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Crystal Ioannou, Don Harris and Nicklas Dahlstrom

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Safety Management Practices Hindering the Development of Safety Performance Indicators in Aviation Service Providers

Crystal Ioannou[1] Don Harris[2] and Nicklas Dahlstrom[3]

[1] Emirates Aviation University, Department of Engineering, Dubai, United Arab Emirates

[2] Faculty of Engineering, Environment and Computing Coventry University, Coventry, United Kingdom

[3] Emirates Airline, Human Factors Office, United Arab Emirates

Abstract: Five aviation service providers participated in a study aiming to identify factors that impact the implementation of a safety management system and the safety performance of the organization. Safety managers were interviewed and their comments analyzed using grounded theory approach. Hindering factors were categorized and integrated into a model.

Keywords: safety management systems, safety performance indicators, obstacles, system performance

Introduction

The International Civil Aviation Organization (ICAO) states that as aviation systems are becoming more and more complex, human performance will no longer be able to be controlled using simple regulation intended to ensure safety. As a result, in 2011, the ICAO mandated the introduction of Annex 19, Safety Management Systems (EU: COM/2011/ 0670, ICAO, 2009, 2013). A safety management system (SMS) is a formal risk management framework for enhancing safety. An SMS should contain systems for: hazard identification and risk management; safety targets and reporting processes; procedures for audit; investigations; remedial actions to improve performance; and safety promotion and training. The size and complexity of an SMS should be tailored to suit the size and activities of each organization (Civil Aviation Authority New Zealand, 2015). However, implementing SMSs is not straightforward and there are often organizational obstacles (Gerede, 2015a).

Safety performance indicators are an important part of the SMS as these allow for the establishment, implementation, and follow-up of policies related to safety (Øien, Utne, Tinmannsvik, & Massaiu, 2011). Organizations have to set targets and need to evaluate and manage the outcomes of their safety-related activities in order to be able to anticipate any vulnerabilities in their system (Hollnagel & Woods, 2006). Traditionally, safety performance measurement is achieved through the collection of data such as near misses, incidents, or damage associated with poor performance. These data are used as safety performance indicators (SPIs; Sgourou, Katsakiori, Goutsos, & Manatakis, 2010). These safety outcomes are known as lagging (or reactive) indicators, providing historical information, such as accident frequency

and severity rates (one accident, 150 fatalities in 2015) or near misses (11 serious incidents in 2015; European Aviation Safety Agency [EASA], 2016; Sgourou et al., 2010; Toellner, 2001). Owing to the nature of lagging indicators, they cannot predict future performance nor do they give sufficient information as to why something happened. In contrast to lagging indicators, leading (or proactive) SPIs can be used to identify underlying causes and contributing factors of accidents, such as inappropriate or inadequate training or a lack of resources, and can be used as predictors or early warning indicators (Hinze, Thurman, & Wehle, 2013; Øien et al., 2011; Sgourou et al., 2010). The Organisation for Economic Co-operation and Development (OECD) uses the term indicators for the observable measures that provide insight into concepts that are related to safety and are difficult to measure directly (Harms-Ringdahl, 2009; OECD, 2014).

Management activities, guidelines, industry standards, organizing, planning, audit, performance measurement and quality principles are the basic components in any SMS (Santos-Reyes & Beard, 2008). The effectiveness of any SMS depends on the strength and the maturity of the system (Civil Air Navigation Services Organization [CANSO], 2014; Heese, 2012). An organization's safety culture and management's commitment to safety are the driving forces behind an effective SMS (CANSO, 2009; European Commission, 2012; Flemming, 2000; Parker, Lawrie, & Hudson, 2006; Schwarz & Kallus, 2015; Zohar, 1980).

Challenges identified as impeding the successful implementation of an SMS are the absence of a positive safety culture and the presence of a blame culture and punishment following error, which results in a lack of reporting. Although improvements in these areas can be a step forward for the management of safety, they are not sufficient for an SMS to be effective. Studies in other industries with similar systems have identified critical components for improving the performance of an SMS as well as barriers to its successful implementation (Aksorn & Hadikusumo, 2008; Bhattacharya & Tang, 2013; Fernandez-Muniz, Montes-Peon, & Vazquez-Ordas, 2007; Ismail, Doostdar, & Harun, 2012), although, there have been very few studies related to SMSs in the aviation industry (Gerede, 2015b). Gerede (2015a) found that the most significant challenge for the successful implementation of an SMS is the problem of establishing a just culture. He further discusses the problems that create a poor safety culture and the consequences if these problems are not addressed.

Studies have demonstrated a relationship between safety management practices and safety performance. Safety management practices can include, but are not limited to: management showing personal involvement in safety activities; provision of high-quality training for new employees and frequent training for existing employees; safety promotion for identifying hazards; higher priority for safety in meetings and in decisions concerning work practice; in-depth investigation of accidents; empowerment of the workforce (Vinodkumar & Bhasi, 2011). When employees are involved in safety matters and are encouraged to work safely, this approach to managing safety at work may improve the desired outcomes (Vinodkumar & Bhasi, 2011).

Hopkins (2000) and Baker et al. (2007) expressed the need for the industry to develop and implement improved SPIs. There are various reasons as to why such indicators are required. One of the reasons is to shape the behavior of management and staff. Effective indicators can drive the required performance while ineffective indicators will lead to misleading figures in performance measurement and may not give information concerning the real issues under consideration (Hudson, 2009). Valid safety knowledge is derived from data collected from appropriate SPIs, hence reliable and valid indicators (both prospective

and retrospective) need to be identified and implemented for any SMS to be effective. Indicators should be both valid, that is, measure what we want them to measure, and reliable, that is give the same measurement result when used in the same situation but by different people (Hale, 2009).

The International Atomic Energy Agency (Hale, 2009; IAEA, 1999) suggested that SPIs should possess a number of characteristics. They should have a direct relationship with safety, and necessary data should be available or easily generated. The indicators should be unambiguous and easy to understand, able to be expressed in quantitative terms but without them being susceptible to manipulation. The SPIs will be effective if they are manageable, valid, capable of being integrated into normal operational activities, and linked to the causes of a malfunction. They need to provide accurate data at each level to allow quality control and verification. Finally, organizations should be able to take corrective actions on the basis of the indicators and they should be cost-effective.

SPIs need to be carefully selected and reviewed and re-evaluated over time. Manipulation of indicators by managers was evident in the Baker report for the BP refinery accident in Texas, contributing to a false sense of security. Manipulation implies changing the indicator to show a better score but without changing the underlying situation the indicator reflects (Hale, 2009). Inconsistencies and incoherence can exist in the approach taken for the selection of indicators. Two problems can be linked to the choice of SPIs: either too many possible indicators are utilized, reducing the mapping of safety-critical activities, or there is a failure to select correct and useful indicators. A systematic approach needs to be used to identify the proper indicators and how we can use these indicators to drive the SMS toward achieving its safety goals (Hudson, 2009).

This study, therefore, examines practices that may play a role, promoting or hindering, in the implementation of an SMS and the choice of SPIs in the aviation industry. A qualitative approach was utilized as the emphasis was on insight, discovery, and development of a theory rather than the testing of a hypothesis (Cronbach, 1975; Merriam, 1988; Silverman, 1993).

Method

Participants

Interview data were elicited from safety managers from the aviation industry. Involvement of these managers in the development and selection of the organization's safety performance indicators was used as a criterion. Another criterion was to select safety managers from aviation operations of different kinds. The sample consisted of the safety managers from five aviation organizations (two medium – large airlines, two airports, and one navigation service provider). All participants were trained in the operation of SMSs.

Data Gathering

An introductory letter was sent to the participants by e-mail to inform them about the research, with a follow-up telephone call before the commencement of data collection. They were informed that the objective of the study was to investigate the effectiveness of the implementation of their SMSs and the development of effective SPIs. Participants were asked to participate in a semistructured interview session. The in-depth semistructured interview contained 33 questions: three to learn and know about the organizational factors that affect the safety of the organization; five to learn and know about the safety knowledge of the participants; 14 questions about their SMS; and 11 questions about SPIs.

Examples of questions included: “How do you think the top management of an organization can affect the safety of an organization?” and “How does management promote the safety policy and the SMS?” (these examples were derived from the section of the interview related to safety). An example from the part of the interview related to the SMS was: “How are the employees trained in identifying hazards?” An example from the part of the interview related to SPIs was: “Does the reporting system give a clear picture of the most important risks in your work and does it help you manage them effectively?”

The data collection was performed in two phases between June 2014 and August 2014. The duration of the semistructured interviews was approximately 2.5–3 hr. During the interview, the interviewer took notes of the interviewees’ answers. At the end of each interview, the interviews were transcribed and saved into word processor files for subsequent analysis. The data were then coded by hand. Data were treated ethically, maintaining the anonymity of the participants.

Analysis

A grounded theory approach was used for the analysis of the narrative data derived from the interviews with the safety managers in the five aviation organizations, using the procedures and techniques described by Strauss and Corbin (1990a). Strauss and Corbin (1990b) defined grounded theory as:

One that is inductively derived from the study of the phenomenon it represents. That is, it is discovered, developed and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon... One does not begin with a theory then prove it. Rather, one begins with an area of study and what is relevant to that area is then allowed to emerge. (p. 23)

The collection and method of analysis of the data are outlined in the following steps (Strauss & Corbin, 1990a):

- Data gathering
- Open coding
- Axial coding
- Selective coding

Each interview report was broken down into individual sentences or small groups of sentences that referred to a single observation from each interviewee.

Open Coding

Open coding was defined by Strauss and Corbin (1990a, p. 61) as: *“The process of breaking down, examining, comparing, conceptualising and categorizing data.”*

The comments produced by the line-by-line analysis of transcripts were analyzed to generate categories into which they could be grouped. Concepts were developed using a continuous dialogue with the empirical data. Concepts are ways of summarizing data and they should be adapted to the data (Becker, 1998, p. 109). The application of this method to the set of comments yielded an initial set of coding categories or dimensions. The comments were then re-coded using these categories to check for interrater reliability. Differences in coding were discussed and resolved to produce an agreed list of categories.

Axial Coding

Strauss and Corbin (1990a, p. 96) defined axial coding as: *"A set of procedures whereby data are put back together in new ways after open coding, by making connections between categories."*

This stage of analysis yielded a set of higher-order categories describing the connection or common properties between the lower-order categories. Comments were then re-evaluated within each category.

Selective Coding

Selective coding was defined by Strauss and Corbin (1990a, p. 116) as: *"The process of selecting the core category [and] systematically relating it to other categories."*

Strauss and Corbin (1990a) pointed out that this process is essentially similar to axial coding, but was conducted at a higher level of abstraction. A core category that emerges is the overarching phenomenon or concept that links each of the categories or phenomena that are developed during axial coding. After the core category was identified, further analysis of the comments in each category revealed the links between the categories identified during axial coding. Once all the categories were linked together to form a complete model, a narrative description was developed.

Data Analysis and Model Development

Open coding identified 15 dimensions containing factors that can obstruct the development of SPIs and hinder the performance of the SMS grouped under three properties.

Following up on the process of open coding, the comments produced from the line-by-line analysis of interview narrative data were grouped into three emergent main categories, namely, "Top management's decisions influencing safety"; "Lack of safety culture"; and "Impractical and fearful data collection approach" (see Table 1).

Top Management's Decisions Influencing Safety

During axial coding "allocation of resources," "allocation of time," "failure to clarify safety commitment," "failure to participate in safety activities," "not interested to know," and "reluctance of management to allocate human resources for the investigation of incidents" were placed in the "managements' decisions" category (Table 1).

Allocation of Resources

From the interviewees' transcripts it was observed by the researchers that some safety managers shared the perception that management would not allocate the money, extra working hours, or resources for hiring additional personnel:

> *In order to perform the investigations people should be removed from the roster or work during their days off and this causes a delay in the investigation of incidents.*

Allocation of Time

Based on the following comment it was noted that the management of some aviation companies would not allocate time for the risk assessments and employees needed to work on their days off in order to complete the risk assessments:

Risk assessments are not effectively performed; they are problematic as there is a delay because people need to be removed from the roster or work during their days off or work overtime.

Failure to Clarify Safety Commitment

On the basis of the comments, it was noted that interviewees perceived that management was not committed to safety as the company management did not show that they were at all interested in safety:

When it comes to (top) management's commitment to safety they don't want to know, they don't have the knowledge or they don't want to show that they are interested.

Failure to Participate in the Safety Activities

On the basis of the following comment, it was perceived that management does not show an interest in the safety activities or want to know about these activities, and it was middle management who handles the safety issues:

When it has to do with needs in the safety department, they [top management] don't want to know, they don't want to show they are interested. Only middle management handles operations and safety.

Not Interested to Know or Learn Anything About Safety

From the next statement, it was indicated that middle management perceived that top management did not care and at the same time top management does not prioritize safety issues within the organization:

(Top) management either doesn't want to know, or they do not have the knowledge, or they do not want to show the least interest in safety matters. It's the middle management who handles the safety issues.

From these statements, it was indicated that the middle management from some aviation service providers perceived that top management did not care and at the same time top management did not prioritize safety issues within the organization.

Delay in the Investigation of Accidents

On the basis of the following comments, "delay in the investigation of accidents" was placed in the top management's decisions category as this could have facilitated investigations and made the findings available sooner (Table 1).

In order to perform the investigations people should be removed from the roster or work during their days off and this causes a delay in the investigation of incidents.

Lack of Safety Culture

During the axial coding stage, "lack of safety promotion," "lack of safety training," "lack of just culture," "lack of trust between personnel," "lack of attention to what personnel is saying," "lack of encouragement by top management," and "resistance to change" were all placed in the "safety culture" category.

"Lack of just culture" was identified as a common property, which hindered the successful collection of safety data from the reporting system. To illustrate, one interviewee commented:

[Employees] don't know what is acceptable and unacceptable in terms of judicial authority taking over.

Lack of Safety Promotion

On the basis of the following comment from one participant, it was noted that top management was not promoting the SMS:

> *The [top] management doesn't really promote the SMS...*

The following comments indicate that the organization did not promote the safety policy and SMS to their employees, and the employees have asked from the safety manager to make a presentation.

> *Employees do not completely understand the safety policy. We know because they asked the safety manager for a presentation. SMS and Safety Policy, is very little promoted by top management.*

Lack of Training

The following statement implies that the employees did not receive training to identify hazards and employees were required to use their common sense to identify hazards:

> *Employees were not trained to identify hazards, this is based on their instinct and their common sense.*

The next statements indicate that some organizations present an overview of how the SMS works and do not provide recurrent training to their employees even if it is stated in the manuals that the employees need to receive recurrent training.

> *Training in safety and SMS, an overview how the system works [is provided], we still have room for improvement. Recurrent training is only written in the manuals.*

The following statement indicates that some organizations do not use the information from the reporting system to train employees and it depends on the manager of each unit to feed back the information given to him/her by the safety manager.

> *We don't have an official lessons learnt process; it depends on the manager of each unit to inform the people.*

Lack of Trust Between Personnel

On the basis of the following comment, it was regarded that the employees might be reluctant to report anything because they do not trust their colleagues since other employees might be able to identify the reporter.

> *Reporting is not encouraged because other employees can identify the reporter especially if one or two people were working on that particular shift the time when the event took place.*

Lack of Attention to What the Employees Are Saying

Lack of attention to what an aviation service provider's safety managers were saying was identified as a common component in the "safety culture" and "reporting systems" categories (see Table 1).

> *Every time we ask them to give a campaign on reporting they keep saying that they will do it the following week and they never do it.*

It was perceived that top management did not care about what they were asking, and this has a great effect on safety culture. Management did not care and they showed it. This is even more obvious from the following comment from one employee:

> *What management shows us is that we will do something if we have time, when we have time.*

As implied, in some organizations, management was not regarded as promoting the SMS and also did not provide training for the identification of hazards. Workers needed to use their common sense, but this of course depended on the perceptions of each individual concerning what he or she considered to be a hazard. Lack of training also resulted in a lack of knowledge of the benefits of making contributions to the reporting systems. In addition, if personnel were trained more on how they could benefit from the reporting hazards and how this could reduce the rate of incidents, they would have cared more about reporting the hazards and cared less about who did what.

The following comment indicates that when middle management wanted to discuss the safety needs of the organization, top management did not want to know and they did not want to show any interest.

> *When it has to do with needs in the safety department, they don't want to know, they don't want to show they are interested. Only middle management handles operations and safety.*

Lack of Encouragement to Report by Top Management

After discussion it was decided that "lack of encouragement to report" was best categorized under "safety culture" because encouragement can be a characteristic of the inner environment and a feature of the organization that can be influenced by the people working within the organization (Schwarz & Kallus, 2015; von Rosenstiel & Nerdinger, 2011).

Several statements indicate that employees are not encouraged to report issues, and they only receive an overview of how the SMS works. It was indicated that although recurrent training is mentioned in the manuals, the organization does not give recurrent training to employees to encourage them to report.

> *When it comes to reporting there is no encouragement and there are bureaucratic procedures.*

The next statement indicates that the actions of top management fail to encourage employees to report.

> *Instead of using the reporting system for improvement, they are using it to penalize.*

The next statement indicates that when the organization was not under the same facility, some departments might have received less encouragement to report, especially if the safety department was not located in the same facility in order to promote reporting. Bureaucratic procedures might also cause lack of encouragement and this is emphasized when the organizations are in different locations.

> *There are units that are isolated from the whole system, without any information on reporting, there are bureaucratic procedures.*

Resistance to Change

Resistance to change was found to be one of the dimensions best placed under the "safety culture" category. Interviewees expressed their opinion that remedial actions became a difficult task as it involved a number of people and sometimes the action to be taken depended on other people.

It is a matter of how easy something can be done and you have to wait for the others; it's not that easy, it has to do with the number of people involved.

Impractical and Fearful Data Collection Approach

Comments about reporting systems were further decomposed into "fear of punishment that impairs reporting" and "impracticality of reporting systems that hinders the reporting process" (see Table 1).

Fear of Punishment That Impairs Reporting

The following statement indicates that when personnel worked by themselves, knowing that no one saw them committing an error, they would not report because they were afraid of punishment.

The disadvantage of reporting is that sometimes you work by yourself, so in that case you would not report yourself.

The next statement indicates that in the organization of this interviewee, higher management is using the reporting system to penalize the reporter or to ask for explanation.

Instead of improvement, they use it to penalize or ask for explanations.

Impracticality of Reporting System That Hinders the Reporting Process

The following statement demonstrates the impracticality of that particular reporting system.

Reporting is not encouraged because other employees can identify the reporter especially if one or two people were working on that particular shift the time when the event took place.

The following statement again implies there is a lack of just culture that affects the reporting system and as a result the organization lacks safety-critical information for the development of SPIs.

The reporting system is just a book in the other room where the employee would go and report the event.

The previous statements are indications of the impracticality of the reporting system. In some cases, workers were effectively discouraged or even embarrassed to report because this action would be obvious and at the same time they could be identified by the other workers because of the small number of people who were working on the same specific shifts.

A Model of Factors Impeding the Development of SPIs

Selective coding is the process by which all the categories are combined around a single "core" category that represents the central phenomenon or that can be identified by asking the question, "What is the main analytic idea presented in this research?" (Strauss & Corbin, 1990). The main idea presented in this study is identifying factors that can obstruct the development of SPIs and hence hinder the performance of safety management systems in aviation.

The importance of this stage of grounded theory development is the development of an overall model. The core category identified was the "obstacles in developing safety performance indicators."

The connection between "top management decisions influencing safety," "lack of safety culture," and "impractical and fearful data collection" may be summarized as follows: The decisions of top management

influenced the safety culture of the organization and the lack of a safety culture has a subsequent impact on the reporting systems making them impractical to use and creating a fear of reporting in employees.

Results and Discussion

The purpose of this study was to identify and describe factors that may promote or impede the development of SPIs in aviation organizations and service providers.

Figure 1 shows the model derived from the interview data and grounded theory analysis of the factors that can impede, delay, and/or mislead an organization in creating their SPIs. Several features of the model were consistent with the findings of Gerede (2015a), who also showed how the success of the safety management systems could be impeded. Gerede (2015a) identified the failure of the reporting system, acceptable and unacceptable behavior not being distinguished, fear of punishment, and hazards that remain hidden as the main factors contributing to the success or failure of an SMS. The model developed also suggests that top management, culture, and data collection processes are significant factors that could either individually or in combination influence the success of the SMS by impeding the development of the appropriate practice.

The Perceived Role of Top Management

While attempting to uncover the factors that impede the development of SPIs, it was found that the perception of the interviewees that management showed little or no interest in knowing about safety issues was one such factor (Table 1). The interviewees reported that employees said that management led them to understand that they (management) will take action about an issue only when and if they have time. The employees' perception about management was that they do not prioritize safety actions, but on the contrary they would only take an action at their convenience. However, for top management to demonstrate commitment to safety the manager will be required to possess high levels of safety knowledge to act appropriately with respect to safety matters and communicate the facts to the personnel. As a result, the safety knowledge will enable managers to understand safety-related information, draw meaningful conclusions from it, and then demonstrate their commitment to safety by their actions (Fruhen, Mearns, Flin, & Kirwan, 2014a).

Employees feel that when it comes to safety, management does not want to know, does not have the knowledge, and/ or is not interested in knowing. Because of this, it would seem that management does not prioritize safety. Neal and Griffin (2004, pp. 15–34) define the safety commitment of management as, "the extent to which management is perceived to place a high priority to safety and communicate and act on safety issues." Zohar (1980) also found that management's commitment to safety is a major factor that can affect the success of an organization's safety management system. Studies have shown that senior management can influence 45% of the organization's performance and have a significant influence on organizational safety (Clarke, 1999; Day & Lord, 1988; Fruhen et al., 2014b).

If sufficient resources are not allocated, SPIs cannot be developed. Personnel in the interviews said that management would not allocate the necessary funds for increasing the number of personnel. This meant that people had to divide their working time between working their shift and performing the SMS activities. Lack of available personnel was forcing people to concentrate on their primary job, having no time to perform SMS activities. As a result of this, incidents would fail to be investigated for several months and the development of SPIs based on the hazards identified that contributed to the accident had to wait until the safety team developed the SPIs during their days off. The success of the SMSs declines

when management fails to allocate resources or show a willingness to improve the system (Gerede, 2015b).

On a related topic, delays in the performance of risk assessments and incident investigations were also related to the development of SPIs (Table 1). Employees said that risk assessments were also not effectively performed. This again means that hazards and risks remained in the system until they were eventually identified and addressed. SPIs were not developed as soon as the hazards and risks were identified; they had to wait until the safety team was removed from the roster or worked overtime or during their own free time, meaning that there was a gap between the hazard identification and the development of the SPIs, leaving the system exposed to these hazards. Even if all the other components of the SMS are working effectively, if risk management fails, then it is likely that the SMS will be unsuccessful (Gerede, 2015b).

Another important factor contributing to an unsuccessful SMS was lack of promoting the SMS. Interviewees said that management does not promote the SMS and they have to use their instinct and common sense to identify the hazards. This means that what constitutes a hazard for someone might not necessarily constitute a hazard for someone else, leaving this to the subjective opinion of each individual. As a result, hazards can be left unreported, because the individual might not have considered the event as hazardous. Various studies have identified that specific safety practices, such as initial and recurrent training for employees, display of safety posters for identifying hazards, communication between workforce and managers, personal involvement of management in safety issues, and making a high priority of safety in meetings predict safety performance. Organizations having these safety practices have lower accident rates (Cohen, 1977; Cohen, Smith, & Cohen, 1975; DePasquale & Geller, 1999; Griffiths, 1985; Harper et al., 1997; Shafai & Shahrai, 1971; Shannon et al., 1996; Shannon, Mayr, & Haines, 1997; Smith, Cohen, Cohen, & Cleveland, 1975).

Employee involvement in safety activities is a key element for the success of an SMS. But to achieve this, people first need to be trained. In the current study, it was found that people did not receive training on the SMS. Interviewees reported that they did not receive SMS training, and they were not trained to identify hazards. They used only their common sense for their identification. As previously mentioned, not knowing what can be a hazard means that hazards go unnoticed, not reported, and not developed into SPIs. A key element for the success of an SMS is effective safety training. Safety training provides the means for making accidents more predictable (Vinodkumar & Bhasi, 2010). Studies have shown that organizations that do not receive adequate training on risk assessment do not perform it adequately (Gerede, 2015a).

Another finding was the lack of attention by top management to what the workforce was saying. Interviewees have been asked by the workforce to provide them with training on reporting systems, or launch a campaign about reporting. The interviewees reported that every time they ask top management for these courses for the employees, management tells them that they will give them training but they never do. This gives employees the impression that management does not pay attention to what they are asking, and this can have a negative effect on the organization's safety culture and discourage people to adopt a safe behavior. Regular communication about safety issues between top management and the workforce is an effective safetymanagement practice that can improve performance (Vinodkumar & Bhasi, 2010). Studies by Cohen (1977), Cox and Cheyne (2000), Mearns, Whitaker, and Flin (2003), and

Vredenburgh (2002) all showed that the safety performance of an organization is influenced by the level of communication.

Lack of encouragement by top management to report issues was another factor that was mentioned in the study. Participants said that they were not encouraged to report issues. One reason was because they felt that other people could identify them. Another reason was that because they did not know what was acceptable and unacceptable, they were afraid to report. A third reason was that they felt that the reporting system was impractical, allowing other people to identify the reporter. Such a lack of encouragement impairs the reporting system and safety data collection of the organization, leaving hazards unidentified and not investigated. The use of incentives and recognition in motivating personnel to perform safely can add interest to the hazard control program of an organization (Cohen et al., 1975; Hagan, Montgomery, & O'Reilly, 2001). Vredenburgh (2002) also recognizes that safety promotion in terms of creating awareness for reporting hazards encourages workers to report safety matters.

Lack of Safety Culture

The findings also suggest that there may be a lack of just culture. Employees reported that it is not clear what should be acceptable and unacceptable behavior. Because it was not clear for them what the organization and juridical authority considers as being acceptable and unacceptable, they were reluctant to report their actions for fear of prosecution. As a result, occurrences that should have been investigated to find out what happened, why it happened, and how to prevent it from happening again now go unnoticed. The biggest concern with judicial action following an aviation accident or incident was focused on how it interfered with independent safety investigation and undermined the willingness of people to voluntarily report errors and violations (Berlinger, 2005; Brous, 2008; Chapman, 2009; Dekker, 2007, 2009, 2011; Flight Safety Foundation, 2006; Thomas, 2007).

A lack of trust between personnel was also reported as a factor impeding the reporting and thus the development of SPIs. Interviewees said that reporting was not encouraged because other employees could identify the reporter, especially if it was only two people working on the shift when the incident took place. Because people were reluctant to report occurrences, this inaction gave the opportunity for hazards to remain unreported. A common response of professionals was to become better at making the evidence go away and not reporting errors: "Practising under the threat of prosecution can only serve to hide errors" (Chapman, 2009, pp. 57–59; Dekker, 2011).

Resistance to change was also found to be a factor delaying the development of SPIs. Employees interviewed stated that even if things or situations could easily be changed the situations would still not change because they had to wait for someone's approval or because other people were involved in the change. Depending on others to make changes, or having a large number of people involved to approve the recommendations, allocate resources, or communicate with other parties, involved delays in the improvement of the situation. In fact, this can be a long process and take time until some action is taken. SMS will not be implemented successfully in organizations where there is a culture of only acting through habit and where there is resistance to change (Gerede, 2015a).

Impractical and Fearful Data Collection Approach

Fear of punishment was identified in this study as a factor impeding the development of SPIs. Employees said that reporting is not encouraged by management as they were not given training on the reporting system including acceptable and unacceptable behavior. This meant that because people were not

informed of what was acceptable and unacceptable behavior and because they were afraid that reporting their error could result in their prosecution, they were reluctant to report their errors.

Findings suggest that the impracticability of the reporting system can hinder the reporting process and the development of SPIs. Employees said that in several cases the reporting system was merely a book in which the employee would report the occurrence. Because of the nature of the reporting system, the person reporting could be easily identifiable especially in the case where only two people were working on a shift. Employees knew that others could trace the reporter by checking the roster system. This impracticality of the reporting system hinders its success because employees are reluctant and discouraged from reporting. Incident data are a key element for the function of the SMS. From the data on incidents taken from the reporting systems, safety metrics can be derived and risk assessment can be conducted; however, the quality of the data can influence the results (Sabine, Majumdar, & Ochieng, 2014).

Conclusion

On the basis of interviews with safety managers in the aviation industry about safety practices in their organizations, a model of factors that may impede the effective functioning of an SMS and the SPIs was developed. The main factors in the less-than-optimal functioning of an SMS may be: the role of top management, the lack of safety culture, and the effectiveness of the data collection approach, either individually or in combination. When present in aviation organizations, these factors are believed to impede the development of SPIs and thus the effectiveness of the SMSs. Organizations should use both leading and lagging SPIs to measure their safety performance. The reported factors may be indicative of practices in other aviation service providers as well. Knowledge of these impeding factors may help organizations to improve their SPIs and the success of their SMS. Addressing the factors that impede the development of SPIs can help organizations measure safety in a way that reflects their performance.

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Table 1. Dimensions of the impeding factors of SPI implementation derived from the Open Coding process.

Broad categories	Property	Dimensions
Top management decisions influencing safety	Management's decisions	-Allocation of resources -Allocation of time/roster -Failure to clarify safety commitment -Failure to participate in safety activities -Not interested to know/ learn anything related to safety -Delay in the investigation of accidents.
Lack of safety culture	Just culture	-Lack of safety promotion -Lack of safety training -Lack of just culture -Lack of trust between personnel -Lack of attention to what workforce is saying

		- Lack of encouragement by top management to report -Resistance to change
Impractical and fearful data collection approach	Reporting systems	-Fear of punishment that impairs reporting -Impracticality of reporting system that hinders the reporting process

Figure 1. Factors impeding the development of SPIs showing the gaps between SMS and actual performance