Tools to quantify safety culture

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Abstract

This paper reviews the notion of safety culture and then describes some of the tools that can be used to assess it. Required characteristics to obtain reliable tools and techniques are provided, along with a short summary of the most common and important tools and techniques used to assess safety culture at the nuclear field is described. At the end of this paper, the reader will better understand the importance of the safety culture of the organization and will have requirements to help him in choosing reliable tools and techniques. Further, there will be recommendations on how best to follow-up after an assessment of safety culture.

1. Introduction

It is now widely accepted, across a number of industries, that if safety culture is poor in any high risk organization, incidents or accidents are more likely to happen.

The reader may be familiar with some the Chernobyl disaster in 1986 where a violation of operating rules and regulations occurred (maybe due to lack of experience and training), or the Three Mile Island incident in 1979, with operators working under pressure and thereafter taking non conservative decisions. Both significant events demonstrated a failure of the management processes and in the underlying organizational culture as it related to safety. Similar accidents have occurred outside of the nuclear field, like the one involving the Challenger space shuttle, or the recent Golf of Mexico oil spill.

The question is: should it be considered that only getting to that point, it will be known that the organization´ safety culture is poor? There are always warning signs that something could happen and, often, it is only a matter of time before it does.

As more than 70% of the causes that contributed to the events are related to human and organizational factors, there is always a certain level of culture of safety present at any place. The point here is to realize that some of the causes or contributing causes for accidents are organizational behaviours that may be unhealthy for the well-being of the organization.

One needs tools and techniques to evaluate how healthy that safety culture is. Today, many such tools and techniques are available and it is important to choose which ones are the most appropriate. This issue is the main theme of this paper.

2. Understanding Safety Culture

In term of safety culture within the nuclear field, the attitude was different before and after the Chernobyl accident. J.N. Sorensen explains clearly the introduction of this concept on this field on his article "Safety Culture: a survey of the state of the art" [1]. He states that "*The International Nuclear Safety Advisory Group (INSAG) introduced the term safety culture to denote the management and the organizational factors that are important to safety"*.

A definition of safety culture could be found at the INSAG-3 [2] and INSAG-4 [3]. INSAG-3 offers a general definition, while INSAG-4 develops the concept in details and defines safety culture as:*"…that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance"*.

INSAG-4 also refers to universal features and tangible evidence that provide characteristics of an effective safety culture and identifies indicators that help to "measure" or analyse the degree of safety culture. It is interesting to note that INSAG-5 [4] stresses the importance of individual dedication as it contributes to safety.

It is Edgar H. Schein in his book Organizational Culture and Leadership [5] that addresses how to analyse and interpret culture. Schein has since been widely used as a reference to develop methods to assess safety culture (the Organization and Management Review Method as an example). The author explains that culture can be analysed at different levels going from what everyone can feel and see to the unconscious assumptions which are more difficult to feel or see. Figure 1 shows the levels at which culture can be analyzed:

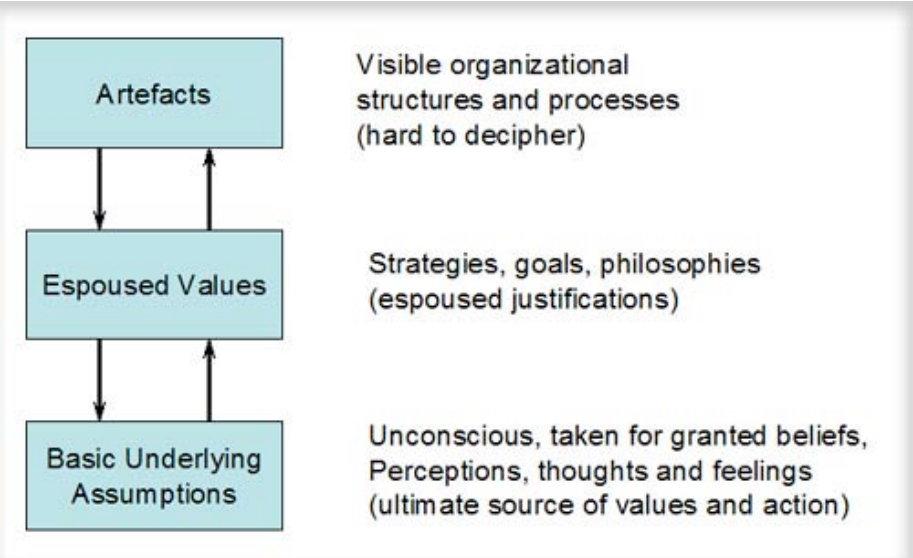

Figure 1: Levels of Culture.

1. Artefacts: At the surface level, artefacts include what can be seen, heard and felt. The cultural aspects of this level can be perceived or observed. The artefacts level is represented through the architecture of the environment, the language, the style as embodied in clothing, the emotional displays, the myth and stories told about the organization, the safety policy statement, the published lists of values, written document and procedures, the state of housekeeping, rituals and ceremonies, etc.
2. Espoused values: This level is deeper than the artefacts but is not directly observable as values are not visible. These values could be expressed through slogans and some examples are: strategies, goals, philosophies like blame free work environment, safety is a priority, etc.
3. Basic assumptions: these are unconscious and tacit. It tells group members how to perceive, think about, and feel about things. Usually, they are neither confronted nor debated and are difficult to change. They define what we should pay attention to and the real meaning of the things. *"The basic assumptions are the taken-for-granted beliefs, perceptions, thoughts and feelings which are not on the conscious level of experience."* [6]
   The following examples will help to understand what are basic assumptions: accidents are caused by carelessness; men can manage an automated machine more reliably than women, a modern plant is inherently safe, etc.

Once ones understand these three levels, the next step would be to determine how to assess them. This is addressed in the following section.

3. Common data collection tools

As mentioned before, several tools and techniques have been developed to evaluate an organization's safety culture. These tools and techniques have both similarities and differences. One important similarity is that most of the tools assess organizational behaviours (OB) even though what is being assessed may be called differently.

Before moving forward on this topic, it is important to list some requirements that should be considered when choosing a tool or technique. The following five requirements will increase the reliability of the resulting assessment:

1. The organizational behaviours that will be evaluated should be common to the entire organization. It would make little sense to assess one OB for a department, and not to do the same for another one. Besides, what would be the criteria to decide which the OB to assess for a specific department?
2. The tool or technique should be capable of yielding objective data, or be used in conjunction with objective data (e.g., it could provide an interpretive context for the objective data);
3. The measures obtained should be quantitative and qualitative. The qualitative data will support the quantitative and the quantitative data is easier to represent;

4. There should be a means of validating the results. Here, validation is taken to mean that the results are a true representation of a given fact. For example, this could be achieved through the administration of multiple tools that assess the same behaviours;
5. Reliable. The same results should be reached by different individuals.

Beyond the requirements above, it is important to consider the size of the organization that it will be evaluated as this may also influence the number of tools or techniques that will be used.

The performance objectives that form the organizational behaviours are those samples of behaviours that will be chosen to determine what to look for. Each of those should also be evaluated in different ways to assure validity. Note that it may not be necessary to use many different tools to achieve validity, in a given context. For example, if a survey is to be administered as the main collection tool in a small organization, a satisfactory means to achieve validity could be to use different questions on the same organizational behaviour. Then, each will be evaluated more than once. However, the ideal would be to use at least two tools to make sure that the results are valid.

After the behaviours to evaluate have been decided, it is necessary to select the type of tool, or tools, which will be used collect the data. The following tools are the most commonly used. Note that the information provided is generic:

3.1 Surveys

This tool can be used by itself or in conjunction with other tools. The results are considered critical because the same behaviour could be evaluated more than once. A survey is used to obtain the employees' perception of the organization with regard to safety. If the survey embraces all of the OBs and if it incorporates the required features to ensure validity of the data, it will provide reliable conclusions. Key features are:

- The survey requires planning; however, the demand on resources is moderate.
- The data collected is quantitative which will allow to benchmark with future assessments.
- The expectation is to have a response rate of at least 70%. A lower response rate would require that the results be validated with other tools or questions.
- The administration of the survey could be done electronically or by hand.
- Anonymous administration will help increase the number of responses and will encourage the staff surveyed to more freely provide information.
- The results can be obtained almost immediately, if the survey is administered through a suitable software tool.
- Surveys support the collection, analysis and eventual correlation of demographic variables with other results as needed.

- The quantitative nature of the information collected enables the creation of graphs and tables to better understand the data and justify conclusions.

3.2 Interviews

There are different types of interviews: structured, unstructured, or mixed, resulting in different types of questions. Whatever the type of interviews, it is often useful to use both closed and open questions, and to provide enough flexibility in the planning of the interviews to address and follow on issues as they arise during the interview. Well-executed interviews allow the collection of individual attitudes and perceptions. Further:

- The interviews are used to produce mostly qualitative data which can be used to provide context and interpretation of the quantitative data. For example, interviews could support a better understanding of the quantitative data derived from a survey.
- Notes should be taken by the interviewers during the interview if at all possible, and be completed as required immediately after the interview is completed. Postponing note taking could cost loosing the data provided.
- The positions that will be interviewed should represent horizontal and vertical cross/sections of the organization.
- The sample size for interviews should be approximately10% of the total employees.
- Interviews usually last from 45 minutes to 1 hour, but should not exceed this except in unusual circumstances.
- The organizational behaviours chosen should be evaluated through multiple types of questions.
- It is recommended to have a team of two interviewers working in pair, with one leading and one noting.
- The information from both interviewers can be usefully combined to increase its value and accuracy.

3.3 Observations

Observations are a good tool to collect information on human and organizational behaviours. With the observation of the technical aspect, it is also possible to collect data regarding the safety aspects of the organization. Key characteristics are:

- There is often an existing process for inspections, so there may be no need to spend resources creating one and it may be possible to modify the existing process with the human and organization perspective to collect the right data.
- The results can be documented in narrative form.
- Some of the data collected can also be quantified into a scale or percentages.
- There are typically many activities to observe, which may provide more information about the same organizational behaviours. Example of

activities to observe could be: shift turnovers, trainings, pre job briefings, etc.
- Multiple observations are recommended to obtain more quantitative data.
- The resources and the time needed depend on the availability of individuals and activities to observe. The resources required can be minimized through careful planning.

3.4 Events Analysis

The event analysis consists on collecting all the incidents that were reported, determine the causes, categorize that and trend the results. This information will provide a picture of what is happening in the organization in terms of unsafe acts and risk. Key features include:

- The categories or the performance objectives of the OB should be clear. Otherwise, the result of the evaluation might change through different analysis and will not allow benchmarking.
- Event analysis can be carried out periodically.
- It uses information that is already available for the organization.
- Typically does not require many resources, and one person is often enough to carry it out.
- Requires time (i.e., a “period”).
- The results can be trended.
- The conclusions could be used as a snapshot of the organization’s performance between safety culture assessments.

3.5 Others

There are more tools that can be used that are not as popular as those listed before. For example:

- Desktop reviews: analysis with a human and organizational perspective of information that belongs to the organization like processes, procedures, references, etc.
- Checklists: a listing of the expected behaviours that will show the enhancement for safety.
- Focus groups: it will provide extra qualitative data and different perspectives of a situation.

4. Correcting the behaviours

This point is, from my point of view, the more important. Once the assessment has been carried out and the results obtained, it is critical for the organization to do something with those results, otherwise, the whole exercise will mostly have been a waste of time and effort.

Unfortunately, experience has shown that several organizations do not take full advantage of the results and only implement incompletely, and sometimes not at all, the required improvements. This step is crucial for many reasons: to actually improve the safety

culture, but also as a demonstration of a commitment to the participating staff that the organization is really committed to the improvements that may be necessary. This will also facilitate further involvement from the employees.

The leaders, or management, of the organization are those primarily responsible to promote and nurture a healthy safety culture. Once they have a snapshot of the situation at their organization, they are the ones who must act. Normally, the first step is to create an action plan to act on the organizational behaviours that require improvements. The execution of this plan should be monitored to assure that is measuring what it is supposed to measure. A key component for the successful implementation of the plan is communication. If communication about what is being done is deficient, it may be that few people will know that the organization cares about safety and the desired results may not be achieved. In fact, it will be then like not doing any effort.

A comprehensive safety culture assessment could be carried out periodically, say every 3 to 5 years. In the meantime, quick assessments can provide a snapshot of the current status of the organization. While the corrective actions from the action plan are being developed, applied and evaluated, a quick evaluation like a survey or trending coming from a review of events or a survey can be useful to follow the evolution of the improvements, to confirm that things are going in the right direction or to identify erosion of the performance of key organizational behaviours.

5. Conclusion

There is little argument from safety conscious organizations that safety culture matters. It is also pretty much accepted that it can be examined and assessed in more than one way.

It is wasteful of time and resources not to follow up on the results from a safety culture assessment. Worst, it may send the message to the staff that the organization is not serious about required improvements. Similarly, even if an organization does follow up on the results from a safety culture assessment but fails to effectively communicate this, the perception from the staff may also be that the organization is not really committed even thought this may not be the case.

A safety culture assessment may change from one organization to another. However, what is done with the results will influence the behaviour of any size organization.

Lastly, there is always a need for improvement somewhere in the organization; this is in fact a basic fact of life for organizations that have a healthy safety culture. Delaying a required improvement may result in allowing an opportunity for a catastrophe to occur.

6. References

[1] J.N. Sorensen, “Safety Culture: a survey of the state-of-the-art”, Washington, USA, December 2001.

[2] International Atomic Energy Agency, INSAG-3, “Basic Safety Principles for nuclear Power Plants”, A report by the International Nuclear Safety Advisory Group, Vienna, 1988

[3] International Atomic Energy Agency, INSAG-4, “Safety Culture”, A report by the International Nuclear Safety Advisory Group, Vienna, 1991

[4] International Atomic Energy Agency, INSAG-5, “The Safety of Nuclear Power”, A report by the International Nuclear Safety Advisory Group, Vienna, 1992

[5] Edgar H. Schein, “Organizational Culture and Leadership”, san Francisco, California, USA, 1992.

[6] B. Wilpert, N. Itoigawa, “Safety culture in Nuclear Power Operations”, London and New York, 2001