



CULTURE MANAGEMENT IN THE UK RAIL INDUSTRY

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Abstract

Organisational safety culture matters because it influences the way staff behave and perform at work. The importance of proactive safety culture management is highlighted by the number of major incidents where poor safety culture has been identified as a causal factor (e.g. Piper Alpha, Ladbroke Grove). As awareness of culture management has grown, organisations are increasingly seeking tools to help them ensure that corporate safety objectives are linked to a strategy for encouraging appropriate staff attitudes and beliefs. The CAS Organisational Safety Culture Analysis (OSCA) is a structured process that helps senior management teams define the safety culture that they need, measure how effectively this culture is embedded within their organisation and identify culture development priorities. This paper outlines the OSCA process and includes a case study describing how a UK rail organisation has made use of OSCA.

1 Introduction

The term safety culture was first introduced by the International Atomic Energy Agency (IAEA) following its review of the nuclear reactor incident at Chernobyl in 1986 [1]. Subsequently, safety culture management failures have been identified as contributing to accidents and incidents in a range of industries, for example, the Piper Alpha oil-platform explosion, 1988 [2] and the Columbia Space Shuttle crash, 2003 [3]. As a consequence, proactive safety culture management is now generally recognised as a priority in most highly regulated, asset intensive industries. In the rail industry itself, findings from major rail accidents, for example, Ladbroke Grove, Southall and Potters Bar have resulted in an increased focus on safety culture [4]. The Office of Rail Regulation has indicated that it expects rail organisations to work to measure and manage their safety culture [5].

1.1 Defining and Describing Safety Culture

Any organisation wishing to manage its safety culture first requires a clear definition of the construct itself and its component parts. While there is a substantial body of research on safety culture, there remains no commonly agreed definition or model. As a result, CAS uses the following definition, 'that set of values, shared by everyone in an organisation, which determine how people are expected to think about and approach safety' which was developed following a review of existing safety culture definitions [6].

Pidgeon (1998), cited in [7], has commented that past research on safety culture has not been underpinned by well validated theoretical models. However, more recently, some useful frameworks for describing safety culture have begun to emerge. One commonly cited framework developed by Cooper [8] distinguishes between three interrelated aspects of safety culture:

1. Psychological aspects – how staff feel about the culture (beliefs, attitudes, values and perceptions).
2. Behavioural or Organisational aspects – what staff do (safety related activities, actions and behaviour).
3. Situational or Corporate aspects – what the organisation has (policies, procedures, management systems).

One of the key points in this approach is that it clearly delineates culture (behavioural and situational aspects) from climate (psychological aspects). It suggests that organisations should consider all three aspects in order gain a fully rounded understanding of their safety culture. To do this they require tools that provide sufficient coverage.

Interestingly, senior managers' opinions and aspirations about 'the way they would like things to be done around here' are not accounted for within this framework. These are important because they influence both 'what staff do' and 'what systems and processes the organisation has'. Senior managers' aspirations also describe the types of cultural change they would be willing to support. Identifying aspirations or goals is

a critical part of culture change and should be incorporated into any culture change process.

1.2 Safety Culture Measurement Tools

In recent years, numerous safety culture/climate assessment tools have been developed to help organisations manage their safety culture. The majority of these tools are questionnaire based and require respondents to answer a range of questions, often more than 100 items, about how safety is managed in their organisation [9]. It is notable that many tools focus on only one aspect of the framework described above, psychological aspects which covers safety climate. This tends to be measured in terms of attitudes held by staff to different components of the safety management process. Indeed, Cooper states that researchers in this area have tended to take an overly narrow approach to safety culture by focusing on climate (using questionnaire surveys) rather than taking a holistic, view of safety culture [8]. This suggests that organisations are not necessarily getting the coverage they need from many existing tools.

Within the rail industry several safety culture/climate measurement tools have been created in recent years. These tend to involve collecting opinions from staff at all levels in the organisation and cover topics such as:

- Training.
- Communication.
- Management commitment.
- Organisational learning.
- Employee involvement.

Several of the tools are linked to safety culture maturity models which help the organisation identify the current level of their safety culture (in terms of maturity). These models also provide a set of culture development enablers to help the organisation move to the next maturity level [10].

Existing tools offer organisations a range of benefits. Used correctly they: ensure that views are gathered from across the organisation; reveal current staff perceptions on a range of issues; pinpoint things that staff feel need to be improved and, if a maturity model is used, provide specific culture improvement steps. Senior management can also use the survey itself to demonstrate their commitment to health and safety. However, they also have several important limitations:

1. The focus on safety climate (staff attitudes and perceptions) does not necessarily give organisations a fully rounded view of their safety culture.
2. Most are not underpinned by a clearly defined culture management model. As a result, they can become taxonomies with items clustered into scales on the basis of apparent semantic/thematic links. With no model defining the relationship between culture, climate and performance and behaviour, results tend to be descriptive and management teams can find it difficult to translate them into action plans.

3. They make the presumption that there is only one 'correct' safety culture that all organisations should aspire to regardless of the environment within which they operate. All organisations are not expected to have the same culture so why should they be expected to have the same safety culture? In reality, different safety cultures may suit different organisations.
4. Large numbers of questions and difficulties with distribution often mean that surveys achieve low response rates which can result in response biases.

During its work in the rail industry, CAS has often heard management teams comment that while the results of their safety culture survey were interesting, they did not understand how to translate them into an achievable set of improvement/development actions. In response to this, and the issues identified with existing tools, CAS has developed the OSCA. A detailed description of OSCA, including a case study describing how it was used in a UK rail company, is provided in the following sections.

2 CAS OSCA

OSCA is a structured process that helps senior management teams' define, measure and develop their organisations' safety culture. Its goal is to provide organisations with a better understanding of their current and desired safety cultures and the gap between their aspirations and the views of staff and contractors.

Fundamentally, OSCA is based on the view that, while all organisations must recognise the importance of managing safety effectively and within the constraints of regulatory requirements, there are various ways that they can go about this. Therefore, OSCA does not promote a particular type of safety culture as being right or wrong. Rather, it allows for different types of safety culture depending on the context within which the organisation operates and its history. What is most important is that, given the type of safety culture that they want, organisations are making best use of the management mechanisms available to them to embed it across their organisation.

2.1 CAS Culture Management Model

The OSCA process is underpinned by the CAS Culture Management Model (CMM) presented in Figure 1. The aim in developing the CMM was to clearly describe the relationships between culture, climate and performance and behaviour and to identify the mechanisms by which culture becomes embedded and enacted. The development of the CMM has been closely informed by previous safety culture surveys CAS has carried out for several of its own clients, two projects CAS undertook for RSSB on strategic safety management and existing research on organisational and safety culture.

The CMM shows the logical relationships between an organisations’ cultural goals and aspirations (Culture), staff attitudes and beliefs (Climate) and observable effects (Behaviour and Performance). It identifies four main culture management mechanisms (CM Mechanisms):

1. Incentives.
2. Management Commitment.
3. Management Systems.
4. Pressures.

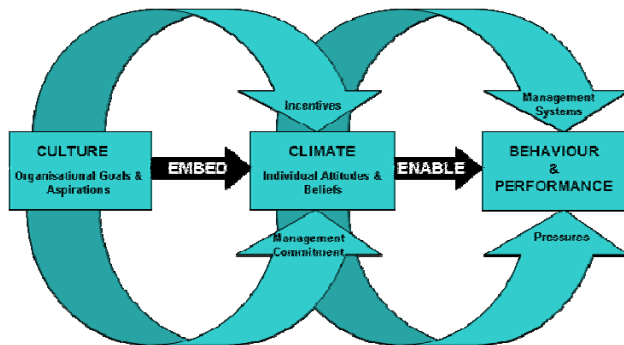


Figure 1: CAS Culture Management Model.

The CMM can be thought of as a causal chain. People within the organisation create, consciously or unconsciously, a preferred culture for producing the behaviour and performance which will enable the organisation to achieve its goals. Managers attempt to *embed* the culture they think the organisation needs through motivating staff (Incentives and Management Commitment). They also try to *enable* the culture they want through creating systems that support staff in behaving in the required manner (Management Systems) and by reducing or eliminating conflicting demands and pressures (Pressures).

The components of the CMM are broken down into a further level of detail than that which is presented in Figure 1. The Culture component of the model has been sub-divided into a set of Safety Culture Types outlined in Table 1.

Culture Types	Description
Participative vs. Authoritative	How and where responsibility is diffused within the organisation.
Outcome vs. Process	Whether outputs/outcomes or ‘the way things are done’ is the primary focus.
Innovative vs. Stable	The extent to which individuals and groups are encouraged to be innovative and take measured business risks.
Short-term vs. Long-term	The relative importance attached by an organisation to meeting short term targets and longer term goals.

Table 1: CAS Culture Type Indicators.

The Culture Types were derived from a larger set collated from relevant research on organisational culture [11]. The initial set of culture types were condensed following safety

culture research CAS undertook with a range of organisations with differing operating environments (e.g. different regulatory requirements).

Each of the CM Mechanisms presented in Figure 1 has been sub-divided into a set of CM Sub-Mechanisms. While it is not possible to list all of the sub-mechanisms within this paper, examples are provided in Table 2 (below).

The lists of sub-mechanisms were derived from earlier safety culture surveys developed and trialled by CAS. They were further developed following a review of factors contained in other safety culture tools [7, 9] and a review of general research on factors that enable or inhibit employee performance [12, 13, 14,15].

CM Mechanism	Sub-Mechanisms Examples
Incentives	Discipline, Remuneration, Performance Recognition, Influence.
Management Commitment	Management Visibility, Accountability, Fairness.
Management Systems	Training, Resource Management, Work Planning.
Pressures	Peer Pressure, Fatigue, Cynicism, Allegiance.

Table 2: CM Sub-Mechanism Examples.

2.2 Implications of the CAS CMM

The structure of the CMM and the relationships that it predicts have several implications for how safety culture should be measured and managed. It suggests that:

1. No particular safety culture can be viewed as ‘the best’. Culture is dependant on organisations’ history and operating environments.
2. In order to manage safety culture, organisations require a fully rounded view of their culture, as suggested by Cooper’s model [8]. The CMM provides a framework for developing tools that cover all three areas of Cooper’s model.
3. Organisations should begin the culture management process by identifying the type of culture they aspire to.
4. Organisations need to identify the mechanisms that are most important for embedding and enabling the culture that they want.

The model also highlights the potential barriers that organisations face in achieving the safety culture they want. If senior managers are not clear about the culture that they want they are more likely to put in place systems with conflicts and inconsistencies (e.g. wanting to have a learning organisation but having a disciplinary process that focuses on assigning blame rather than identifying root causes). If management mechanisms are not properly aligned staff will find it difficult to comply.

2.3 OSCA Process

The basic steps that organisations should take when undertaking any culture change process are described in Figure 2. The CMM has been used to design a process and a set of tools for helping organisations to manage safety culture change.

The OSCA process enables organisations to decide: what style of organisation they need to be; which mechanisms they should work to embed; the size of the gap between where they are now and where they need to be and what actions they need to take to change their safety culture.

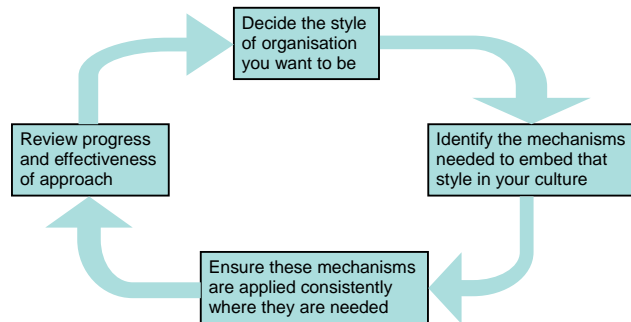


Figure 2: Culture Management Process.

The main stages of the OSCA process are described below. The tools used in each stage of this process were developed based on the CMM described in Section 2.1.

Goals and Aspirations Workshop – The senior management team undertake a structured exercise within which the CAS Culture Type Indicators are used to develop consensus on the organisations current safety culture and the safety culture that senior team wish to have. The outcomes of the workshop are used as a point of comparison in the analysis of staff responses to the OSCA Staff Survey.

OSCA Staff Survey – All staff within the organisation complete a 43 statement paper-based survey focusing on Climate and the four CM Mechanisms. Respondents score each statement on 5-point Likert scales ranging from strongly agree to strongly disagree. As part of the survey demographic information is collected and space is made for comments.

Organisational Performance Data – Available and relevant data (e.g. absenteeism rates, accident rates) are reviewed to help identify specific issues that the organisation is facing.

Improvements Workshop – The senior management team review survey outputs and initial safety culture development suggestions and rate them according to risk, feasibility, resource requirements and value. At this stage valuable information about current management systems, ongoing or recent change initiatives (safety or otherwise) and barriers to implementation is gathered. This enables CAS to better understand existing systems the organisation uses to manage safety and to make final recommendations that are relevant and appropriate for the particular organisation.

2.3 OSCA Analyses

Data collected during OSCA is analysed in several stages. The Goals and Aspirations workshop results are reviewed first to identify the safety culture senior managers think the organisation has and the culture they aspire to. The most important CM Mechanisms for achieving these aspirations are then identified (e.g. an Authoritative culture needs an effective disciplinary process and effective procedures). OSCA Staff Survey results are then collated and analysed in several ways:

1. Scores at the CM Mechanisms and Sub-Mechanisms levels are compared to CAS Benchmarks¹.
2. Scores on each CM Sub-Mechanism are reviewed to identify low scores. Particular emphasis is placed on those sub-mechanisms known to be important for the culture the organisation aspires to.
3. Scores for each demographic group are reviewed to identify areas where the organisation should focus its efforts when seeking culture change.
4. Comments from survey respondents are reviewed and interpreted.

Performance data provided by the organisation is then reviewed in light of the survey findings. The aim of the performance data is to seek corroboration of any survey results. For example, if a particular demographic group reports high levels of stress or fatigue, it is useful to look at absenteeism or turnover data.

All of the analyses described above are then brought together to develop a draft set of recommendations which are reviewed by the senior management team within the Improvements Workshop. Following the workshop CAS updates and refines the recommendations in light of information the organisation has provided about current management systems and initiatives.

3 Evidence for OSCA

The CMM is of relatively recent origin. As a result, testing of the model and supporting tools is ongoing. However, initial analyses have provided information about the structure of the CMM and the OSCA Staff Survey. In addition, earlier work undertaken by CAS provides information about the benefits of safety culture management and the reliability of the self reporting approach used throughout OSCA.

In order to test the reliability of the OSCA Staff Survey items a classical item analysis was undertaken. Results indicated that all of the CM Mechanisms had acceptable internal consistencies (Cronbach's coefficient alpha):

- Incentives (r=0.81).
- Management Commitment (r=0.85).

¹ CAS's safety culture dataset contains 8,500+ survey responses from staff employed in over 20 civil engineering and infrastructure maintenance companies.

- Management Systems ($r=0.83$).
- Pressures ($r=0.73$).

Once the reliability of the survey was established, a factor analysis was undertaken to analyse whether OSCA Staff Survey data provided support for the CMM. An unrestricted Principal Components Analysis resulted in an 8-factor solution (using the Eigenvalues > 1 rule). However, the associated Scree test and the CMM itself both suggested a 4-factor solution. Therefore, a further Principal Components Analysis was run with a forced 4-factor solution. While the results of this analysis did not entirely coincide with the CMM, they do clearly overlap. Factor one contained all items related to embedding culture (Incentives and Management Commitment items). Factor two picked up all Management Systems items and Factors three and four contained all Pressures items, Factor three contained items related to work/life balance and Factor four contained pressures related to trust, allegiance and solidarity. These results provide early support for the basic structure of the model.

Previous work undertaken by CAS also highlights the importance of safety culture management in general. In particular, CAS undertook two safety culture analyses for a rail maintenance organisation that were separated by six months. The aim of the work was to demonstrate safety culture and climate development over the six-month timeframe. Using the recommendations from the first survey, the organisation undertook a 6-month improvement plan and then re-surveyed their staff. The results of the second survey showed a significant improvement in staff ratings of the organisation's safety climate. This suggests that by taking up the recommendations from OSCA, the organisation was able to significantly improve staff perceptions.

Finally, work undertaken by CAS on strategic safety management provides support for a self-report based approach to safety culture [16]. The work found that there were significant correlations between senior managers' self-ratings and actual organisational and safety performance. The following list provides examples of significant correlations:

- Managers' perceptions of organisational attitudes and response to change were significantly correlated with objective organisational performance (0.55).
- Managers' perceptions of organisational commitment were significantly correlated with objective organisational performance (0.81).
- Managers' perceptions of organisational commitment and readiness were significantly correlated with safety performance (direct management control) (0.379).

While tests of the validity and reliability of OSCA and the CMM are ongoing, initial work has indicated that both the model and the tool are promising. Furthermore, earlier data collected by CAS highlights the importance of culture

management in general, and provides support for the self-report approach to measuring culture.

4 Case study for the CAS CMM

In March 2008, Southeastern Railway commissioned CAS to undertake an analysis of its safety culture. The aim of the analysis was to help Southeastern define its safety culture aspirations and identify ways of moving the organisation towards these.

Southeastern chose to undertake this work as part of a corporate change process aimed at increasing efficiency of the organisation across a range of functions. Southeastern chose OSCA because they felt it had clear synergies with work they were undertaking on Investors in People and because it provided a broad picture of safety culture within an organisational context. It was felt that the outputs of the work would be useful across the business as a whole. Southeastern undertook the full OSCA process including:

1. Goals and Aspirations workshop.
2. OSCA Staff Survey.
3. Performance data review.
4. Improvements Workshop.

Within OSCA, the Goals and Aspirations workshop is usually only undertaken with the senior management team. However, Southeastern chose to run two workshops, one with the senior team and another with a larger group of managers during the regular quarterly management forum. This meant that over 100 managers were able to comment on the kind of safety culture they thought Southeastern needed. Southeastern chose to run this extra workshop in order to engage the widest possible group of managers directly in the OSCA process. By engaging many of Southeastern's managers, the organisation was able to assess the level of consensus amongst the management team regarding perceived safety culture requirements. This process showed that there was a high level of consensus and indicated that Southeastern wished to develop a safety culture that was more participative, outcome oriented, innovative and long term.

Concurrently with the first workshop, OSCA staff surveys were distributed to all 4500 Southeastern staff and performance data was sent to CAS for analysis. Following CAS's analysis of the data from all three sources, Southeastern took part in an Improvements Workshop to identify steps to develop the safety culture they aspired to. During the Improvements Workshop senior managers identified several areas they needed to develop to move them towards the safety culture that they wanted. A number of specific improvement actions were identified in the following areas:

1. Developing middle managers' staff management skills (e.g. staff direction, performance appraisal, support and development).

2. Identifying opportunities for gathering information about organisational performance to support learning and development.
3. Identifying ways to involve staff in organisational change and improve information sharing.
4. Reviewing management of fatigue, stress and work-life balance.

The OSCA process gave Southeastern a roadmap for creating the safety culture they aspire to. In order to progress further, Southeastern have now consolidated the outputs from OSCA and the outputs from their Investors in People assessment into company wide and departmental action plans. At a company level, work on fatigue management and the development of a company wide safety communications plan are early priorities. At departmental level, plans to target specific areas of weakness highlighted within the survey are being developed. At Southeastern's next quarterly management forum the OSCA outputs will be reviewed with a larger group of managers to further develop and refine the action plans.

When asked their view of the OSCA process, Southeastern commented that the process was very interactive and engaged the senior team well. 'It got the whole top team thinking about our safety and organisational cultures, where we wanted to go and how we might get there. The process required us to maintain close ownership of aspirations and objectives so the final report was closely aligned to our business objectives.'

5 Conclusions

The OSCA process, and in particular the CMM, provide a framework for understanding the relationship between safety culture, safety climate and performance and behaviour. Using this framework, organisations are able to define the safety culture that they think they need and identify specific short term and longer term actions that will assist in embedding and enacting this culture.

The OSCA process enables organisations to consider their culture from a range of perspectives. This approach is supported by emerging frameworks for understanding culture and climate as described in this paper. While some areas of the OSCA process require further validation, initial analyses provide promising results and further validation work is currently underway. As the case study shows, organisations are finding that the outputs from OSCA support them in planning how they will manage safety in their business.

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