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The Safety Management System (SMS) As A Tool for Building Safety Culture in Aviation: A Qualitative Research

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Abstract

Safety culture is conceptualized as the combination of beliefs, values, norms, attitudes, roles, and practices—both social and technical—within an organization, aimed at mitigating the exposure to adverse or hazardous conditions for both internal and external individuals. In entities where a safety culture is deeply ingrained, efforts are made to formulate a framework that encourages employee adherence to safety regulations, promoting safe behaviours, particularly in high-risk environments. The efficacy of safety culture in substantially reducing accidents, incidents, errors, hazards, and risks, especially those related to human factors, is pivotal in attaining elevated safety standards. At the heart of fostering such a culture lies the implementation of a robust Safety Management System (SMS), which, through its effective and dynamic execution, paves the way for cultivating a safety-centric ethos.

This study conducts a detailed empirical analysis of aviation enterprises in Türkiye to evaluate the hypothesis that the Safety Management System (SMS) is a crucial instrument in cultivating a safety culture within the aviation industry. The study employs qualitative research methodologies to discern the correlation between the effectiveness of SMS and its components and the level of safety culture within these organizations. Findings from the study reveal a direct relationship where entities with inadequately implemented SMS and its elements exhibit lower levels of safety culture. Conversely, enterprises that demonstrate effective implementation of SMS are characterized by a high level of safety culture, affirming the critical role of SMS in fostering safety within aviation organizations. This inquiry not only substantiates the integral role of SMS in developing a safety culture in aviation but also highlights the necessity for meticulous implementation of SMS components and processes to achieve a superior safety standard in the industry.

This study was created from the master's thesis study.

1. Introduction

Given the critical importance of safety in the aviation industry, numerous incidents and accidents have been attributed to safety deficiencies (Von Thaden and Gibbons, 2008, p. 1). (2008, p.1). To mitigate these occurrences, various legal and institutional measures have been implemented over time. Despite these efforts, the anticipated reduction in accidents and incidents has not been fully achieved. This outcome indicates that solely technical approaches to safety are insufficient. As a result, the importance of cultural factors, in addition to technical considerations, has become recognized. Safety culture has thus emerged as a crucial behavioral regulator in accident prevention, warranting its consideration as a fundamental aspect of safety management (Aytaç, 2011a, p. 31).

Literature review reveals that research on establishing a safety culture within aviation organizations primarily includes conceptual analyses of safety culture development (Gürsel et al., 2020) and recommendations for fostering a positive safety culture (Erdener, 2019). Furthermore, another study suggests that the concept of safety culture entails the successful and effective operation of a Safety Management System (SMS) in organizations with an established positive and effective safety culture (Gerede, 2005).

This study investigates the role of SMS and its components as intermediaries in developing a safety culture within aviation organizations, based on the hypothesis that strategic SMS implementation can facilitate a safety culture. In doing so, it aims to contribute a novel perspective to future research in this domain.

2. Conceptual Framework

In this section, a theoretical overview will be provided on safety culture, the safety management system, and the relationship between safety culture and safety management system.

2.1. Safety Culture

Although accidents in aviation are not frequent events, they cause great losses and damages when they occur. When the

development of the concept of safety culture, which aims to minimize accidents, is examined, it can be stated that three basic periods come to the fore in which the causes of accidents are approached from different perspectives. The *first* of these periods; it is a period of ***technical factors*** including underdeveloped technology and inadequate regulations. *Second*; it is the ***human factor*** period in which accidents have decreased significantly due to the development of technology and the human factor has come to the fore in increasing safety. The *third* is the ***organizational factors*** period, which started in the 1990s and continues to be important today, and the organizational factors underlying the unsafe situations experienced began to be taken into consideration (Uslu and Dönmez, 2016, p. 235-236).

In periods when the safety culture was not yet widespread, many accidents occurred due to deficiencies in the system as well as the human factor. For this reason, research began to focus on organizational factors such as tools, technologies, procedures, and reducing errors (Von Thaden and Gibbons, 2008, p. 1). As organizational factors began to be taken into consideration, interest in safety culture also increased. The concept of safety culture was first used after the nuclear accident at Chernobyl in 1986 (Wiegmann et al., 2004, p. 121). In the report prepared as a result of the accident, the cause of the disaster was attributed to violations caused by nuclear power plant personnel and the deterioration in safety culture (Kurnaz and Deniz, 2018, p. 126; Ustaömer and Şengür, 2020, p. 98). After this disaster, the concept of safety culture spread to other industries such as medicine, chemicals, oil and gas, railway, and aviation (Wang, 2011, p. 61). The definitions compiled by Wiegmann et al. (2004, p. 121) from studies in sectors such as medicine, chemistry, oil and gas, railway, and aviation are given below:"

- Cooper defines safety culture as "*a sub-dimension of organizational culture that is thought to influence the attitudes and behaviors of employees in relation to the safety performance of an organization*" (Cooper cited Wiegmann et al., 2004, p. 122).
- Ciaverelli defines the concept of safety culture as *"shared values, beliefs, assumptions and norms that can govern individual/group attitudes regarding safety as well as organizational decision-making*" (Wiegmann et al., cited in Ciaverelli, 2004, p. 122).
- Turner et al. define safety culture as *"a set of beliefs, norms, attitudes, roles, social and technical practices aimed at minimizing the exposure of employees, managers, customers, and the public to conditions considered dangerous or harmful*" (cited in Cooper, 2002, p. 31).
- Pidgeon and O'Leary, on the other hand, define safety culture as "the *set of beliefs, norms, attitudes, roles, and social and technical practices within the organization that are concerned with minimizing the exposure of individuals inside and outside an organization to adverse or dangerous conditions*" (cited in McDonald et al., 2000, p. 152).

ICAO defines the concept of safety culture as *"the behavior of people towards safety and risks even when no one is watching them*". Safety culture is the expression of how managers and employees in the organization perceive, value, prioritize safety and how it is reflected to employees.

Creating a safety culture and ensuring its sustainability is an effective tool for improving safety in aviation organizations (Choudhry et al., 2007, pp. 1004-1005). However, it takes a long time for the safety culture to be fully established in aviation organizations. It is not difficult to predict how the negative consequences of accidents and incidents that may occur in this process may affect the aviation organization, employees, and the country's economy (Olcay and Erdem, 2021, p. 84-85).

Various studies have been conducted on how to improve a safety culture in organizations. Firstly, Hale (2000) listed a number of elements for improving a safety culture. These include emphasis on safety, the participation of employees at all levels, the role of safety personnel, trust, openness in communication, belief in improving safety, and the integration of safety into the organization (cited in Choudhry et al., 2007, pp. 1004-1005). Wiegmann et al. (2002, p. 12) emphasized five key points in the creation of a safety culture: organizational commitment, participation of management, employee empowerment, reward systems, and reporting systems. Vecchio-Sudus and Griffiths in 2004 stated that to create and promote a safety culture, awareness about safety can be increased by changing attitudes and behaviors, management commitment, employee participation, promotional strategies, training, and seminars (Vecchio-Sudus and Griffiths cited in Choudhry et al., 2007, pp. 1004-1005).

2.2. Safety Management System

SMS is of great importance in ensuring safety in the aviation sector. The occurrence of an accident indicates a major failure in the functioning of the aviation system. Failures in the functioning of the SMS have a significant share in this failure (Labodova, 2004, p. 572). A Safety Management System (SMS) is a systematic approach to managing safety in aviation and other safety critical industries. Airlines that implement an SMS are able to identify and mitigate safety risks that they are exposed to during their day-to-day operation, ultimately improving safety performance (IATA, 2024). The SMS is a mechanism integrated into the organization and designed to control the hazards that may affect the health/safety of employees (Labodova, 2004, p. 572). In that it is a set of strategies, practices, procedures, roles, policies, and safety-related functions, the SMS (Fernandez-Muniz et al., 2007, p. 54) can be likened to a toolbox that explores ways to identify, analyze, reduce, or control the factors that create safety risks before they cause an accident with a predictive approach, beyond the classic accident investigation that conducts post-accident investigation and investigation (SHGM, 2013, p. 17)."

The following four basic elements, which are accepted as the basis of the SMS in the aviation sector, are very important for the elimination of risks and hazards and effective realization of safety management activities (ICAO, 2018, p. 9-2):

- *Safety policy and aims:* It covers the determination, implementation and coordination of the policies necessary for the effectiveness of safety management in the aviation organization. In addition, policies and rules related to safety culture include determining the system and the creating documentation (Erceylan and Atilla, 2021, p. 357).
- *Safety risk management:* It includes decision-making processes such as identifying potential hazards and reducing risks by carefully evaluating the organization's systems and working environment (Chatzi, 2018, p. 192).
- *Securing safety*: While the first two components of the SMS aim to increase safety, this component ensures that the safety that is supposed to be increased is guaranteed.

For this reason, it is necessary to check whether the measures taken to reduce the risks have been implemented and whether they are still effective. These controls are provided through audit processes. Because if the measures foreseen by the risk management application are not taken or applied at an insufficient level, safety may decrease again. These are revealed by audits and necessary measures are taken (Gerede, 2018, p. 204).

- *Promoting safety:* This last component of the SMS is designed to improve safety performance by promoting safety among the employees of the organization. All personnel, including senior management and new hires, should be familiar with safety policies and procedures, existing reporting procedures and risk controls, and should be aware of their responsibility for safety (Chatzi, 2018, p. 193).

These components, created by ICAO, allow the organization to adapt to existing conditions and legislation (Fernández-Muñiz et al., 2007, p. 54). However, in order for this system to be effective, senior managers who determine the SMS policy must show that they support the SMS and are committed to its execution in accordance with this climate (Chen and Chen, 2012, p. 177). In addition, employees need to participate and internalize the system. In other words, the system must promote a positive safety environment. To do this, a strong commitment and support from all managers and employees in the organization is required (Fernández-Muñiz et al., 2007, p. 54).

2.3. The Relationship Between Safety Culture and Safety Management System

Based on the view that threats to safety in aviation organizations can always occur, the SMS aims to detect and prevent hazards before accidents occur (Gill and Shergill, 2004, p. 233). Although SMS is necessary for the safe maintenance of operations in aviation, it is not sufficient alone for an acceptable safety performance. In order for the SMS to ensure safety, employees must be aware of the existence of the SMS, understand it and be willing to implement it. This is only possible with the presence of a positive safety culture. For this reason, SMS and safety culture are interrelated concepts. While SMS covers the competencies required to ensure safety, safety culture represents commitment to establishing safety. The main purpose of both is to develop and maintain safety (Ustaömer, 2020, p. 47).

In summary, to create a positive safety culture and to maintain this culture permanently; it depends on how well the SMS and its components penetrate the fabric of the organization and the ways things are done (Gill and Shergill, 2004, p. 233). In this context, ICAO includes the following statements within the scope of the *safety risk management component*; a culture of safety in aviation organizations can be strengthened by effectively involving employees in safety risk management and making management's commitment to safety clear. When safety is accepted as a priority by management, it will also be prioritized by employees and become part of operations (ICAO, 2018, pp. 1-2).

Developing an effective method for identifying possible hazards within the organization, determining the necessary safety improvements in this context, and evaluating whether they are effectively implemented in the organization will contribute to the establishment of a safety culture (ICAO, 2018, p. 3-5). In this context, the inclusion of employees in the safety risk management of the SMS will increase the loyalty to the organization as well as the adoption of the safety culture. Employee engagement is of great importance in terms of creating a safety culture.

The 'management's commitment' component, which is part of the safety policies and objectives component, allows management support to become visible and enable employees to participate actively in managing safety risk. It also supports efforts to achieve a positive safety culture (ICAO, 2018, p. 3-2). Senior management should sincerely commit to achieving and maintaining a high level of safety and provide support to employees in this direction. Commitment to safety; it reflects the level of having a positive attitude towards safety by senior management and realizing the importance of safety. Management should contribute to the formation of a safety culture in the organization by providing safety-oriented trainings and resources as a role model for employees to take care of safety (ICAO, 2018, p. 3-4). Effective safety management should be implemented by providing high-level support to increase the safety performance of the employees in the organization. This support will influence the attitudes and behavior of everyone involved in the organization and contribute to the creation of a safety culture within the scope of management's commitment (ICAO, 2018, pp. 4-2). ICAO states that by making this commitment clear, the safety culture will be strengthened and the safety of employees will be a priority.

Within the scope of the 'monitoring and measurement of safety performance' component of the safety assurance component, it is stated that a continuous monitoring of the safety-related behaviors of the employees will contribute to the creation of a safety culture (ICAO, 2018, p. 3-5). In addition, recommendations on establishing a safety culture within the scope of this component are included below (ICAO, 2018, pp. 3-4 - 3-7):

- Continuous monitoring of safety-related behaviors,
- Rewarding employees who show high performance in relation to safety,
- Providing trainings on safety,
- Prevention of communication problems that lead to dangerous situations.

Within the scope of "Continuous improvement of the SMS", which is another sub-component of the “assurance of safety component”, it is emphasized that employees who perform well in terms of safety are recognized and rewarded regularly (ICAO, 2018, p. 3-7). In this context, it is thought that rewards will contribute to the formation of a safety culture.

Within the scope of the "training and development" and "safety communication" sub-components of the “safety promotion component”; it is stated that trainings on aviation safety should be provided effectively. It is also emphasized that safety-related information should be conveyed to relevant people in a meaningful and useful manner in order to prevent communication deficiencies that will lead to dangerous situations (ICAO, 2018, p. 3-6). In this context, it is thought that training on safety, regular provision of information and prevention of communication deficiencies will contribute to the creation of a safety culture.

In summary, in order for the components of the SMS (safety policies and objectives, safety risk management, safety assurance, safety promotion) to become an effective element in the creation of a safety culture, the following points should be given importance:

- Inclusion of employees in risk management within the scope of the safety risk management component,
- Within the scope of the safety policies and objectives component, the management is sincerely committed to achieving and maintaining a high level of safety and supporting the employees in this direction,
- Regular monitoring of the safety behavior of employees within the scope of the safety assurance component and rewarding employees with high safety performance,
- Within the scope of the safety promotion component, safety training should be organized and important information about safety should be conveyed and a safety culture should be established.

2.4. Literature Review on the Relationship between Safety Management Systems and Safety Culture

Upon reviewing the literature, the following studies are notable in the context of Safety Management Systems (SMS) and safety culture:

Gürsel et al. (2020) discuss the methods used to develop a safety culture in their study titled "Developing Safety Culture in Aviation." This study introduces safety culture and the models for developing safety culture.

Teke and Şimşek (2020) aim to determine the impacts of SMS applications on corporate image in their study titled "Effects of Safety Management System Applications on Corporate Image: A Study in Flight Training Organizations." In this context, an application was conducted in flight training organizations affiliated with the General Directorate of Civil Aviation located in Istanbul, Ankara, Samsun, and Adana.

Ustaömer and Şengür (2020) aim to contribute to the Turkish literature by examining Reason's Safety Culture Model in their study titled "Safety Culture in Aviation: Examination of Reason's Safety Culture Model."

Erceylan and Atilla (2021) investigate the impact of SMS processes on corporate reputation through the mediating role of employee job satisfaction in their study titled "The Effect of Safety Management System Processes on Corporate Reputation in Aviation Training Organizations: The Mediating Role of Job Satisfaction." An application was conducted in aviation training organizations within this scope.

Tunç (2021), in his study titled "Safety Management System Applications in Air Traffic Control Services," examines SMS applications in air traffic control services. This study aims to determine the impacts and contributions of a positive safety culture on SMS and processes implemented in air traffic control units.

This study, on the other hand, addresses the mediating role of SMS and its components in establishing a safety culture within aviation organizations. Therefore, this study is significant in terms of utilizing SMS as a tool for creating a safety culture. In this context, the article holds unique value as it aims to provide a perspective on associating the SMS system with organizational culture, contributing a novel viewpoint to future studies in the field.

3. Methodology

In this section; information about the purpose and importance of the research, research model, data analysis, data collection and findings are included.

3.1. Purpose and Importance of the Research

This study was created with the idea of utilizing SMS components to facilitate the creation of safety culture in all aviation organizations and its internalization by all employees.

The main objective of the research is to examine the use of SMS as a tool in the creation of a safety culture in aviation organizations. In addition to the stated main purpose six more research questions have been established:

- What do employees at all levels of the organization think about the safety culture and SMS?
- Are they considering the SMS as a necessity or a requirement?
- What kind of activities are carried out in order to establish safety in the organization?
- What kind of activities are carried out in order to create a safety culture in the organization?
- Has safety been made a culture in the organization?
- Is SMS used to create a safety culture in the organization?

In this context, the study examines the use of SMS and its components as a tool in the creation of a safety culture in aviation organizations; determining the positive impact of SMS and safety culture in civil aviation is important in terms of examining the safety culture in aviation in detail in the context of SMS and its applications. For this reason, this study is important for creating a safety culture by using SMS as a tool. In this respect, it has the purpose of providing a perspective to the studies to be carried out in this field.

In the study, the issues that are emphasized as important in terms of creating a safety culture in the SMS components were determined as research code. It was tried to determine the extent to which the enterprises attach importance to the relevant subject from their emphasis on these codes and their thoughts about these codes and it was aimed to seek answers to the research questions.

3.2. Research Model

The model of the study is the interview-based inductive analysis method, which is one of the qualitative research methods. Qualitative research is research in which human behaviors are observed, recorded and interpreted in natural environments (Bayramoğlu, 2007, p. 169). Qualitative research, which uses data collection techniques such as observation, interview and document analysis for the solution of a problem, expresses a subjective-interpretive process aimed at the perception of previously known or unnoticed problems and the realistic handling of natural phenomena for the problem (Baltacı, 2019, p. 369-370).

Social reality in qualitative research; reality is not investigated because it varies according to people and situations. Only the characteristics of a particular situation are tried to be described. Since it is not possible to create a certain environment with social, physical or psychological dimensions, it is very difficult to generalize the research findings and results obtained from a certain environment to other environments. In this sense, qualitative research can only reveal a number of experiences and descriptions and these can give perspective to an individual working on the field (Bayramoğlu, 2007, p. 169).

In this study, the most important reason for choosing the interview-based inductive analysis method from the qualitative research methods is to obtain detailed information about the subject by meeting face-to-face with the managers in order to investigate all aspects of the research aimed at creating a safety culture through the SMS in aviation organizations.

With this method, the drawbacks such as filling out the questionnaire to someone else or not showing the necessary care that can be seen in quantitative tools have been tried to be eliminated. In this research carried out with qualitative research methods, the fact that the data were obtained through interviews and analyzed qualitatively allowed the real thoughts of the people interviewed within the scope of the research to be examined in depth.

3.3. Collection of Data

The interviews were conducted in line with the information obtained from the managers. The data were collected between 08.06.2022 – 05.10.2022.

In order to search for answers to the research questions, 18 interview questions were created. While preparing the questions, importance was attached to determining the questions for investigating the basic and sub-objectives of the research. The prepared questions are also designed to meet the main and sub-objectives of the research. Since the scopes and concepts for literature review are taken into consideration in the preparation of the questions, the number of questions is arranged to cover all dimensions for purposes involving different dimensions. It was preferred that the questions were open-ended questions and care was taken not to be directing.

3.4. Data Analysis

The existing answers obtained during the analysis of the data were deciphered and transferred to the Word program. It was then transferred to the MAXQDA qualitative data analysis program. Here, the content analysis method was analyzed by inductive type. The data were primarily encoded, the related contents were collected under the same codes and interpreted by tabulation. Table-1 shows the codes that help the research:

Table 1. Code to aid research

Code	Explanation of the code
SMS	Safety Management System
SC	Safety Culture
S	Safety
HR	Hazards and Risks
RP	Reporting
J	Justice
RE	Rewarding
P	Punishment
E	Education
C	Communication
HF	Human factor

SMS and SC codes were created to determine the thoughts of managers and employees about the SMS and safety culture and to determine whether SMS is considered as a necessity or a requirement. Safety code was created to determine what kind of activities are carried out to establish safety and to be used as an auxiliary factor in creating a safety culture.

Education code is emphasized by ICAO in three components of SMS. Within the scope of these components; it is emphasized that safety-related education should be provided effectively and educational activities should be measured.

Justice code emphasizes the importance of employees' belief in justice in reporting hazards, risks, intentional errors, and violations. If employees believe in the strength of the justice system in their institution, they will report without hesitation.

Reporting code; reporting is one of the most important elements in aviation activities. Through reporting, businesses learn, improve themselves, and take precautions against hazards and risks. For these reasons, reporting contributes to the formation of a safety culture and is important.

Punishment code; when employees know that they will not be punished for unintentional mistakes and violations, they feel safe and do not hesitate to report. This issue, which indirectly contributes to issues such as reporting, hazards and risks, is important in terms of creating a safety culture.

Rewarding code; ICAO emphasizes the issue of rewarding in two separate components. In this context; it emphasizes that employees who perform well in terms of safety are recognized and rewarded regularly, and that the rewarding activities of businesses are important in order to create a safety culture.

Hazards and Risks code; within the scope of the "safety risk management" component of SMS, businesses should include their employees in risk management, prioritize safety, and identify hazards while raising awareness on this issue. By involving employees in these issues and raising their awareness, it will be possible to contribute to the formation of a safety culture.

Human Factor code; the human factor is one of the most important elements in aviation. By solving and preventing human factor-related problems, success can be achieved in areas such as safety, communication, hazards and risks, and reporting.

Communication code; ICAO emphasizes communication in two separate components. In this context; it emphasizes that businesses should prevent communication deficiencies that can lead to dangerous situations and that their effords to prevent communication deficiencies should be measured.

3.4.1. Findings

While determining the managers to participate in the research, phone numbers and e-mail addresses were obtained from the websites of the enterprises. Additionally, in order to facilitate access, middle and lower-level managers of the enterprises were reached through contact who knew the people working in these enterprises. Table-2 provides information about the managers participating in the research.

Table 2. Personal Information About the Managers Participating in the Research

Code Name	Title	Seniority in the enterprise
A	Manager	20
B	Chief Operating Officer	8
C	Chief Operating Officer	22
D	Chief Operating Officer	10
E	Chief of Operations Services	9
F	Chief of Passenger Services	14
G	Chief of Passenger Services	7
H	Chief of Passenger Services	13

The information given for each code is summarized in Figure 1 to facilitate the analysis of how often administrators highlight each code.

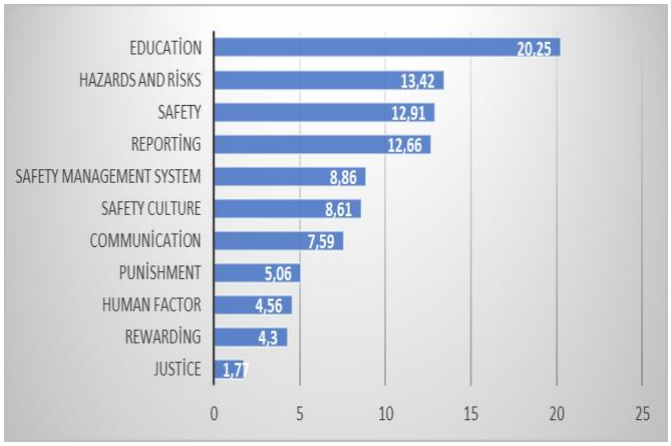

Figure 1. Percentage distributions of data numbers for research codes

When the general distribution of the codes is examined, it is seen that the education code is emphasized with the highest rate of 20.25%. The least data is related to the justice code with a rate of 1.77%.

Separate graphs were created to analyze in detail which code the business managers emphasized and how much. Figure 2 shows the percentage distribution ratio of codes in relation to the responses given by the manager of business A.

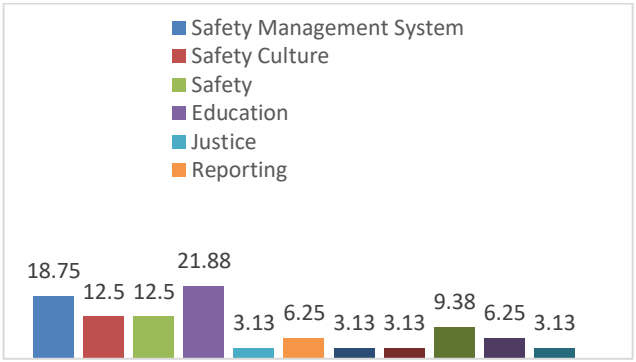

Figure 2. Distribution Ratio of Data Received from Business "A" According to Codes

As can be seen in Figure 2, the code that the manager of business A emphasizes the most is education with a rate of 21.88%. This code is followed by the SMS with 18.75%. The least information is related to justice, punishment, reward and communication with a rate of 3.13%. Figure-3. shows the percentage distribution rate of the codes for the answers given by the manager of business B.

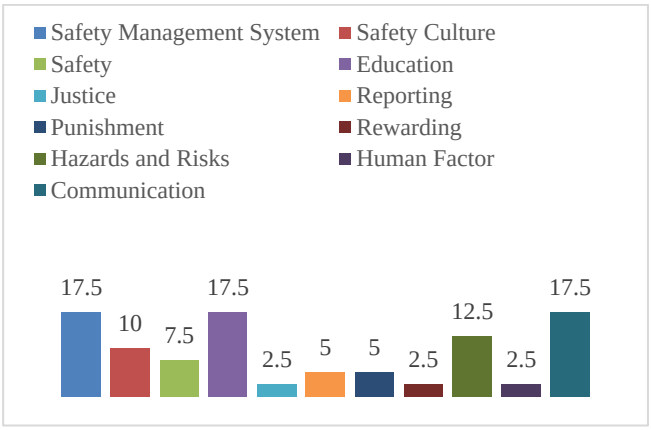

Figure 3. Distribution Ratio of Data Received from Business "B" According to Codes

In the data obtained from enterprise B, it is seen that the most emphasis is placed on issues related to SMS, training and communication. Business B shared 17.50% of the information on these issues. These codes are followed by hazard and risk with a rate of 12.50% and a safety culture with a rate of 10.00%. The least information was received from business B regarding justice, reward and human factor with a rate of 2.50%.

Figure 4 shows the percentage distribution rate of the codes in relation to the answers given by the manager of business C.

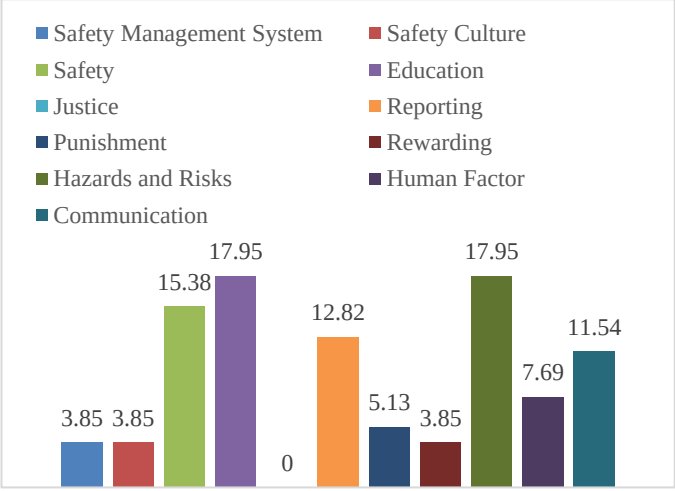

Figure 4. Distribution Ratio of Data Received from Business "C" According to Codes

Among the data received from business "C", the highest rate is related to education and hazard and risk code with 17.95%. The information given about safety is in second place with 15.38%. While 3.85% of the information on the SMS, safety culture and rewarding were received, no information was given regarding the justice code.

Figure 5 shows the percentage distribution rate of the codes in relation to the answers given by the manager of business "D".

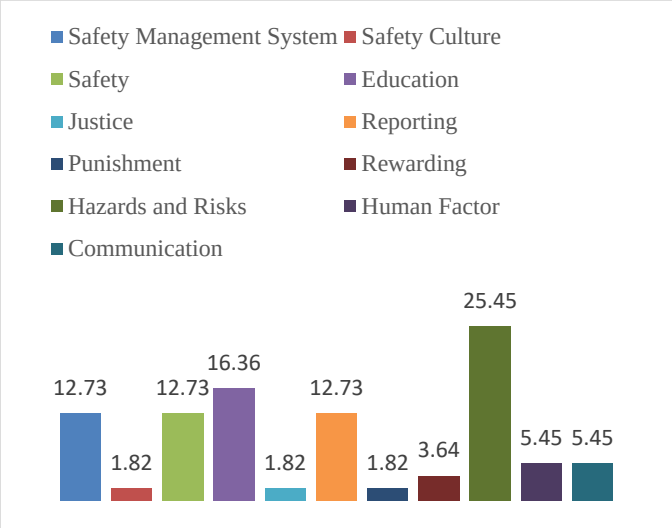

Figure 5. Distribution Ratio of Data Received from Business "D" According to Codes

With a rate of 25.45%, information about the most hazards and risks was obtained from the "D" business. Hazard and risk are followed by the education code with 16.36%. Business "D" provided at least 1.82% of the information on safety culture, justice and punishment.

Figure 6 shows the percentage distribution rate of the codes in relation to the answers given by the manager of business "E".

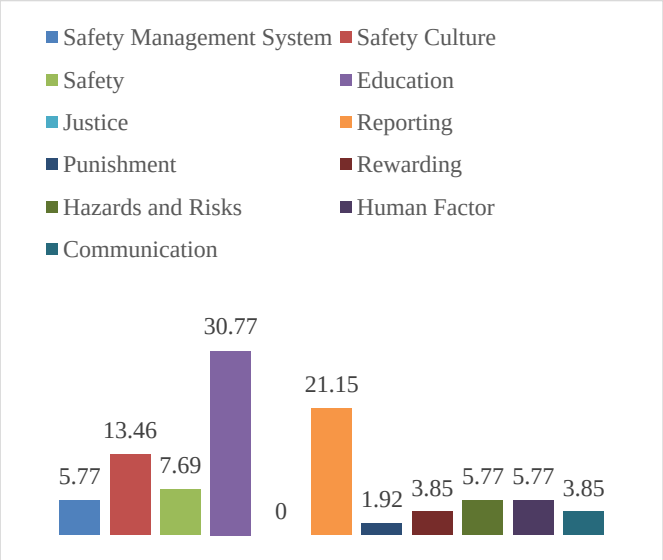

Figure 6. Distribution ratio of business "E" by codes

Among the data received from the "E" enterprise, the highest rate is related to the education code with 30.77%. This code is followed by reporting code with 21.12%. Business "E" gave the least information about the punishment code with a rate of 1.92%. We were unable to obtain any data from this business regarding the justice code.

Figure 7 shows the percentage distribution ratio of the codes in relation to the responses given by the manager of business "F".

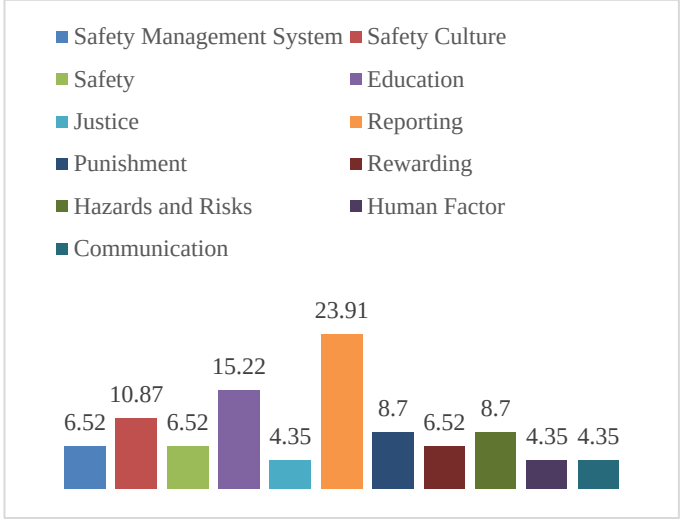

Figure 7. Distribution Ratio of Data from Business "F" by Code

The most emphasized code of business "F" is reporting with a rate of 23.91%. This code is followed by education with 15.22%. The least information is for justice, human factor and communication with a rate of 4.35%.

Figure 8 Shows the percentage distribution rate of codes for the answers given by the "G" business manager.

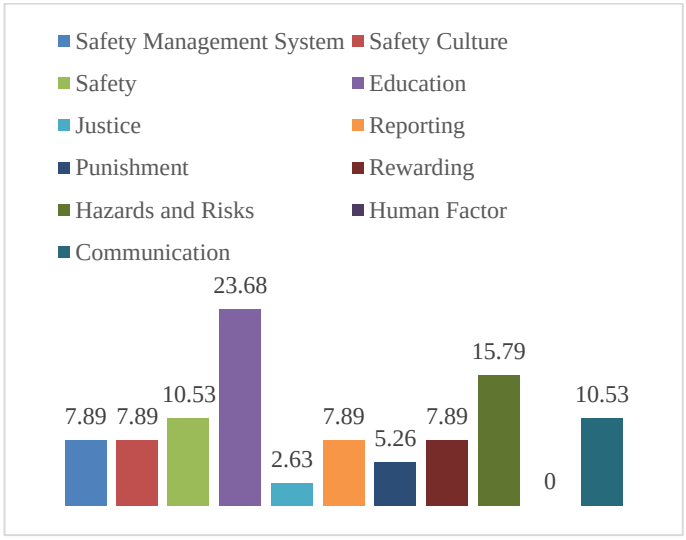

Figure 8. Distribution Ratio of Data Received from "G" Business by Code

The "G" business highlighted the education code the most with a rate of 23.68%. This code is followed by hazards and risk with a rate of 15.79%. In the data received from the "G" business, the data for the least justice code was taken with a rate of 2.63%. No data on the human factor code could be obtained from business "G".

Figure 9 shows the percentage distribution rate of codes in relation to the answers given by the manager of business "H".

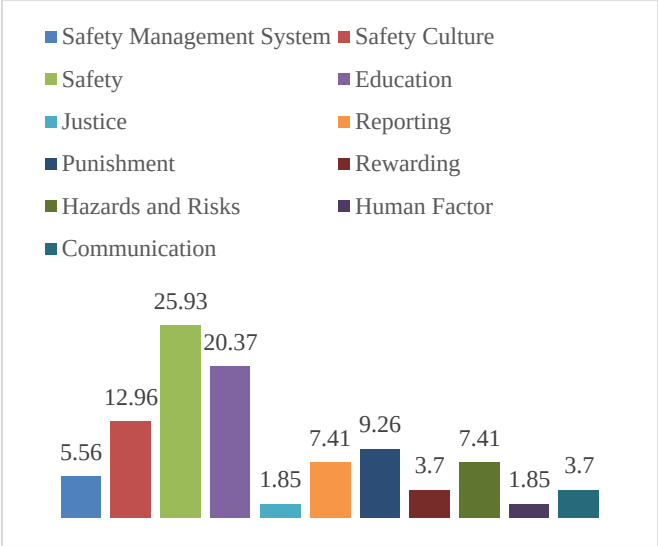

Figure 9. Distribution Ratio of Data Received from Business "H" by Codes

Among the data received from the "H" business, the highest rate is related to the safety code with 25.93%. The information given about education is in second place with a rate of 20.37%. With a rate of 1.85%, the "H" business conveyed the least information about justice and the human factor.

3.4.2. Analyzing Data for Businesses

When the details of the interview were examined, it was determined that the level of safety culture of enterprise "A" was low and the level of safety culture of enterprise "B" and "E" was high. Although a safety culture has been formed in "C", "F", "G" and "H" enterprises, it has been determined that it is not at the desired high levels. In enterprises "D", the level of safety culture could not be determined.

In the interview with the manager of enterprise "A", although the "safety culture" code was emphasized by 12.5%, it is considered that the level of safety culture of enterprise "A" is low. In the details of the interview, the business manager shared the following information:

- On the subject of communication; "correspondence-related problems may occur".
- On the subject of punishment; "Depending on the nature of the unsafe situation, warning punishment are given to the personnel, but as a result of the unsafe situation, the necessary punishment (warning, reprimand, deduction from salary, etc.) are applied to the relevant personnel."
- On rewarding; "We don't have any reward system. This is the primary duty of the employees".
- On the subject of reporting; Stating that there is a software program for reporting, the business manager said, "Some personnel do not enter data into the software program we have specified for certain reasons.
-

Since the business manager often emphasizes that "our safety culture is strong, our safety culture is formed", the safety culture code rate is high. When the details of the interview are examined, it can be easily seen that the enterprise does not show the necessary sensitivity and care in communication, reward, hazards and risk, safety and reporting. Detailed information on safety, hazard and risk issues was also not shared.

In the interview with the "E" enterprise manager, it is seen that the "safety culture" code is emphasized by 13.46%. High level of safety culture of "E" enterprise is determined and uses the SMS as a tool in creating a safety culture. In the details of the interview, the business manager shared the following information:

- **Punishment**: "We do not impose any punishment other than for intentional violations. We commit to this to our employees in writing and verbally."
- **Rewarding**; As part of the incentive system, every report is acknowledged with a formal letter to the employees. An official letter of appreciation is written and at the end of the year we evaluate the companies in all our organizations throughout Türkiye on the basis of our business and award the top three. In addition, we give a small gift to the employee who does the most reporting in our own station, and we try to reward it.
- **Danger and risk**; emphasizing that he attaches importance to the participation of all personnel in the matter of danger and risk and that success can be achieved by involving them, the business manager also emphasizes that expert support is obtained in this regard.
- **Education;** stating that training is often given in the institution, the manager said, "We try to understand the safety culture of employees with training. We already have a training called SMS on this subject. Every 3 years, these employees are already given these trainings by our institution. Our training activities are in this direction and we also have radio communication trainings."
- **Reporting**; emphasizing that they are informed about the reporting via the boxes and the internet, the business manager states that they bring up the importance given to this issue in every meeting. It is stated that the staff is frequently reported without naming names.

4. Conclusion and Recommendations

In the aviation sector, the concept of safety culture serves as a critical behavioral regulator in preventing accidents, errors, incidents, near-miss events, violations, hazards, and risks. Consequently, there is a growing consensus on the utilization of SMS (Safety Management System) components to develop and internalize safety culture across all aviation organizations.

This study aims to explore how safety culture can be promoted through the effective and dynamic implementation of SMS components and processes. The collected data were analyzed in the context of the four fundamental components of SMS to evaluate the development of safety culture. The findings related to the objectives of the study are summarized as follows:

- A significant portion of personnel in aviation organizations lacks comprehensive knowledge about SMS and safety culture.
- In many organizations, SMS is viewed more as a compliance obligation rather than a mandatory requirement.
- Notable efforts include organizing training, defining safety, identifying hazards and risks, enhancing reporting mechanisms, and implementing reward practices.

- Few organizations have successfully integrated safety into their culture.
- Training, rewarding, disciplinary practices, addressing hazards and risks, focusing on human factors, communication, and reporting initiatives have been identified as important in developing a safety culture. However, almost all organizations fall short of the expected standard in terms of "justice," a fundamental infrastructure element of safety culture.

Remarkably, only one of the eight examined enterprises uses SMS as a strategic tool. The research revealed that two of the participating enterprises (B and E) exhibited a high level of safety culture due to the effective implementation of SMS components, with an emphasis on safety, training, hazard and risk management, rewards, and communication.

Organizations with an existing but not yet desired level of safety culture showed deficiencies in areas such as safety, training, hazard and risk management, rewards, and communication. SMS should be included in the organizational chart as a department and experts in this field should work. Organizations with low levels of safety culture tended to neglect these areas. The study suggests that organizations actively and effectively implementing SMS components tend to develop a safety culture. Although a positive safety culture exists with less application, it falls below the required standards. In contrast, enterprises neglecting SMS requirements tend to exhibit very low levels of safety culture. The identified shortcomings in achieving a positive and high-level safety culture include:

- **Underestimating the value of rewards**: Organizations that do not prioritize rewarding tend to have low safety culture levels, leading to a lack of ownership and commitment among employees.
- **Punitive Approach:** Firms strictly adhering to punitive measures often record low safety culture levels. A balanced and fair approach to discipline is essential to foster a positive safety culture. Additionally, efforts should be made to develop a non-punitive disciplinary policy. In this context, “informing” emerges as one of the most critical elements. An informing culture is crucial for raising awareness among employees about the organization's safety status and priorities. Thus, all employees can clearly understand the difference between acceptable and unacceptable actions and can report faulty behavior without fear of punishment in a working environment.
- **Employees' perception of justice**: Many companies do not prioritize justice, which affects employee loyalty and reporting rates. Establishing a fair culture is primarily dependent on the existence of a sense of "trust." Another important requirement is understanding the mitigating effect of non-punitive reporting on safety management. Knowing that unsafe actions will be addressed and that voluntary reports will not result in punishment can foster a sense of justice and balance. In this context, "a fair organizational culture" can significantly enhance the safety culture.

To elevate safety culture in aviation, emphasis on safety, education, hazard and risk management, rewards, and communication is crucial, along with supporting elements such as justice, reporting, punishment, and human factors. Finally, the study highlights a general lack of comprehensive understanding of 'safety culture' among many organizations. The training content is predominantly focused on safety, SMS, hazards and risks, reporting, and communication, yet lacks safety culture-specific training. There is a need for more in-depth research and resources on safety culture and SMS in Türkiye.

Ethical approval

Ethics Committee Approval of this study was obtained with the decision of Hitit University.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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