FROM SURVEYS TO MATURITY MODELS:
Lessons from 20 years of trying to improve safety culture

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SUMMARY

The term safety culture was first used in the investigation into the Chernobyl nuclear disaster in 1986 to capture the human and organizational factors that contributed to the disaster[1]. Initially the safety culture concept was limited to the nuclear industry, but expanded to other industries as it was identified as a causal factor in inquiries in passenger rail[2] (e.g. Clapham Junction in 1989), and offshore oil and gas industry[3] (e.g. Piper Alpha in 1988).

In the early 1990's the UK offshore oil industry identified safety culture as key factor to improving safety. Specifically they were interested in how to promote employee compliance with safety procedures and participation in safety. Initially, the research focused on developing and refining employee safety culture perception surveys, but it became clear that survey results were hard to translate into improvement actions. To resolve this problem I developed the safety culture maturity model[4]. This model provides a framework for safety culture improvement. Organizations can use the model to determine their current level of safety culture maturity and develop strategies to move to the next level. Since the focus was still on employee perceptions, the level of maturity was assessed using card sorting workshops, which were effective but resource intensive. In addition, organizations continued to struggle to implement practical strategies to improve their level of maturity. To resolve this issue I developed a safety culture improvement tool to enable organizations to identify improvement strategies without the need to conduct perception surveys.

In recent years the concept of safety culture has become more widely accepted and many organizations have conducted safety culture assessments. Given the intensity of these assessments they are only conducted on an intermittent basis, so it is difficult to have an ongoing sense of the health of the safety culture. In order to meet this need I have drafted 20 safety culture metrics that provide a continuous indication of safety culture change. Ongoing research involves the development and testing of these safety culture metrics. The key innovation with these metrics is that they assess the quality of safety specific safety activities rather than just the frequency. For example, instead of counting the number of safety observation cards submitted, cards are graded for quality of a five point scale corresponding to the safety culture maturity model. Since all metrics are assessed on the same five point scale one overall score for safety culture health is obtained.

The challenge is using the knowledge gained over the last two decades to drive improvement. To meet this challenge I have adapted SMS model (policy, organization, planning, evaluation, improvement and audit) to safety culture to create an integrated approach. The safety culture management system involves the following six elements, Vision, Responsibility, Plans, Assessment, Review and Audit.

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INTRODUCTION

The term safety culture was developed to explain why safety management arrangements designed to manage hazards were not in place or were not used as intended. Those charged with investigating major disasters have continued to use the term safety culture as a way to explain why known hazards were not managed even though effective practices were available. Pidgeon[5] argues that safety culture is important for hazard management, as it enables us to take a broader view of risk handling and management within organizations. Importantly, safety culture moves the focus beyond ***what*** happened to offer potential explanation of ***why*** it happened.

1.1 Origins of Safety Culture

The term 'safety culture' was first used by the International Nuclear Safety Advisory Group (INSAG) as a causal factor in the Chernobyl nuclear disaster in 1986. They argued the errors and violations of the operating procedures, which contributed to the incident, were due to a poor safety culture at the plant. Specifically, it was used to describe the complacency towards nuclear hazards and the willingness to override safety control systems. The public inquiry into the Clapham Junction Railway accident[2] in the UK highlighted the importance of creating a positive safety culture to prevent future disasters.

Over the last quarter of a century, a vast amount has been written about safety culture. In many ways, the popularity of the concept has been counterproductive and there is a danger of it becoming meaningless. In fact, leading safety culture academics have raised concerns about over use of the construct, as illustrated by the following quote from Sue Cox and Rhona Flin.

> ***"Sometimes culture is just a lazy catch all term for a mishmash of practices that are somehow meant to combine to produce a coherent approach to safety… calls for a change in culture are little more than feel good messages"*** **(p. 153)[6].**

It is therefore important to clearly define the concept, present a theoretical framework and explain how safety culture may influence important safety outcomes.

1.2 Definition of Safety Culture

When the International Nuclear Safety Advisory Group originally coined the term safety culture, they did not ground it in the broader literature on organizational culture[7]. This has resulted in numerous conceptualizations and definitions of safety culture, nearly one for everyone who has attempted to study it[8]. Although there are numerous definitions, the one proposed by the Advisory Committee for Safety in Nuclear Installations (ACSNI) in 1993 is widely used, and is the most comprehensive and consistent with the broader organizational culture literature.

> ***"Safety culture is the product of individual and group values, attitudes, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of an organization's health and safety programmes. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures." (p. 23)[9]***

1.3 Initial safety culture research (1990's)

In the aftermath of the Chernobyl disaster, the nuclear industry dedicated significant resources to understand safety culture and develop methods to assess safety culture. This research was conducted on both a national and international basis (e.g. International Atomic Energy Agency). In the UK ACSNI conducted a comprehensive literature review to identify the attributes of a positive safety culture. In the absence of previous research on safety culture they focused mainly on occupational safety research, based on the assumption that the underlying causes on individual injury incidents are the same as major incidents. There is now some evidence that this assumption may have been flawed, as there have been a number of major disasters where the company had an excellent safety record prior to the disaster.

A very influential early research study was conducted by Lee and Harrison[10], which aimed to develop a safety culture questionnaire for the UK nuclear industry. They adopted a standard psychometric approach to developing the questionnaire, by initially conducting focus groups with employees, using this information to create items, surveying employees and the evaluating the questionnaire statistically. Specifically they tested the construct validity using factor analysis and predictive validity by correlating employee responses

on the safety culture items with their self-report occupational injuries. This approach to safety culture assessment was replicated across the UK in a range of industries including, offshore oil and gas[11], Railways[12], and Petrochemical[13].

This early research produced numerous industry specific employee perception questionnaires. All of the questionnaires contained similar content but varied in the specific wording and emphasis on different constructs. Towards the end of the 1990's a number of review papers were written to try and identify common dimensions, for example Flin and colleagues identified five common safety culture dimensions[14].

From an industry stakeholder perspective there was a growing concern that safety culture studies were adding little value. For example one safety manager described a safety culture report he received as being as useful as "describing the water to a drowning man"! These reports identified a long list of intractable problems with no potential solutions available. This growing concern about the practical utility of safety culture research resulted in industry taking more of a leading role and focusing on the development of more practical tools.

1.4 From academic to practitioner (2000's)

In the early 2000's in the UK there was significant interest in safety culture assessment from many organizations. In addition, the UK Health and Safety Executive (HSE) actively promoted safety culture assessment and had developed their own assessment tool that companies could purchase. The demand for practical and simple assessment tools lead to the development of two similar safety culture maturity models, namely the Hearts and Minds model[15] (see figure 1) and the safety culture maturity model[16]. Both of these models break safety culture into five levels from poor to excellent. Organizations can use the model by first locating themselves on the five level continuum and identify strategies to move to the next level. It is important to note that these are conceptual rather that empirical models, as there is no evidence that organizations actually move through these levels sequentially.

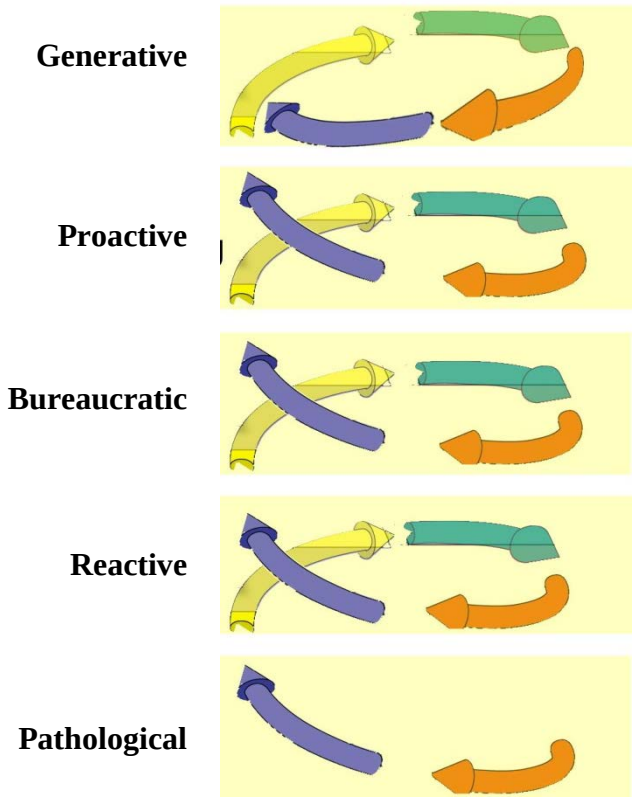

Figure 1: Safety culture maturity model

These maturity models also produced new approaches to measurement, such as card sorting, improvement workshops and audits[17]. The maturity model approach has been very popular and the card sorting

assessment tool is widely used across a range of industries. Recently safety culture system audits have been developed and shown to discriminate between high and low injury rate companies[17]. These self-assessment audits may be a good choice for small companies and a good starting point for larger companies embarking on safety culture assessment.

The 2000's saw significant improvement in tools to assess safety culture, but there was little progress in strategies to improve safety culture. The development of a systematic approach to safety culture improvement has been the focus of my research for the past few years.

1.5 Focus on improvement

The aim of virtually all the effort devoted to safety culture has been to enable organizations to improve their culture. It is therefore surprizing how much of the research has focused on assessment and the near absence of research on improvement. In order to address this imbalance I have developed the safety culture improvement system (see figure 2). This model was developed by adapting the standard Safety Management Systems (SMS) model (policy, organization, planning, evaluation, improvement and audit) to safety culture to create an integrated approach. The safety culture management system involves the following six elements, Vision, Responsibility, Plans, Assessment, Review and Audit. I describe each element in turn below.

Figure 2: Safety culture improvement system

Safety culture vision
The safety culture vision statement is similar to general health and safety policy. It describes the ideal culture and states the desire to continuously strive to improve the safety culture in pursuit of perfection. It may also define the nature of safety culture and what an ideal culture would look like in this organisation. The writing of this statement should be an inclusive process where input is sought from all parts of the

organization. The final statement should be something that all members of the organization could endorse. It should be short, positive and aspirational.

Responsibilities

The responsibilities element is similar to the organizing element of the SMS. This element defines the responsibility and accountability for key groups in creating and maintaining a positive safety culture. Senior leaders and managers have a key role in creating a positive safety culture. It is therefore important that they are aware of their role and know what they need to do (and not do) to promote a positive safety culture. Supervisors set the tone in their work group and are key individuals in ensuring workplace safety, they also are key in promoting a positive culture. To be effective supervisors need to know it is a part of their responsibilities to promote a positive safety culture. Given the increasing importance of contracting companies it is important that contracting company management are aware of their responsibilities to promoting a positive safety culture. Finally every employee in the organisation has a role to play in promoting a positive safety culture and while this role is more limited it is important that they know their part.

Plans and actions

A positive safety culture does not just emerge by chance; it takes specific plans and actions. It is likely that most organizations have systems in place that promote a positive safety culture but they may not describe it as a safety culture intervention. For example many companies require managers to conduct worksite visits to observe worksite safety practices and to speak to employees about safety concerns. If worksite visits are conducted properly then they will promote a positive safety culture. It is therefore important for organizations to review current systems and practices (e.g. using a safety culture improvement tool), in order to capture the current systems in place to promote a positive culture. The organization can then identify gaps in current systems and set short and long term safety culture improvement objectives and processes to promote a positive safety culture. These processes should link with other aspects of the SMS (e.g. training, incident reporting).

Assessment

It is not possible to improve if you do not know where you are or the direction that you are going in, therefore safety culture assessment is important. There are two main types of safety culture assessment episodic and continuous. Episodic (biannual) assessment involves a detailed analysis of the safety culture and sets the strategy for the next couple of years. This is an intensive process which involves multiple methods (e.g. questionnaire, interviews, document review) to assess the safety culture. Ideally this process will provide the organization with a deep understanding of their current culture including strengths, weaknesses and opportunities for improvement. Although these intensive assessments are important it is very difficult to continuously improve if you only get feedback every two or three years. It is therefore necessary to have an ongoing indication of the safety culture. The development of continuous safety culture indictors is the primary objective of the safety culture metrics project. This project has developed 20 metrics that companies can use to get an ongoing indication of the health of their safety culture. These metrics are not a substitute for detailed episodic measures, but designed to give a general indication of the direction of the safety culture. These metrics involve capturing the markers left by safety culture on daily operations (e.g. the quality of safety reports).

Audit

Audit is integral to any continuous improvement process. It is important to assess the implementation of safety culture improvement processes to ensure compliance with specified plans (e.g. leadership training). In addition it is also important to assess the effectiveness of the processes designed to promote a positive safety culture. For example the extent to which process met desired objective (e.g. change leader behavior). This audit is the same as any other safety audit process and can be incorporated into regular safety audits.

Review and refine

Since this is a continuous improvement process it is important to review the information produced by safety culture assessment and the audit process to refine the safety culture improvement system. It is also important to learn from other aspects of the SMS such as incident reviews and to learn from other organisations and research.

CONCLUSION

In this paper I have outlined the development of safety culture over the past 20 years. This summary has been from my personal experience and not comprehensive, but it provides a context for where we are today and the challenges for the future. The early work on safety culture focused too much on assessment and

not enough on improvement. There was also a tendency to develop industry specific assessment instruments and processes, which has been of little value and tended to focus the assessment at a micro or behavioural level.

Organizations should focus on safety culture improvement as their objective and adopt a systematic approach to improvement. Safety culture improvement is a continuous process and should not be viewed as a one off exercise. By integrating safety culture improvement within their SMS organizations are more likely to be able to adopt a continuous improvement approach.

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