A DESCRIPTION OF METHODS AND TECHNIQUES OF SAFETY CULTURE RESEARCH

IRINA FEDORYCHEVA, MILOS HAMMER

Dept. of Quality, Reliability and Safety, Institute of Production Machines, Systems and Robotics,

Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic

e-mail: y168272@stud.fme.vutbr.cz

According to the analysis of disaster investigation, written safety plans can be effective, but its insufficient condition for maintenance optimal safety level. It is also necessary to ensure creating a true safety culture. As reported by S. Mohamed (2005), this fact highlights the need not only to better understand the role played by the organizational and behavioral variables, but also to measure their individual contributions in creating and nurturing a true safety culture. In order to improve the safety culture of a company, the most important aspect is proper assessment of the current level of safety culture. The main objective of this paper was to review the main methods of analysis (measurement) the safety culture applied in different industries and countries. As the analysis of the literature there is no perfect approach, each method has its advantages and disadvantages.

KEYWORDS

safety culture, Delphi method, sociometry, ethnographic research, questionnaire.

1 INTRODUCTION

The question of safety culture has been researched over the last few years. This paper will review of literature on work already carried out in this area. This article will concentrate on the methods of safety culture analysis which used in different countries and industries.

In order to improve the safety culture of a company, the most important aspect is proper assessment of the current safety culture. Choosing a model such as the Health and Safety Executive (HSE) Safety Culture Maturity® Model (SCMM) (Figure
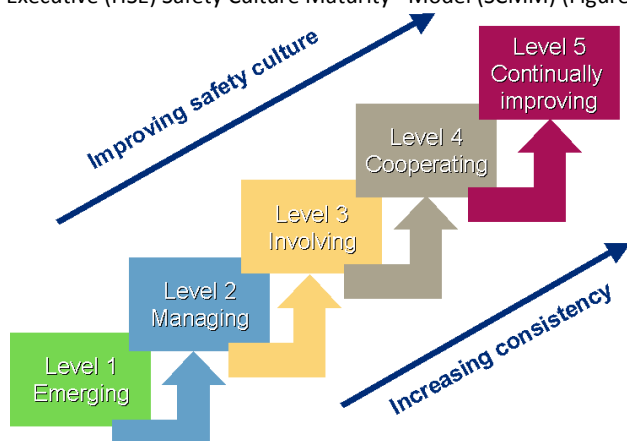

Figure 1. The Safety Culture Maturity® Model of HSE

1) or through a model of the company's own design is necessary. After a model has been chosen, it is necessary to evaluate the current level of safety within the company through leading and lagging indicators, such as occupational injury and fatality statistics. The next step in assessing the current culture is through interviews, audits, questionnaires and others. Progress in improving the culture can be assessed through periodic/ annual questionnaires. All of these aspects are only the minimum requirement to achieve a successful safety culture. In order to become a company that is in the top tier of safety culture, a company must go above and beyond the minimum requirements. The following section outlines the existing techniques of safety culture assessment. Combination of this approach can help in safety improving process.

2 METHODS AND TECHNIQUES OF SAFETY CULTURE RESEARCH

2.1 Surveys (questionnaires, interviews)

Questionnaires are often used to study organizational culture and their effect on safety [Ek 2007]. They can be used to study organizational practices, as well as attitudes. A drawback of surveys is that they tend to provide relatively superficial descriptions of organizational culture, since many practices are too complex and dynamic to be effectively captured in survey questions [Hopkins 2006].

The approach to measuring safety culture that was chosen was to select safety culture aspects that have been previously investigated in other studies. Each aspect was then represented in the questionnaire package as a scale with a number of relevant items that are homogeneous (acceptable internal consistency). This approach may lead to average scores for different aspects (scales). The advantage of 24 this approach is that the average scores for safety culture aspects represent identifiable and recognizable characteristics of safety culture, and the results of the study can be placed within the contexts of previous research investigating such aspects [Ek 2007]. Summarising, because of their numerical and quasi-numerical output, questionnaires can be useful when comparisons have to made, e.g. between teams or departments, or before and after an intervention program. Furthermore, because most questionnaires have scales underlying them, the scores on these scales can be used to pinpoint specific weaknesses and suggest remedial interventions. When research time is quite limited, questionnaire surveys provide particular answers relatively fast [Guldenmund 2007].

Often, safety culture/climate questionnaires are expanded with additional questions, for instance to study the relationship of safety climate with other constructs or indicators. Examples of such constructs are leadership [Zohar 2002], risk perception [Rundmo 1992], personality [Clarke 2006], safety control [Huang et al. 2006] and values [Reiman et al. 2004].

Molenaar identified a total of 31 characteristics that define organizational safety culture. The characteristics were then organized into a hierarchical structure and broken down into 54 measurable questions in a questionnaire survey to operationally measure these characteristics [Molenaar et al. 2002], [Mochamed et al. 2005]. All questions were based on previously proven research. The survey results served in a type of 'snap-shot' assessment of organizational safety culture.

Cooper and Phillips used behavioural safety checklists as part of a behaviour based safety programme (BBS) in a manufacturing facility. Specified behaviours were scored either 'safe' or 'unsafe' based on the observed group's behaviour. These checklists were revised every 20 weeks, where 100% safe behaviours were deleted in favour of behaviours identified during observation

rounds or taken from incident records. An example of their checklist is given in the paper [Cooper et al. 2004], [Guldenmund 2007].

Personal interviews

Next to questionnaire studies, personal interviews are frequently employed in safety culture research, although the purpose of the interviews differs significantly between studies. In general, these interviews are held for three kinds of reason.

1. The information gathered with the interviews is used to complement other data sources, or as a means to confirm such sources.

2. The information from the interviews is judged and used in an assessment.

3. The interviews are used as building blocks for a theory (e.g. about the organisation, about culture [Guldenmund 2007]. There are various issues related to (the art of) interviewing, many of which pertain to the relationship of the interviewer and interviewee. Obviously, this relationship should facilitate the provision of relevant and useful data that contribute to the research aims [Yin 2003].

Focus group interviews

Whereas personal interviews are held with one individual, a focus group interview is a structured group process used to obtain data about a certain topic. Stroeve works extensively with in-company (focus) groups when 'deciphering culture for insiders', following a procedure that leads the group from the tangible to the intangible aspects of their culture [Schein 1992]. Obviously, working with groups has the advantage of satisfying the requirement of 'sharedness' of culture, indeed if group opinions converge. However, groups can also bring along certain response biases, such as acquiescence, or other dysfunctional behaviours that should be managed by a competent facilitator [Churchill et al. 2004].

Delphi method (modified)

The combination of qualitative and quantitative methods with a panel of experts. Linstone and Turoff provide an underlying definition of the method: "Delphi may be characterised as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem" [Linstone et al. 1975]. The Delphi technique is a structured method used to gain consensus from a panel of experts [Keeney at al. 2001]. The process involves a number of 'rounds' in which participants respond to questions with the aim of reaching consensus in the final round. Traditional Delphi methods usually include three or four rounds of surveys, with each round providing the same information as the previous, but with group statistical data included. Each panel member then has an opportunity to amend their responses in light of the group data, making it an iterative process [Linstone et al. 1975], [Jeeb 2015].

More recently, the Delphi method has been used with various modifications to shorten the process and ensure participant involvement throughout the rounds. Modified Delphi methods are particularly prevalent in health and policy research [Keeney et al. 2001] Benefits of the Delphi method include: panel members remain anonymous to one another, reducing the potential for influence or bias throughout the rounds; it suits groups that are geographically distant; information and opinions are gained from a wide range of experts; and importantly, the process ensures that key stakeholders are involved from the beginning, which can assist in the implementation of future policies or programs that may be developed from the results [Hon et al. 2010], [Jeeb 2015].

The disadvantages of this method are the high cost of time on a multi-level examination, the uncertainty in the number of rounds, ignoring the difference in the competence of experts.

2.2 Document analysis

Documents usually offer a plethora of published values, like mission statements, strategies, job descriptions, reports, procedures, or any other published means the organisation uses to articulate a value. Such values often reflect ambitions, aspirations and intentions (things the organisation would like to be or aspire to have), or rationalisations (plausible and otherwise attractive explanations which do not necessary reflect a proven relationship or theory). Not much has been published on the topic of systematic document analysis in the area of safety culture. Guldenmund counted the amount of times the word 'safety' was mentioned over a period of several years in the minutes of team meetings and used this count as an argument that safety did not occupy a prominent place on the agenda. To the extent that safety is central to or indeed a value in an organisation, one would expect the word to appear regularly during meetings [Guldenmund 2010].

2.3 Ethnographic research

The origins of the concept of ethnography are to the found within social anthropology and sociology [Antonsen 2009].

Ethnographic research, where a researchers study the organization from within, can provide a much richer account of organizational culture than surveys can [Hopkins 2006].

The term 'ethnography' refers both to research processes and to the presentation of the product of that research.

A central objective of ethnography is to understand both the social meaning given to objects, actions, and events and the way in which these meanings reflect, reiterate and renegotiate wider social discourses and cultures. Here meaning is not conceptualised as universal or static but it is seen as negotiated and sustained within relative socio-cultural and historical settings. How people perceive, interpret and make sense of something is shaped by the norms, practices and knowledge(s) within which they engage [McDonald 2006]. One of the concerns raised about ethnographic methods is the effect of the researcher's presence on those within the research setting (the problem of 'reactivity').

According to few researches there are seven characteristics that mark a study as ethnographic [LaCompte et al. 1952], [Antonsen 2009]:

1. Ethnographically oriented assessment or research takes place in natural settings. The aim is to produce description and understanding of events as they occur in their natural context. This means that the researcher should have gained first–hand knowledge about the phenomena under study.

2. Ethnographically oriented researchers strive to become intimately involved with members of the community under study and engage in face-to-face interaction with them.

3. Assessments place emphasis on the perspectives and interpretation of the participants in the research. The goal of ethnographically inspired research is to provide accurate descriptions of the way informants perceive and make sense of the world around them. This involves an attempt to "imagine the other", to see things from the participant's view, and this, perhaps, is the core principle of ethnographic research.

4. Ethnographic methods use "inductive, interactive and recursive processes to build theories to explain the behavior and beliefs under study". This means that interpretations made about cultural processes in the field under study are produced through dialectic between data and hypotheses.

5. Methods use multiple sources of data – any form of data that may shed light on some problem may be included in ethnographic studies (accident/incident data, data from questionnaires, observation, structured or unstructured interviews, learning history, etc.).

6. Knowledge about social phenomena is always seen in relation to context in which they occur.

7. Ethnographically oriented assessment are concerned with providing a description of why people do things, say them or believe in them.

2.4 Socio-psychological research

Term "sociometry" means the need in measuring the interpersonal relations in a team. The founder of sociometry approach is a famous psychiatrist and social psychologist Jacob L. Moreno. In accordance to Moreno, the complex of interpersonal relations in a team predefines a primary social and psychological basement of the team. And the features of this basement mainly predefine the internal state of each person in the team (not only what the team is itself).

Sociometry approach is applied for diagnosing the interpersonal and intergroup relations with the purpose of their changing, improving and developing. Sociometry helps to define how the people behave in a team.

Together with formal or informal structure of communication which presents the rational and mandatory aspect of human relations, any social team contains the psychological structure of informal level. This structure is formed as a system on interpersonal relations, sympathies and antipathies. Mainly, the peculiarities of such a structure depend on preferences of the members, their psychological accepting and understanding to each other, self-rating and rating to others. As a rule, such teams contain several informal structures. They can be structures of aid-giving behavior, mutual influence, popularity, leadership, etc.

Informal structure depends on formal one as much as the members can collaborate together for the group purposes. Sociometry helps to evaluate this influence. Sociometry methods allow in looking the interpersonal relations in a view of values and charts. This can help to get the necessary information about team state.

Sociometry procedure is targeted to:
- Measuring the level of solidarity and dissociation in a team.
- Detecting «sociometry positions» in sense of so called popularity of team members in accordance to sympathies and antipathies (the last positions on two sides are team leaders and members rejected).
- Detecting intergroup subsystems or internal integrated formations where other informal leaders can be in the head.

Sociometry indexes. There are personal and group sociometry indexes. The first ones are characteristics of the psychological features of a person in a team. The second ones describe the features of the group communication structures.

Sociometry procedure is provided for a group of people and not for each person separately. It doesn't spend much time (often, enough about 15 minutes). It's enormously useful in practice! It can be used to enhance the interpersonal relations. [Moreno 1941], [Petrusek 1969], [Begun 2012], [LeDis Group© 2015].

2.5 Major accident inquiries

Major accidents, such as rail crashes, space shuttle disasters and petrochemical plant explosions where many lives are lost, often give rise to multi-million dollar inquiries. These are a priceless source of information about organisational cultures and the way they impact on safety [Hopkins 2006].

These inquiries may sit for many days taking evidence from a large number of people. Inquiry panel members or counsel assisting the inquiry may question individual witnesses for hours. Questioners may pursue numerous lines of inquiry, probing, looking for things that might have been overlooked, exploring inconsistencies and conflicts of evidence, day after day. Proceedings are taped and many thousands of pages of transcript evidence are generated. This is far more material than an individual researcher engaged in an intensive interview process could ever produce. Moreover, the fact that witnesses can be required to give evidence to these inquiries and that witnesses can be interrogated in quite hostile fashion means that inquiries can gain access to information that no interviewer could ever hope to uncover. It is of course not possible to provide a complete picture of the culture of an organisation using this method [Hopkins 2006]. Schein argues that it is never possible to describe an entire culture. What is possible is to identify what he describes as "elements of the culture", in more concrete terms, groups of practices that hang together in some way [Schein 2004]. Hopkins advocates the use of major accident inquiries for studying organizational culture and its impact on safety.

3 CONCLUSIONS

Organizations that measure the quantity and quality of their safety drivers and then measure how these drivers have affected three elements of safety culture (concepts, perceptions and competencies) begin to understand the process of safety improvement [Mathis 2013]. In this paper, we have seen that there are many ways to define the level of safety culture for drive safety performance to a higher level and prevent unsafe situations.

This article has only been able to touch on the most general features of methods and techniques of safety culture research for finding the main indicators which influences to overall safety status.

Safety culture indicators (for example: frequency of reporting of near misses (view of mistakes), number of safety improvement teams (view of people), number of safety inspections, safety attitude score, frequency of senior manager plant tours, etc.) play a role in providing information on organizational performance, motivating people to work on safety and increasing organizational potential for safety. Clearly, further studies are needed to understand optimal process of the measure and monitoring of safety culture indicators.

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CONTACTS

Ing. Irina Fedorycheva
Brno University of Technology
Institute of Production Machines, Systems and Robotics,
Dept. of Quality, Reliability and Safety
Technická 2896/2
616 69 Brno
Czech Republic
+420 54114 2187, y168272@stud.fme.vutbr.cz

Doc. Ing. Milos Hammer, CSc.
Brno University of Technology
Institute of Production Machines, Systems and Robotics,
Dept. of Quality, Reliability and Safety
Technická 2896/2
616 69 Brno
Czech Republic
+420 54114 2194, hammer@fme.vutbr.cz