitates a more favorable evaluation of managers' contributions to safety, which leads to a more favourable perception of safety culture [20]. Similar to how Mengolini [21] notes that staff involvement and motivation are important for defining improvement initiatives and are necessary for managing safety.

The second mechanism likewise has to do with how well the employees can spot and address safety problems when doing assessments [23]. This time, however, the benefit of the participation is viewed from the bottom up: this kind of participation is not just a way to improve employee views and motivation, but also a way to utilise the workers' safety knowledge and skills to address safety issues.

Workers-manager relations versus involvement, accountability, and communication vs. participation, reporting, and relations

As we've seen, the top-down method and the bottom-up approach differ in how they view the role of employees in the evaluation phase of improving the company's safety culture, but they also differ in the transformation phase and in the company's regular safety actions.

The involvement of the workforce is crucial for enhancing safety culture, but different authors have different ideas about what it entails. According to Mengolini [22] and Lallemand [20], employee involvement fosters increased employee motivation and gives managers better information with which to guide their decision-making. On the contrary, Mearns [23] believes that employees' participation in the process of fostering a safety culture is crucial to identifying and resolving some safety issues.

Chen and Jin [14] and Carroll [13] identify the accountability system as a vital component to prevent safety procedure breaches as a guideline for enhancing trust and safety climate. In addition to self-responsibility, a broad peer screening and control based on safety norms is also requested. The ideal circumstance in this case is a workplace with zero risk taken, where all the regulations are effective and where the employees have no should play a constructive influence in enhancing safety norms and practises.

On the other hand, a "Just Culture," as intended by Reason [24] and implemented by Alm [12], is based on reporting, relationships between employees and managers, and trust. It promotes an opening of the conversation about what needs to be done to reduce daily risky activities and ensures the proper reward or disciplinary response regarding the necessary errors and violations needed to improve safety norms and behaviours. Similar to this, Zuschlag [25] demonstrates how better labor-management relations aid in creating a "trust culture," which is "a critical component of an effective safety culture" [25]. It's important to distinguish this contact from certain authors' top-down "communication."

On the other hand, a "Just Culture," founded on reporting, relationships between employees and managers, and trust, as intended by Reason [24] and put into practise by Alm [12], stands for the beginning of the discussion about what needs to be done to improve daily risky activities and ensure the right reward or disciplinary response regarding the necessary errors and violations needed to improve safety norms and behaviours. In a similar vein, Zuschlag [25] demonstrates how better labor-management relations contribute to the development of a "trust culture," which is "a critical component of an effective safety culture" [25]. This interaction must be distinguished from certain authors' top-down "communication."

For instance, Chen and Jin [14] claim that the communication is perceived as a one-way top-down communication channel, similar to Nielsen [15]'s statement. The difference between appreciating the workers' expertise and depending solely on management to address the safety concerns resides in this repetition of the safety procedures through a specific communication effort during a safety culture programme. [14, 15]

Limiting Factors for the Improvement of Safety Culture

Managing Different Subcultures

A portion of the authors highlight the diversity of sub-cultures and the ensuing complexity of managing several safety regimes as a circumstance that might affect the safety management system and the resulting safety culture [13, 16]

Relying only on the Managers and HSE Specialists

Defaults can occur with any strategy, as Mengolini [22] pointed out. The top-down strategy is not "focused on the point of view and experience of people who act in the company," to start. The top-down strategy, which is focused on managers and safety specialists and seeks to build a good management system that the workforce should adhere to, may not always provide the opportunity for communication and the sharing of differing viewpoints regarding safety issues [22]. Carroll [13] makes the specific observation that a management style that is overly hierarchical tends to "inhibit the raising of issues" from the organization's lowest levels. In order to monitor safety, there is therefore a shortage of pertinent information.

Discussion

We presumably utilized a more condensed search strategy and focused primarily on the findings and conclusions of the research, which resulted in the limitations of this systematic literature review. By contrasting research techniques and other aspects, subsequent studies may deepen the conversation that was started here. This would broaden the discussion's focus. Despite the restriction noted above, the articles under analysis highlight problems that might be regarded as crucial to changing practises and creating a safety culture. The discussion of the daily operations of the manufacturing units and the involvement and participation of the labour force have been highlighted as important aspects of the long-term and ongoing process of changing the safety culture [14, 18, 19].

Two points that may be in conflict from the perspective of safety procedures can be underlined. Building trust between managers and employees is necessary for the evolution of the safety culture, but this relationship can be strained by two key elements of the safety management system: accountability systems and methodologies for accident analysis that are frequently viewed by employees as lacking consistency.

Conclusion

In summary, this systematic study showed that while there are several beliefs and methods for enhancing safety culture, some commonalities may be found. To expand the understanding of the subjects covered in this work, more research should be conducted.

It appears that the key to creating a convergence of views between the many hierarchical levels and different corporations typically present in the units of industrial production is to deepen the diagnostic procedures and the concrete actions implemented.

References

1. van Nunen, K., et al.: Bibliometric analysis of safety culture research. *Saf. Sci.* 108, 248–25(2018). Currens, Amsterdam, 1991
2. Guldenmund, F.W.: The nature of safety culture: a review of theory and research. *Saf. Sci.* 4(1-3), 215–257 (2000) F. J. de Castro Moura Duarte et al.
3. Glendon, A.I., Neville, A.S.: Perspectives on safety culture. *Saf. Sci.* 34(1), 193–214 (2000)
4. Collins, A.M., Gadd, S.: *Safety Culture: A review of the literature*. Health and Safety Laboratory, Human Factors Group, Sheffield, vol. 35 (2002)
5. Wiegmann, D.A., et al.: Safety culture: an integrative review. *Int. J. Aviat. Psychol.* 14(2), 117–134 (2004)
6. Vierendeels, G., et al.: An integrative conceptual framework for safety culture: The Egg Aggregated Model (TEAM) of safety culture. *Saf. Sci.* 103, 323–339 (2018)
7. Morello, R.T., Lowthian, J.A., Barker, A.L., McGinnes, R., Dunt, D., Brand, C.: Strategies for improving patient safety culture in hospitals: a systematic review. *BMJ Qual. Saf.* 22, 11–18 (2013)
8. Amalberti, R.: *Security management: theories and practices about the necessary decisions and compromise solutions*. *Gestão da Segurança: teorias e práticas sobre as decisões e soluções de compromisso necessárias*. Translated by Dayane Mussulini; Review Flora Maria Gomide Vezzà. – Botucatu: FMB-UNESP (2016)
9. Daniellou, F., Simard, M., Boissières, I.: *Human and Organizational Factors of Industrial Safety: a state of the art*. *Fatores Humanos e Organizacionais da Segurança Industrial: um estado da arte*. Translated from original *Facteurs Humains et Organisationnels de la Sécurité Industrielle* by Rocha, R., Lima, F., Duarte, F. Número 2013-07 of *Notebooks of Industrial Safety*. ICSI, Toulouse, France, ISSN 2100-3874 (2010)
10. Perissé, A.R.S., Gomes, M.M., Nogueira, S.A.: Systematic reviews (including meta-analyses) and clinical guidelines. *Revisões sistemáticas (inclusive metanálises) e diretrizes clínicas*. In: Gomes, M.M. (ed.) *Organizador. Medicina baseada em evidências: princípios e práticas*, pp. 131–48. Reichmann & Affonso, Rio de Janeiro (RJ) (2001)
11. Ouzzani, M., et al.: Rayyan—a web and mobile app for systematic reviews. *Syst. Rev.* 5(1), 210 (2016)
12. Alm, H., et al.: How to increase safety in complex systems—an ongoing project. *Work* 41(Suppl.1), 3234–3237 (2012)
13. Carroll, J.S.: Safety culture as an ongoing process: culture surveys as opportunities for enquiry and change. *Work Stress* 12(3), 272–284 (1998)
14. Chen, Q., Jin, R.: Multilevel safety culture and climate survey for assessing new safety program. *J. Constr. Eng. Manage.* 139(7), 805–817 (2013)
15. Nielsen, K.J.: Improving safety culture through the health and safety organization: a case study. *J. Saf. Res.* 48, 7–17 (2014)
16. Bahn, S.: Moving from contractor to owner operator: impact on safety culture—a case study. *Empl. Relat.* 35(2), 157–172 (2012)
17. Remawi, H., Bates, P., Dix, I.: The relationship between the implementation of a Safety Management System and the attitudes of employees towards unsafe acts in aviation. *Saf. Sci.* 49(5), 625–632 (2011)
18. Fitzgerald, M.K.: Safety performance improvement through culture change. *Process Saf. Environ. Prot.* 83(4), 324–330 (2005)
19. Reniers, G.L.L., Cremer, K., Buytaert, J.: Continuously and simultaneously optimizing an organization's safety and security culture and climate: the Improvement Diamond for Excellence Achievement and Leadership in Safety & Security (IDEAL S&S) model. *J. Clean. Prod.* 19(11), 1239–1249 (2011)

20. Lallemand, C.: Contributions of participatory ergonomics to the improvement of safety culture in an industrial context. *Work* 41(Suppl. 1), 3284–3290 (2012)
21. Mengolini, A., Debarberis, L.: Lessons learnt from a crisis event: how to foster a sound safety culture. *Saf. Sci.* 50, 1415–1421 (2012) Improvement of Safety Culture in Industry: A Systematic Review 201
22. Mengolini, A., Debarberis, L.: Safety culture enhancement through the implementation of IAEA guidelines. *Reliab. Eng. Syst. Saf.* 92(4), 520–529 (2007)
23. Mearns, K., et al.: Development of a methodology for understanding and enhancing safety culture in Air Traffic Management. *Saf. Sci.* 53, 123–133 (2013)
24. Reason, J.: *Managing the risks of organizational accidents*. Ashgate Publishing, Hampshire (1997)
25. Zuschlag, M., Ranney, J.M., Coplen, M.: Evaluation of a safety culture intervention for Union Pacific shows improved safety and safety culture. *Saf. Sci.* 83, 59–73 (2016)

