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MONITORING AND INFLUENCING SAFETY THROUGH SAFETY CULTURE

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Abstract

Organizations need to make sure that their level of safety is acceptable. Therefore it is important to know which factors contribute to the level of safety and how to monitor and improve these factors. One method used today to evaluate the level of safety in organizations is safety culture measurements. In different contexts, different models of safety culture are used. Safety culture is often considered an antecedent or an indicator of safety. It is also common to consider systematic organizational learning, often including incident reporting systems, important for continuous safety improvements. To efficiently monitor and influence the level of safety through safety culture and learning activities there is a need for a model for the relationship between safety culture and safety. It is also desirable to identify more factors, beside safety culture, that contribute to the level of safety in organizations. In this paper we propose a tentative model for the relationship between safety culture and safety, focusing on cause-effect relations, with learning as a mediating factor between safety culture and safety. We also discuss the need for additional factors contributing to safety in organizations. Our present research aims to develop methods suitable for continuous safety improvements in the field of medical service organizations.

Introduction

In the field of safety management, monitoring the level of safety in organizations is of general interest. Organizations want to make sure that their level of safety is acceptable. Often it is also desirable to achieve continuous improvements of safety in order to raise the safety level. Therefore it is interesting to investigate which factors contribute to the level of safety in organizations, and how to monitor and influence these factors. One concept often used to evaluate and influence the level of safety is safety culture. Different forms of safety culture measurements have been used to measure the level of safety in for example aviation (e.g. Gill & Shergill, 2004), shipping (e.g. Ek & Akselsson, 2005) and the nuclear power industry (e.g. Reiman, Oedewald and Rollenhagen, 2005).

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Within the field of medical services the importance of an improved safety culture has recently attracted much attention. For a long time there has been a culture of punishing people who make mistakes through different disciplinary actions. Reason (1997) points out that it is often the system rather than the person that ought to be blamed for an accident. Reason distinguishes between active failures and latent conditions. Active failures are unsafe acts committed by an individual person. They are difficult to foresee and prevent. Latent conditions are circumstances that are built into the system. They are results from decisions made by e.g. designers or management. Studies have shown that errors made by health care personnel are frequently the result of latent conditions in which the errors have often occurred earlier (Ternov & Akselsson, 2005). If the goal is to prevent new mistakes from occurring it is important to highlight these latent conditions to make it possible to learn from those mistakes. This can be done by e.g. a near-miss and incident reporting system. Improving the safety culture in an organization increases the confidence that the organization uses the reports to improve safety and not to blame individual persons. An improved safety culture also increases the willingness of and commitment for the employees to report.

Within medical service organizations there is a faith that improving safety culture also improves the safety in organizations. However, there is no clearly established model for the relationship between safety culture and safety (e.g. Hale, 2003). Practical work with safety improvements benefits from validated models for the relationships between influential concepts within the safety domain. Such a model would be useful for strategic decisions on where interventions should be directed. Furthermore, it is also desirable to identify more factors, beside safety culture, that contribute to the level of safety in organizations. We are presently studying safety management in the medical service of a Swedish Region. One aim of that project is to investigate the usefulness of safety culture measurements as an instrument for safety improvements in their organizations. In our present research, we aim to develop a model over causal relationships between antecedents of safety and safety, suitable for generating hypotheses of complementary factors of safety that can be influenced. In the end, we want practical methods for safety development.

Theory and Method

Safety culture and safety climate

In different contexts, different definitions of safety culture and safety climate are used. Neither of the concepts is well defined, which leads to a confusion over the use of the terms (Guldenmund, 2000; Hale, 2000). In the literature there are several different definitions of the two concepts. Some of these definitions overlap. Cox and Cox (1991) define safety culture as something that "…reflects the attitudes, beliefs, perceptions, and values that employees share in relation to safety". Brown and Holmes (1986) instead use the term safety climate and express it as "…a set of perceptions or beliefs held by an individual and/or group about a particular entity (p. 455)". Hale (2000) describes culture as something more than a collection of attitudes and values of some casual group. About attitudes and values in relation to safety Hale claims that "…to be labelled as a culture they have to go beyond the sum of the individuals (p. 7)".

Guldenmund (2000) proposes a framework where the concepts safety culture and safety climate fuse. Guldenmund conceptualizes safety culture as having three layers. These are basic assumption, espoused values and artefacts. The core of the culture resides in the basic assumptions. These assumptions permeate the whole organization and are unconscious and relatively unspecific. In the middle layer we find the attitudes. This layer can be equated with safety climate. At the outermost layer we find the particular manifestations, i.e. the artefacts, Guldenmund (2000) pointed out the need for safety research to explicitly focus on causal relationships among concepts considered related to safety.

Safety culture (or climate) is often considered a subgroup of organizational culture (or climate) (DeJoy, Gershon & Schaffer, 2004). The organizational culture comprises both general dimensions and specific dimensions. Communication and leadership are examples of general dimensions and safety culture is an example of a specific dimension (Neal, Griffin & Hart, 2000). Since the expression safety culture indicates something separate from organizations culture, which it is not, Hale (2000) instead proposes the use of the expression cultural influences on safety. Since the expression safety culture is so commonly used we also choose to use it, although Hale makes a good point.

Measuring safety culture and safety climate

There is no consensus regarding which dimensions, factors or aspects safety culture or safety climate consist of, and how to measure them. Several different instruments have been designed for this purpose with a variation in what is measured (Glendon & Stanton, 2000). According to Hale (2000) attitudinal measuring tools like questionnaires only measure at most safety climate. To determine safety culture there is a need to study more factors than attitudes (i.e. safety climate), sometimes referred to as using a triangulation approach.

When measuring safety climate it is common to use questionnaires. To do this there is a need to understand safety climate's main dimensions (DeJoy, Gershon & Schaffer, 2004). Different authors use different dimensions. It is common to use dimensions as management, safety systems, risk, competence, and work pressure (Flin, Mearns, O´Connor & Bryden, 2000). Instead of using already developed questionnaires and scales most researchers develop their own. Consequently there are no questionnaires or scales that are fully validated (Hale, 2000).

Ek and Akselsson (2005) described an operational definition of safety culture, consisting of nine aspects of safety culture. They have used the operational definition in several studies. Building on Reason (1997), Ek and Akselsson stress learning as a crucial part in the development of safety. Their work aims to find methods for improving safety culture, and thereby safety. Their method developed for measuring safety culture "…is intended to collect valid data that characterize the safety culture in such a manner that the results can support changes towards more efficient safety management (Ek & Akselsson, 2005, p.174)". The models nine aspects of safety culture, which were theoretically derived, are interrelated with each other, and have shown correlations when measured. The aspects were chosen to provide a good coverage of the spectrum of factors currently thought to be relevant for accomplishing continuous improvements in safety.

The first four aspects in Eks and Akselssons (2005) operational definition are borrowed from Reason (1997). The first aspect is *learning*. It is hypothesized that monitoring operations and trying to collect relevant information, analyze it, and feed back the proper conclusions in order to improve safety is central for proactive safety. The second aspect, *reporting culture*, is considered vital for efficiency of the learning processes. This, in turn, is depending on the third aspect, which is (the need for a) *just culture*, without excessive blame-placing that obstructs proper reporting. The fourth aspect is *flexibility*, i.e. the ability of the organization to transform itself when necessary (for safety reasons). The fifth aspect is *communication*, how everyday communication influences safety. *Safety-related behavior* is the sixth aspect. *Attitudes towards safety* is the seventh, (the perceived) *working situation* the eighth, and *risk perception* the ninth aspect in the model.

The nine-part operational definition of safety culture has been used and applied at different levels within the organizations studied. Ek and Akselssons method for data collection was observation of operative work, inspection of documents relating to the safety organization and the reporting systems for anomalies and incidents, semi-structured interviews with a small sample, and questionnaire assessments of safety culture and organizational climate among a large sample. The method can be characterized as utilizing a triangulation approach (Hale,

2000). Ek and Akselsson measured safety culture with a standardized questionnaire, developed by Ek, comprising the nine aspects of safety culture described above. The questionnaire contained 97 items, of which a majority was answered using a 5-point scale. Using Guldenmunds (2000) definition of safety culture, it might be more appropriate to say that the questionnaire measured safety climate rather than safety culture.

Reporting systems and learning

To achieve a successful learning system many organizations believe it is enough to develop an incident and accident reporting system (Hale, 2000). If managed successfully, a reporting system can help to develop a learning organization (Koorneef, 2000). Pidgeon (2000) placed reporting systems as a key to a good safety culture. For an effective reporting system there is a need for the organization to structure and limit blame for not reducing the reporting frequency and learning.

Koorneef (2000) described in detail how a system for organized learning from small-scale incidents can be set up. Building on the work by Argyris and Schön (e.g. Argyris and Schön, 1996), Koorneef described how organizational learning should be organized in order to function properly. The main idea is to make organizations better at efficient proactive safety management, where occurred and possible "unwanted events" are used as motivational and meaningful input to organizational learning processes aiming for continuous safety improvements. Koorneefs model evolves around the idea that operational surprises need to be detected and reported. An operational surprise occurs when unanticipated operational conditions arise. Organizational learning is seen as when individuals within an organization experience operational surprises and start inquiry processes about them. Koorneef believes that it is necessary with a designated learning agency, i.e. an organizational unit responsible for gathering reports on organizational surprises and analyzing them, followed by the sending back of lessons learned to appropriate receivers within the organization.

Koorneef (2000) described how safety culture was considered important during implementation projects of the learning process model developed. Koorneef concluded that there is a need for further investigations into which barriers to successful implementation of good organizational learning for safety that might stem from (safety) culture within different organizations. "The cultures in different organisations obviously had their impact on the success of projects. Some were and are highly defensive. The key premise remains that an organisation must want to learn from its operational surprises or it will not do so, no matter what effort is invested by researchers, consultants or even the staff in a given part of the organisation (Koorneef, 2000, p. 159)".

Safety performance metrics is a complicated issue. Some writers call for safety research to address the connection between safety and factors thought to lead to or influence safety (e.g. Guldenmund, 2000). Other scholars propose other approaches, avoiding a need to directly measure safety. There are different reasons for such ideas. Reason (1997), for an example, concludes that when a certain level of safety is reached by an organization, the frequencies of negative outcomes are so low that they are no longer suitable as measures of safety performance. Instead, Reason argues, one can turn to monitoring processes aiming for safety improvements. That means to turn from studying output to studying process. A similar approach is described by Weick and Sutcliffe (2001), proposing that safety is a "dynamic non-event", that continuously has to be re-established. As different learning processes seem necessary for the maintaining and development of safety it is interesting to monitor and manage such learning processes. We also believe that a positive safety culture is necessary for the possibility to initiate and run such learning processes successfully. Therefore it is also of interest to monitor and try to influence safety culture.

Studying safety culture in medical services

For measuring safety climate in Swedish medical service organizations we use Ek and Akselssons (2005) operational definition of safety culture, and an edited (shortened) version of their questionnaire, with slight adaptations of some items to the studied medical services context. We test how their operational definition can be used in medical service organizations (i.e. hospital clinics). In that context, we are examining the relationships between the safety-related concepts of safety culture and learning. The questionnaire assessments are complemented with interviews and studies of the formal safety management systems. The practical aim of the project is to develop methods for measuring and communicating safety culture, so that it can be addressed by improvement processes.

We plan to use incident reports as indicators of activities in the field of learning (for safety). We are collecting data on the frequencies of incident reports filed and analysed in the organizations studied, and plan to systematise the analysis based on Koorneefs (2000) model for organizational learning for safety improvement. In the research we will compare safety climate data with frequencies of incident reports produced, analyzed and acted upon. This will be done twice, with approximately 12 months between the measurements. We aim to establish statistical relations between the nine aspects of safety culture we measure with the questionnaires, and the level of learning activities around incident reports.

Results

Our starting point is a simple model over causal relationships between safety culture, learning and safety. Findings from literature studies and research contacts with different medical service organizations in Sweden indicate that a causal chain from safety culture to safety might be illustrated as in Figure 1.

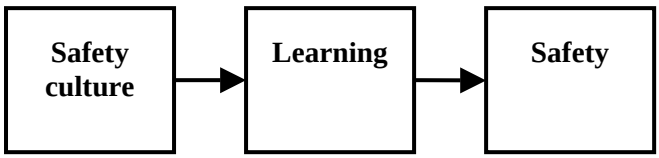

Figure 1. A model over the causal relationship between the concepts safety culture and safety.

The above model proposes that safety culture can either facilitate or obstruct learning activities, which in turn can influence the level of safety. This is in line with e.g. Reason (1997), who places great emphasis on learning and factors influencing learning as important for (the development of) safety in organizations. The model above concerns causal relationships between concepts that might be seen as different aspects of a coherent whole. The parts of the model should not be seen as separate entities that interact with each other, but rather as different aspects of efficient safety improving activities.

In accordance with Guldenmund (2000), we look at safety climate as a manifestation partly formed by an underlying safety culture. Considering safety climate as one indicator of safety culture means that safety climate measurements are indirect measurements of safety culture. In combination (triangulation) with measurements of other concepts that are hypothesised to be influenced by safety culture, and hence possible indicators of the safety culture, we try to capture the safety culture.

We believe that the frequencies of filed and analysed incident reports are possible measurements of activities concerning organizational learning for safety. We are trying to capture connections between safety culture indicators and such reporting statistics. This will be used to refine our model.

Discussion

In this paper we describe a tentative model for the relationship between safety culture and safety. The model only coarsely illustrates one causal chain. To improve safety, there is a need for more detailed models. We aim to develop our model by further analyzing the causal relationship between safety culture, learning and safety. It is also desirable to identify more factors, beside safety culture, that contribute to improvements of safety in organizations. This is what we are presently working with, using data from studies of safety culture and learning processes in medical service organizations.

Since frequencies of reports passing different stages in a system for organised learning is a rather coarse measure of learning activities, we try to find complementary sources of information as well. We use interviews and observations, and are looking for more ways of capturing learning in the organizations we study.

To be able to capture the level of safety it is essential that we don't miss the main factors. Examples of possible factors that seem promising for closer examinations are knowledge, skills and motivation (e.g. Neal, Griffin & Hart, 2000). We are currently designing a study where we will investigate the relationship between safety-related knowledge and attitudes to safety. This work is planned to further enhance the model and make it more suitable for monitoring and influencing improvements of safety through safety culture and better at capturing ways to improve safety.

We believe that the chain metaphor is highly appropriate. It might be the case that the whole system is no stronger than its weakest link. It is possible that some links in the causal chain are crucial for success, e.g. attitudes towards incident reporting might more or less hinder actual organizational learning and safety improvements. There has been awareness of the possibility of such dependencies for a long time, but we believe there still is no sufficiently developed and validated model for the issue.

So far we are only concerned with causal relationships in one direction. However, we believe there might be influences going in the other direction as well, given the definitions we use, but we do not focus on that in our present research.

It is important to improve the level of safety to prevent accidents and emergencies from occurring, but it is impossible to prevent everything. Therefore it's necessary to study both safety and emergency management. Solitary focus on either is unfavourable. In future research we are interested in studying how safety culture, learning and other factors that influence safety affect the ability of an organization to prepare for and handle an emergency. We will also study if there are other important factors, beside those thought to influence safety, that influence emergency management.

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