

Guide for Collecting and Analyzing Qualitative Data for Safety Culture Evaluations

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Introduction

It has been said that statistics represent the experiences of people with all of the emotion washed away. Using qualitative methods in a safety culture evaluation restores some of that emotion and brings the results to life. Collecting

Quantitative analysis uses statistical tools to analyze numbers while qualitative analysis requires different tools to analyze words.

and analyzing qualitative data (i.e., words and text) enables a deeper and richer understanding of an organization's safety culture than would be possible by relying solely on the quantitative results of a survey. The words spoken

and written by managers and members of the workforce provide context and specific examples that complement the numerical results of a survey.

Coding

Qualitative analysis starts with close reading of the text and associating labels or tags with the text so that patterns, relationships, and themes can be recognized. This coding process has been greatly enhanced by software applications such as QDA Miner© (Provalis Research Corporation) and Nvivo© (QSR International). These and other tools are described in qualitative research methods publications such as Paulus, Lester, and Dempster (2014).

To facilitate sorting of text data, a coding manual is created. The coding manual contains labels or tags and can be "socially-constructed" or developed "in vivo." Socially-constructed means that the coding manual follows some structure that is common to society. For example, a coding manual that is structured according to the 10 traits of a healthy safety culture and their underlying attributes as defined by the NRC and INPO would be considered a socially-constructed coding manual. An example of an in vivo coding manual would be to use the

words of the participants to describe the patterns. For example, if during a focus group participants said, "When managers talk to us they don't show respect for our experience and knowledge. They talk down to us and treat us like children." A code could be inserted called "treat us like children." Other passages that express similar sentiment would also be coded as "treat us like children." Either type of coding manual is acceptable. Refer to Glesne (2011) for more details about coding qualitative data.

The process of drawing conclusions begins early in the coding process. Even as you begin reviewing and coding your data, you are beginning to form ideas about the important phenomena they indicate, and beginning to generate propositions about these phenomena, and the relationships among them (Braun and Clark 2006). Once all data streams have been coded, the assessment team has sufficient information to begin to build an overall picture of the organization. The team members should have an overview of the topics that were perceived positively or critically and whether any subgroups differed significantly from the others. At this point the assessment team has probably developed an impression of the organization's performance (Braun and Clark 2006) and can begin the search for themes.

Themes

Thematic analysis should go beyond identifying the general or the norm. A strength of qualitative research is that it can help reveal underlying complexities. Be aware of where and why people vary from the norm and seek to understand the varying perspectives (Glesne 2011). Search for themes by collating, nesting, and separating codes. Ideally, an overarching structure or framework for the data will emerge. The process of thematic analysis is iterative, moving back and forth between coding, analysis, and the safety culture assessment criteria (Braun and Clark 2006; Boyatzis 1998). Try not to *list* themes, but rather explore *relationships* amongst them to form an overall story with the data.

A good practice is to gather together all of the text passages coded for a theme. Reading all of these passages together (while also referring back to their original contexts for accurate interpretation) will enable better understanding of the theme. Often it becomes clear that there is more than one theme captured by the code, and it must be partitioned. At other times, after reading several themes, it becomes clear that several should be combined or one subsumed within another. It is important to illustrate each of these theme summaries with quotes. By defining/naming themes and refining, the assessment team develops an overall story (Braun and Clark 2006).

Cultural Schematic Diagram

Another technique to consider using when doing qualitative analysis is to develop a cultural schematic diagram. A cultural schematic is a pictorial representation of interrelationships uncovered during the analysis. It may also include themes or issues supported by quantitative analysis and results.

The value of the cultural schematic is twofold. First, it presents a summary diagram of the major issues and suggests how they are related. This has value inasmuch as it allows the stakeholder to quickly understand issues related to safety culture. They are not faced with having to distill a mental model from voluminous descriptions of text. The cultural schematic provides that summary in a visual format.

The other valuable aspect of using a cultural schematic is that it fosters communication and understanding between the researchers and project stakeholders. Invariably, as stakeholders immerse themselves in the assessment results, they are evaluating its credibility. They ask themselves, “Based on my experience in the organization regarding safety and safety related behaviors, do these results ring true?” If there are significant gaps between the stakeholders personal experience and the assessment results, perceptions of its credibility may be low. Low credibility diminishes the potential for the

assessment results to be used to increase the strength of the organization’s safety culture.

Since the cultural schematic provides a visualization of the safety culture landscape, there is a high likelihood that stakeholders will identify with at least some of the findings. Here is a basic description of the process. An example is presented in Figure 1.

1. Collect data inputs from a variety of sources (e.g., focus groups, interviews, behavioral observation, and safety incident trends). Look for commonalities in the collected data to create themes.
2. Create relationships between themes by asking, “Is this an outcome or a driver?”
3. Further arrange themes by applying a higher order framework. The objective is to arrange themes in a manner that can tell a coherent story about the safety culture. Examples include macro and micro level influences; structural—process—people related themes; foundational beliefs, primary and secondary effects.
4. Include key issues from the external business environment that may also influence the safety culture.

Triangulation

Using multiple methods (i.e., both qualitative and quantitative) for obtaining data also facilitates triangulation.

Triangulation is a term referring to the comparison of data from multiple sources to identify where there is agreement (i.e., convergence) and disagreement (i.e., divergence). This helps define the varying perspectives that may exist within an organization. When the data from the different data sources converge, the evaluator may have greater confidence in the findings. When there is divergence, more evaluation may be needed to understand why the differences exist. Table 1 provides an example of how to triangulate data from a survey, focus group, and interviews.

Data Analytics

There are numerous sources of qualitative data that may be useful for understanding an organization's safety posture. Some of the data may be naturally occurring, such as day-to-day email messages sent between people within the organization, while other data may be synthetic, such as the transcript from an interview transcripts or focus group notes. Large volumes of data require a corresponding level of effort to code and sort. A single page of text may take 5-15 minutes to code, depending on the situation. If you have 10,000 pages of text, it could require as much as 2,500 labor hours just to code the data. That is a barrier that is often too high to overcome.

Implementing data analytics methods is a means of accelerating the time required and decreasing the costs of analyzing qualitative data. Here is a basic description of the process:

1. Identify the data set and capture it in a format that is suitable for analysis
2. Develop a coding structure to facilitate the sorting and analysis of the data
3. Manually code a sample of the data to begin developing a knowledge base
4. Develop computer code that will enable the computer to identify the coding structure and learn the knowledge base
5. Use the computer to analyze and machine-code a sample of the data. Manually correct errors to the machine coding.
6. Repeat this process multiple times to improve the accuracy of the machine coding

7. When the machine has achieved a sufficient level of accuracy and precision, apply the computer code to the larger data set
8. Use statistical and data visualization tools to help summarize and report the results, as you would if the data had been manually coded
9. Incorporate the results into the broader analysis and report

The desired endpoint is to be able to apply machine learning methods to a very large data set in a rapid and cost effective manner so that analysts can search for and identify patterns and relationships between the data and important safety outcomes. Once these patterns and relationships are understood, theoretical models can be developed that explain the relationships between key variables that are associated with safety outcomes of interest (e.g., catastrophic events). Such models may lead to an understanding of changes in the variables which are predictive of the conditions necessary for the safety outcome to occur. The organization can then routinely monitor these variables, using them as a leading indicator and taking action to mitigate undesirable conditions before the outcome occurs.

The rate limiting factor for analyzing these types of data is the intense labor requirements to read, comprehend, and code the data.

References

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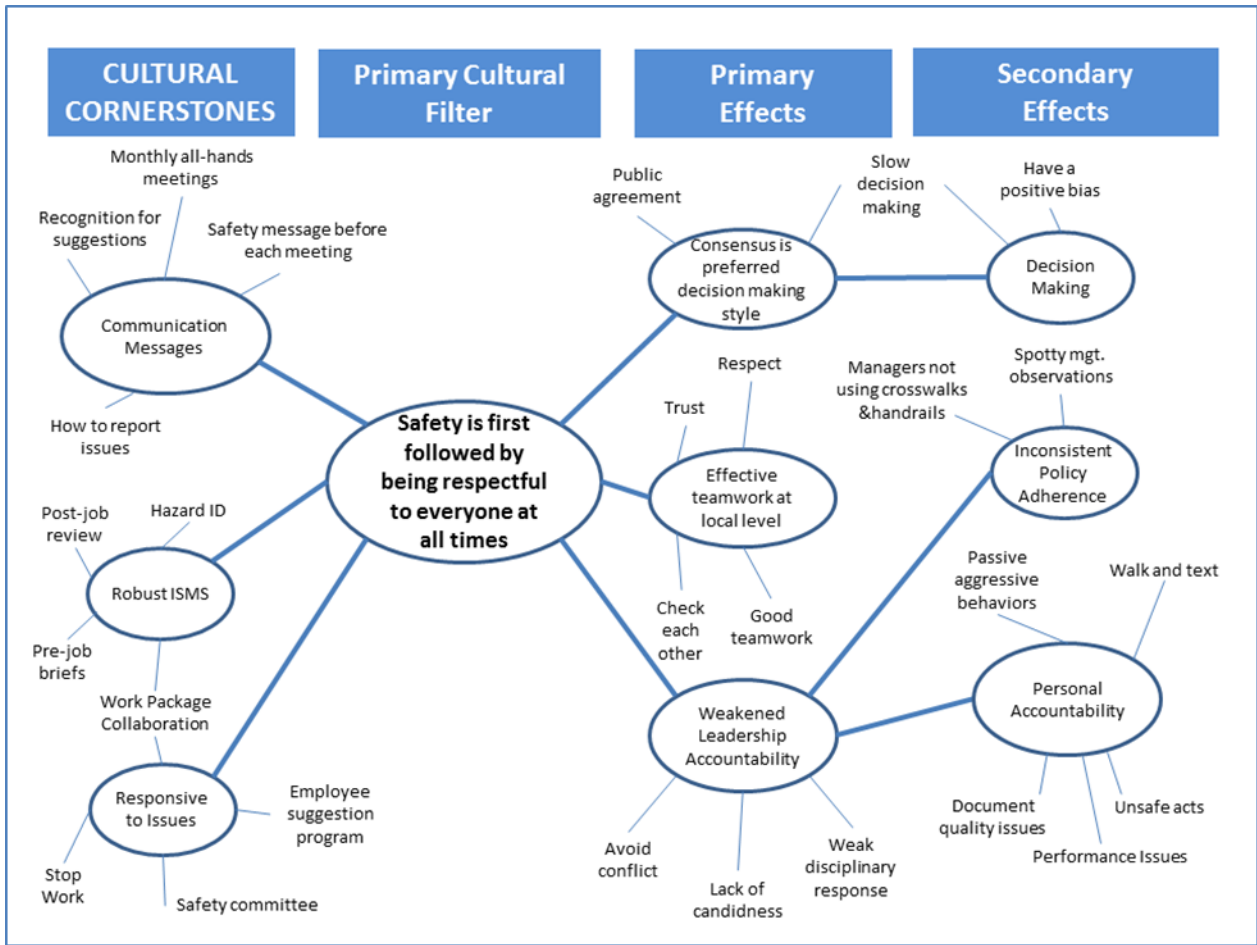


Figure 1. Example of a safety culture schematic diagram

Table 1. Example of triangulation using safety culture data from multiple sources

		<i>Theme</i>		
		<i>Consistent and Effective Work Planning</i>	<i>Timely resolution of safety problems</i>	<i>Effective communication</i>
<i>Data Source</i>	<i>Questionnaire</i>	Two of the lowest scoring items were (question 38) “We plan, control, and execute work activities so that safety is the overriding priority;” and (question 40) “Up-to-date procedures are available to me.”	The lowest scoring item was (question 33) “When a safety problem is found, we address the problem in a timely manner.”	From the survey it was learned that (question 9) “I get timely information about decisions that affect my work” scored near the top as did (question 10) safety communication is a part of my daily work activity.”
	<i>Management Interviews</i>	Management indicated that work planning processes were comprehensive and thorough but they seemed to struggle with the safe execution of more routine work. Some managers were concerned that there was too much “cut-and-paste” during work planning and that people were complacent in their analysis of hazards.	In the interviews managers reported that they encouraged people to report safety concerns and that it was their responsibility to address safety problems in a timely manner. They expressed frustration that issues that were due to aging infrastructure were not always resolved quickly.	In the management interviews participants consistently reported that safety communications occur at every plan-of-the-day meeting and that all meetings are begun with a safety minute. They also indicated they schedule and dedicated time to observe work in the field and communicate with the workforce.
	<i>Focus Groups</i>	Non-managers indicated that there was inconsistency in how potential safety issues were addressed in work planning. Working planning for complex and highly hazardous work was rigorous and detailed but that applying that same rigor was overkill on simpler, more routine work. Some indicated that procedures did not always reflect how the work was actually done.	Participants indicated that they were encouraged to report safety problems and they were not hesitant to do that. However, some indicated they did not receive feedback about whether the problem was corrected. They indicated that simple problems get fixed quickly but complicated problems or problems that cost a lot of money get reported and then go into a “black-hole.”	Participants were consistently positive about the frequency, timeliness, and relevance of safety communications. They provided multiple examples of how the organization communicated safety topics to them. They also provided examples of how safety was within their work groups.