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Occupational Safety and Health culture assessment - A review of main approaches and selected tools

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Acronyms

AHRQ	Agency for Healthcare Research and Quality
ASCOT	Assessment of Safety Culture in Organisation Team
BARS	Behaviourally Anchored Rating Scale
CAA	Civil Aviation Authority
CASS	Commercial Aviation Safety Survey
CIS	Centro de Invenstigacao e Intervencao
EfH	Enterprises for Health
ENWHP	European Network of Workplace Health Promotion
ERI	Effort Reward Imbalance
ESQHC	European Society for Quality in Health Care
EUNetPaS	European Network for Patient Safety
EU-OSHA	European Agency for Safety and Health at Work
FAA	Federal Aviation Administration
FIOH	Finnish Institute for Occupational Health
HRMI	Her Majesty's Railway Inspectorate
HSEC	Health and Safety Engineering Consultants
HSL	Health and Safety Laboratory
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
INQA	Initiative Neue Qualität der Arbeit
INRS	Institut National de Recherche et de Sécurité
INSAG	International Nuclear Safety Advisory Group
IRIS	International Research Institute of Stavanger
JDR	Job Demands Resources
KOOP	Kooperationsstelle
LSCAT	Loughborough Safety Climate Assessment Questionnaire
MIT	Massachusetts Institute of Technology
MSCS	Multilevel Safety Climate Scale
NORSCI	Norwegian Offshore Risk and Safety Climate Inventory
NOSACQ	Nordic Occupational Safety Climate Questionnaire
NRCWE	Danish National Research Centre for Working Environment
OSART	Operational Safety Review Team
OSCI	Organisational and Safety Climate Inventory
OSH	Occupational Safety and Health
OSQ	Offshore Safety Questionnaire
PSC	Psychosocial Safety Climate / Patient Safety Climate/Culture

RSSB	Rail Safety and Standards Board
SAQ	Safety Awareness Questionnaire
SCART	Safety Culture Assessment Review Team
SCIMS	Safety Culture Indicator Scale Measurement System
SCMM	Safety Culture Maturity Model
SCT	Safety Climate Tool
SHoMe	Safety Health of Maintenance Engineering
SME	Small and Medium sized Enterprise
WHO	World Health Organisation

Executive Summary

Managing OSH in a systematic way, addressing regulatory, technical, organisational and managerial aspects, is vital to attain safer and healthier workplaces. However, OSH entails more than just focusing on formal issues. As risk prevention and OSH is, in the first place, about people - and preventing them from harm - attention should also be paid to behavioural aspects, and social and cultural processes. Approaching OSH from an organisational culture perspective can in this regard facilitate achieving sustainable improvements in organisational OSH performance.

Occupational safety and health culture, or more briefly 'OSH culture', can be seen as a concept for exploring how informal organisational aspects influence OSH in a positive or negative way. It can have an impact on how OSH is perceived and dealt with among workers in an organisation, and on whether workers are aware of OSH-related issues and act in a safe and healthy way. OSH should not be entirely reduced to a matter of culture. OSH culture helps to see an organisation in a different way. The knowledge and information, gained from such a cultural approach, can, in turn, be very useful in the process of changing OSH-related policies, processes, and practices step by step, adapting them to the existing local context and culture, and eventually leading to better OSH performance.

This review attempts to describe a cultural approach towards understanding OSH. It aims to help the reader understand OSH from a cultural viewpoint, and how OSH culture can be assessed as part of a process of organisational improvement. The aim is to convey up-to-date information on this complex topic in a straightforward, condensed way, trying to build a bridge between research and practice. The review is intended as an informative text for business managers in general, and as a practical guide for OSH practitioners. This is because much of the academic research related to the topic is published in scientific books and journals that are often less accessible for non-academic OSH professionals.

The first section outlines the concept of OSH culture. As the EU-OSHA aims to address work-related safety and health issues as one joint matter, the term of 'OSH culture' is used in this report. However, research has for the most part focused on cultural aspects linked to process and occupational safety (safety culture and safety climate). Conversely, the topic of organisational health culture has received less attention from research. Different research traditions recognise the mutual interaction between organisational culture and health.

The main approaches and methods that exist to assess the safety culture in an organisation are presented and discussed in the next section. The term safety culture appears to have been first used in a report by the International Atomic Energy Agency after the Chernobyl disaster in 1986. Since then, over the past 25 years, the concept of safety culture has been studied internationally by many academics from different scientific backgrounds (psychology, anthropology, engineering, etc.), resulting in different, but complementary, approaches for exploring and assessing an organisation's safety culture.

Generally, three assessment approaches can be distinguished in this regard: the academic, analytical and pragmatic approach. These distinct strategies provide a different way of looking at and assessing an organisation's safety culture and each comprise specific methods and instruments. The most appropriate approach(es) that can be used in a particular organisation or situation are discussed, as is how the assessment outcomes can be used. Not one single approach or technique is suitable for understanding and exploring safety culture. Rather, a holistic and multi-method approach should be taken towards measuring safety culture. The three approaches should thus be regarded as complementary. A safety climate questionnaire survey can, for instance, result in some (quantitative) outcomes, which should then be further checked and explored by means of interviews with managers and workers.

There exist many tools for exploring and assessing an organisation's safety culture. It is therefore useful to know what they can be used for, their potentials and limitations, and their pros and cons. This review gives an overview and selection of useful tools and techniques from the EU domain and abroad. Many of the available safety culture assessment tools are 'commercial' products, provided by

OSH institutions and consultants. As the EU-OSHA can only promote tools that are available to all EU stakeholders and are free of charge at the point of use, commercial tools were excluded from this selection. No tools were found that are explicitly targeted at the assessment of corporate health culture. Assessment tools for patient safety culture were excluded from this review.

In addition to selected tools being non-commercial, some other criteria were also taken into account as well. They had to be available within the EU public domain, preferably accessible through the Internet. In addition, they should be aimed at OSH practitioners, and also as information to business managers in organisations, the selected tools had to comprise at least some guidance for use.

Based on these criteria, six diagnostic tools/toolkits were retained for a more detailed description. It is important to note that this selection of six tools should not be regarded as the only, true solution for assessing an organisation's safety culture. The selected tools are a selection of (publicly and freely available) exemplary tools, giving the reader/user some well-illustrated ideas on how a safety culture assessment can be approached.

The conclusions section summarises the main findings and most important messages with regard to the assessment of the occupational safety (and health) culture in organisations. It addresses how a cultural diagnosis should be practically approached. Before commencing a diagnosis of an organisation's safety culture, and deciding which strategy and specific tools to apply, it is important to first consider and determine the true purpose of such an assessment. It is in addition not feasible to adopt a standard, 'one size fits all' strategy. Addressing and diagnosing an organisation's safety culture is about more than just simply 'taking a tool from the shelf'. It implies a tailored approach, taking into account the local context. It is recommended to combine several methods and tools during the assessment process. Taking a tailored triangulation approach towards safety culture provides the best chance of success.

The diagnosis of an organisation's safety culture requires a close collaboration between the organisation’s internal resources and outside expertise. So one important consideration is to determine which actions can be covered internally, and to what extent external consultancy and support is needed. Expert guidance can add significant value, but it is absolutely necessary that there is a degree of ownership of the tools by people within the respective organisation. Assessing an organisation's safety culture is, of course, just the start. It should be the basis for further systematic actions. This requires management commitment and participation of people from all hierarchic levels (managers, middle managers, supervisors and workers).

The conclusions section also discusses briefly whether occupational safety and occupational health could be jointly approached from a cultural perspective. Another issue that is addressed is whether the use of safety culture assessment tools is really relevant for many SMEs - particularly for the smaller and micro enterprises outside the high-risk industries. Finally, the feasibility of developing a standard European tool for OSH culture assessment is discussed.

1. Introduction

Occupational safety and health culture, or more briefly 'OSH culture', is a complex concept that has been the subject of extensive research since the eighties. There are different perspectives on how to define and approach this OSH culture in organisations. This report does not aim to give a full overview of theoretical research and discussions on the matter, given the existence of a number of thorough, academic publications. The interested reader is in particular referred to the recent, excellent works of Stian Antonsen ('Safety culture: theory, method and improvement', 2009) (Antonsen, 2009), and Frank W. Guldenmund ('Understanding and exploring safety culture', 2010) (Guldenmund, 2010). In addition, chapter 8 of this report contains a brief, non-exhaustive list of interesting publications and web links on the subject of OSH culture.

This review is intended as an informative text for business managers in general and a practical guide for OSH practitioners. This is because much of the academic research related to the topic is published in scientific books and journals that are often less accessible for non-academic OSH professionals.

This report attempts to describe a cultural approach towards understanding OSH. It aims to help the reader understand OSH from a cultural viewpoint, and how OSH culture can be assessed as part of a process of organisational improvement. The aim is to convey up-to-date information on this complex topic in a straightforward, condensed way, trying to build a bridge between research and practice. Some content might, therefore, be open to discussion and constructive criticism.

The report consists of four main chapters. Their contents are summarised below.

Chapter 2 outlines the concept of OSH culture, explaining and situating the terms organisational culture, safety culture and safety climate, and corporate health culture. The benefits of taking a cultural approach towards OSH are discussed, and the need to explore and assess an organisation's OSH culture is raised.

In chapter 3 the main approaches and methods that exist to assess the OSH culture in an organisation are presented. It is discussed which approach(es) should be used in a particular organisation or situation, and what can be done with the assessment outcomes. The focus of this chapter is on safety culture; tools related to corporate health culture and patient safety climate are not included.

Chapter 4 focuses on a selection of tools that can be applied for the assessment of organisational OSH culture. Firstly, the criteria for selection as well as the search strategy are discussed. Then, each tool with its specific approach and features is described in detail. Finally, common features of these available tools are discussed, and practical advice is provided on how to select the most appropriate tool and on specific implementation issues.

The conclusions chapter summarises the main findings and most important messages with regard to the assessment of the occupational safety (and health) culture in organisations. Finally, the feasibility of developing a standard European Tool to assess OSH culture is discussed.

2. Taking a cultural approach towards OSH

2.1. Introduction

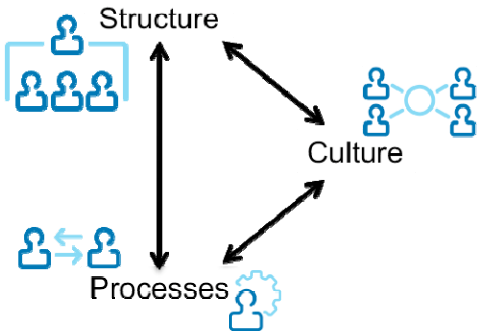
For employers, business managers and OSH professionals striving for excellence in the field of occupational safety and health, the key issue is to ensure that occupational accidents and work-related ill health are prevented as much as possible, and that safe and healthy behaviour among all employees is promoted. In order to achieve continuous improvement of workers' safety and health, a systematic, integrated, proactive, participative, and multiple-strategy approach towards OSH management is needed. This is addressed by the Framework Directive 89/391/EEC (European Union, 1989). Sound OSH management, incorporated into an organisation's overall management and business, and addressing regulatory, technical/engineering, organisational, and managerial aspects, is critical to ensure OSH excellence (EU-OSHA, 2010). However, OSH entails more than just focusing on formal issues. As risk prevention and OSH is about people - or to put it in a more formal way, about investing in and protecting the human capital of an organisation - attention should also be paid to behavioural aspects, and social and cultural processes, in order to attain safer and healthier working environments and better general organisational performance.

In order to better understand how decisions are made in an organisation, where priorities lie and why people actually do what they do (their attitudes and behaviour), we will take a brief look at how an organisation can be analysed.

2.2. The organisational triangle

When looking at an organisation and its activities, three main components can be identified: 'structure', 'processes', and 'culture' (based on Antonsen, 2009[1] and Guldenmund, 2010). The model in figure 1 illustrates these three organisational components and their relationship, as a triangle.[2]

Figure 1: The organisational triangle



Source: based on Antonsen, 2009, p. 44f.; Guldenmund, 2010, p. 85.

[1] Antonsen (2009, p. 44-45) distinguishes the following three components: 'structure', 'culture', and 'interaction' (instead of 'processes').

[2] It should be noted that this is just one organisational model. There exist many more models, some more oriented to business management than the other (such as for instance the 7S Framework by McKinsey). Models always are a simplification of reality, and each model has therefore its strong and weaker points.

- Organisational **structure** is about the *formal* aspects of an organisation. Not only about the infrastructure and "hardware", but also about the distribution of tasks, roles and responsibilities, control, and authority (power). Structure thus determines how the organisational mission should be achieved, and by whom (Guldenmund, 2010, p. 85).
- Organisational **processes** refer to the core business and supporting processes in an organisation. These also comprise management processes and systems, as well as the social/interactional processes i.e. everything that relates to social relationships, communication, exchange of information between the workers in an organisation. These interactional aspects can be seen in features like cooperation, trust, competition, or conflict. (Antonsen, 2009, p. 45). Gort and associates (Gort et al., 2006; EU-OSHA, 2010, pp. 41 f.) address organisational learning as another critical factor, next to 'structure' and 'culture'.
- Organisational **culture**, or corporate culture, applies more to the *informal* aspects of work and organising. It is about what (a group of) people in an organisation value, or value not, as important, and about their underlying common beliefs and convictions.[3] Organisational culture is often described as "the way we do things around here" (Guldenmund, 2010, p. 21).[4] There is not just one overall culture within an organisation. Several cultures can co-exist, typically linked with different units, departments, hierarchical layers, occupations, etc. These cultures within an organisation are not isolated but are obviously affected by the national culture, and specific characteristics from a country, region, sector, industry, or occupation (Antonsen, 2009).

As can be seen in Figure 1, these three major organisational aspects - structure, culture and processes - are closely interrelated and intertwined, acting upon each other and operating at the same time on the people in an organisation. This organisational triangle is situated in, and thus influenced by, a broader context of national, regional, sectoral and/or professional culture, the political and economic situation, policies and regulations, technological development, etc.

2.3. OSH culture

In order to analyse and better understand OSH within an organisation, the organisational triangle model (Figure 1) can be used, and OSH can be approached from the (interrelated) perspectives of the three above mentioned organisational dimensions (see also EU-OSHA, 2010, pp. 14 f.).

Take, for example, an industrial company, one of whose employees has experienced a serious accident. The investigation following the accident reveals that some minor incidents preceded this accident. These 'near-misses' were, however, not reported to the line management, and did not lead to any appropriate measures that could have reduced the risk of the accident happening. From the *processes* perspective, it could be argued that there was a lack of communication on safety issues. Poor communications on safety issues could also be related to structural factors in organisations e.g. because line managers, supervisors, and/or workers are not aware of their specific role and responsibilities related to safety. The problem could also lie in the "softer", *cultural* aspects of the organisation. Working safely and preventing accidents may not form part of the company's value system, leading to an atmosphere of non-compliance with good operating practices, poor safety communication and failure to take effective action to remedy safety and health problems.

[3] Organisational culture however should be regarded as from a different order than national or tribal culture. According to anthropological science, national/tribal culture is associated with communities where the primary socialisation of its members takes place within the borders of the cultural unit, which is not the case for organisations. Organisational culture is not as deeply rooted in the members of the cultural unit as the frames of reference and behaviour conventions of a nation or tribe. (adapted from Antonsen, 2009)

[4] A thorough description/definition of organsational culture by Guldenmund is: 'A relatively stable, multidimensional, holistic construct shared by (groups of) organisational members that supplies a frame of reference and which gives meaning to and/or is typically revealed in certain practices.' (2010, p. 21)

Another example where the organisational triangle model can bring some clarity is the common phenomenon of non-compliance with work procedures (Antonsen, 2009). Why is it that some workers do not carry out their work according to formal procedures and requirements, leading to more unsafe/unhealthy acts and (higher) risks of accidents/ill-health? This problem cannot be resolved by applying traditional OSH approaches (risk-based prevention by means of, amongst others, training and control). A cultural perspective on OSH issues may thus be required to tackle this issue.

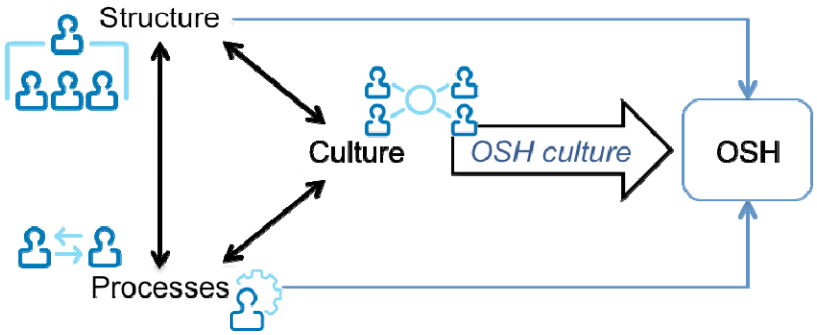
Furthermore, there may be discrepancies between procedures, (local) practices, and the policy statements of an organisation on the one hand and how senior management makes decisions, sets priorities, and acts in its daily operations. The practice of always putting OSH-related items at the end of the meeting agenda, shows for example implicitly that safety and health issues are of less importance than for example production and quality matters.

These simple examples show that, by using the organisational triangle model, safety culture - and more generally 'OSH culture' - can be seen in terms of the relationship between organisational culture and OSH. **OSH culture is about how an organisation's informal aspects influence OSH in a positive or negative way**. This is done at two levels (Antonsen, 2009, p. 151):

- by setting the values and norms, and underlying beliefs and convictions, through which workers deal with or disregard risks;
- by influencing the conventions for (safe or unsafe, healthy or unhealthy) behaviour, interaction, and communication.

The triangle model and Antonsen's analysis both demonstrate that not only should organisational culture be taken into account, but also the total interplay between the different organisational aspects (structure - processes - culture). This implies that cultural issues should not be studied in isolation from other organisational features (Antonsen, 2009). This holistic approach towards OSH culture and OSH is also shown in the model below (Figure 2).

Figure 2: The organisational triangle and its relation with OSH



Source: based on Antonsen, 2009; Guldenmund, 2010.

2.4. Theoretical backgrounds

2.4.1. Introduction

As stated above, OSH culture can be described in terms of the informal, cultural aspects of an organisation. The latter can have an impact on how OSH is perceived and dealt with, and on whether people are aware of OSH-related issues and act in a safe and healthy way.

The term 'OSH culture' is, in fact, not used very commonly. Most research and related literature is instead focused on the concepts of 'safety culture' and 'safety climate'. The notion of corporate 'health culture' is, on the other hand, less widespread in the research literature.

Nevertheless, the term 'OSH culture' is further used in this review in order to stress the interrelatedness between issues linked to occupational safety and work-related health. Moreover, as the relation between poor workplace practices and ill health are less apparent than between unsafe work environments and resulting injuries, the informal aspects influencing occupational health are even more important than those linked to safety issues (IOSH, 2004).

In the next chapters, the concepts of safety culture, safety climate, patient safety culture, and health culture are briefly explained and their backgrounds discussed.

2.4.2. Safety culture

▪ *Background*

The term 'safety culture' appears to have been first used after the Chernobyl disaster in 1986.[5] The investigation report by the International Nuclear Safety Advisory Group (INSAG) of the International Atomic Energy Agency (IAEA) pinpointed "poor safety culture" as one of the contributing factors to this worst nuclear power plant accident in history (INSAG, 1986). Investigations of other major, tragic accidents in the following years, such as the King's Cross underground fire in London (1987) and the explosion of the North Sea oil production platform 'Piper Alpha' (1988)[6], also identified cultural aspects as causal factors (see e.g., Wiegmann et al., 2002; Antonsen, 2009). From then on the concept of safety culture has been used more and more in safety research, particularly in high-risk industries[7] such as the nuclear and petrochemical industry, and (public) mass transportation (railway, aviation), recognising the importance of the human element and soft organisational aspects in accident and risk prevention (Antonsen, p. 10).

▪ *Concepts and definition(s)*

Organisational culture and safety culture are abstract concepts, giving researchers a large degree of freedom on how they understand these concepts and put them into practice (Havold, 2005). This implies that there is a lack of consensus on how the safety culture concept is understood, and no widely accepted definition of the concept either (see Wiegmann et al., 2002; HSL, 2002; Antonsen, 2009, Guldenmund, 2010, p. 182). Wiegmann and associates (2001; 2002, pp. 6 f.) have, for example, identified in the research literature 13 definitions of safety culture, each differing slightly from one another. Most of these definitions are based on the definition supplied by the Advisory Committee on the Safety of Nuclear Installations (ACSNI, 1993). This definition states that:

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[5] The Chernobyl disaster occurred on 26 April 1986, at reactor number four at the Chernobyl plant, near the town of Pripyat, during an unauthorized systems test. A sudden power output surge took place, and when an attempt was made at an emergency shutdown, a more extreme spike in power output occurred which led to the rupture of a reactor vessel as well as a series of explosions. This event exposed the graphite moderator components of the reactor to air and they ignited; the resulting fire sent a plume of radioactive fallout into the atmosphere and over an extensive area, including Pripyat. The plume drifted over large parts of the western Soviet Union, and much of Europe. (Taken from Wikipedia, http://en.wikipedia.org/wiki/Chernobyl_disaster)

[6] Piper Alpha was a North Sea oil production platform. The platform began production in 1976, first as an oil platform and then later converted to gas production. An explosion and resulting fire destroyed it on 6 July 1988, killing 167 men, with only 59 survivors. (Taken from Wikipedia, http://en.wikipedia.org/wiki/Piper_Alpha)

[7] Could also be referred to as High Reliability Organisations (HROs) (High Profile Organisations): organisations consisting of complex systems like nuclear power plants, offshore platforms, airplanes, etc., and accordingly showing very high levels of safety (in order to prevent organisational accidents or disasters) (Antonsen, 2009, p. 11-14).

"the safety culture of an organisation 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 organisation's health and safety programmes." "Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventive measures."

▪ *Perspectives and approaches*

The safety culture concept has, over the past 25 years, been studied internationally by many academics from different scientific backgrounds and disciplines. Roughly, a distinction can be made between the approach taken by psychology-oriented research and the engineering-based approach (based on Antonsen, 2009, pp. 18 ff.; see also HSE, 2005a/b).

- The **psychological approach** focuses specifically on how workers feel about and perceive safety and safety management, and on their attitudes and behaviour regarding risks and safety. This psychological research refers more to the term 'safety climate' than to 'safety culture' (see below).
- The **engineering approach** is more interested in the formal and managerial aspects and systems that have an influence on safety (i.e. management systems, procedures, policies, control systems, etc.). This approach tends to be more practical and oriented towards change and improvement of organisational and safety performance.
- Apart from this divergence between the psychological versus engineering perspective, safety culture can also be analysed from the viewpoint of **organisational (culture) theory**, **anthropology and sociology**. Antonsen (2009, p. 24) regards organisational culture "as the primary matter of investigation in safety culture research".[8] Guldenmund (2010) considers safety culture as that part of organisational culture that is related to safety and risks, and considers this in relation to (amongst others) Schein's theory of organisational culture. This approach allows Guldenmund to describe the concept of safety culture (or at least to analyse and describe the influence of organisational culture on safety) (see below).

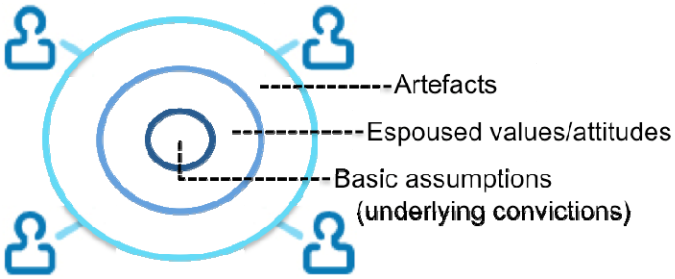
Related to this categorisation, Guldenmund (2010, pp. 183 ff., p. 197) distinguishes respectively the analytic (psychological), the pragmatic, and the academic (anthropological) approach to the study of occupational safety culture. These approaches determine how cultural assessments can be undertaken. The assessment strategies and methods linked to the different perspectives are further discussed in chapter 3.

▪ *Cultural layers*

The image of an onion, consisting of different layers, is often used to visualise organisational and safety culture, using the analogy of a core and several surrounding layers. Edgar Schein (2004), regarded as one of the founders of the concept of organisational culture, makes a distinction between three different levels at which organisational culture can be studied and analysed, namely - from the outside to the core - (1) artefacts, (2) espoused values, and (3) basic assumptions. These three levels are also shown in Figure 3.

[8] Antonsen bases his vision on organisational/safety culture amongst others on the theories of Turner (1978) and Weick et al. (1999).

Figure 3: Layers of organisational culture



Source: based on Schein, 2004; Guldenmund, 2010.

This onion model can be applied to look at safety culture (IAEA, 2002; Guldenmund, 2010, pp. 109 ff.).[9]

- **Artefacts** comprise the tangible/visible and verbally identifiable elements in an organisation. Examples, linked to occupational safety, are safety posters, messages and slogans, documents and reports related to safety (audits, accidents, etc.), work procedures and instructions, dress codes (wearing of personal protective equipment), etc.
- **Espoused values** (adopted values) include the aspects stated or aspired to by the organisation. They are the written or spoken statements made by the employer or business manager (e.g. regarding prioritisation of safety before production goals). Values also include workers' (safety) attitudes towards (1) behaviour (e.g. responsibility, safe working, communication about safety), (2) people (e.g. co-workers, supervision, management), (3) issues related to the "software" (e.g. safety procedures, training), and "hardware" related elements (e.g. preventive measures, personal protective equipment) (Guldenmund, 2010, p. 48).
- **Basic assumptions** are the underlying, shared convictions regarding safety among the members of an organisation. These assumptions are implicit and invisible, but evident for the members. Guldenmund (2010, pp. 49 ff.) gives some examples of safety related assumptions: these could be about what is safe and what is not, about workplaces, their hazards and housekeeping, about the time spent on safety, about whether certain people are likely to show risky behaviour, about the extent to which people should take the initiative or await instruction and about whether it is acceptable to correct other people's unsafe behaviour, etc.

The core of an organisational (safety) culture, i.e. the basic assumptions, is invisible, and cannot be discovered in a direct way. These basic assumptions do however show through the outer layers. This means that the cultural core only can be construed by exploring and assessing the values/attitudes and artefacts.

It is the inconsistencies between espoused values and artefacts that reveal to us the hidden dimension of the basic assumptions and open the view to an organisation's culture. Typical espoused values that are relevant to occupational safety can stress the leadership approach and may prioritise working safely, open communication and worker participation (over secret management decision), flat hierarchy, employee responsibility, promoting training measures for the workers, promoting work-life

[9] Edgar Schein is not the only one who distinguishes and label different cultural layers in an organisations. Guldenmund (2010, p. 192) mentions other authors, like Rousseau, Hofstede, Spencer-Oatey, Trompenaars and Hampden-Turner.

balance, and teamwork. On the other hand, it can stress the responsibility of individuals for safety in a zero tolerance policy, near miss reporting, or continuous motivation of colleagues in safety issues. The question is now whether such espoused values go hand in hand with the artefacts in the company such as incentive systems (e.g. are there incentives for working safely or only for productivity?), management practice (e.g. are safety experts involved in management decisions, is the existing hierarchy involved, who makes decisions in favour of safety relevant activities such as training, etc.?), or company awards (e.g. rewarding good safety practice).

Specific strategies and methods to explore and assess the different cultural layers will be further discussed in chapter 3 of this report.

▪ *Safety climate*

The term 'safety climate' has already been mentioned above, as originating from a psychological approach towards safety culture. Although the two terms and underlying concepts are related, and often used interchangeably, safety climate and safety culture are not the same. Safety climate can be regarded as a more superficial and momentary reflection - a snapshot - of an organisation's safety culture. When considering the different layers of organisational safety culture (Guldenmund, 2010; see figure 3), safety culture addresses the deeper, implicit convictions (at the core) which are shared amongst the members of a group, and which are expressed, amongst others, through the safety climate, i.e. the shared perceptions of workers regarding safety and their working environment (Guldenmund, 2010; Smith and Wadsworth, 2009). Using a metaphor, organisational (safety) culture could be seen as the *personality* of an organisation, whereas (safety) climate as the organisation's *mood* (Cox and Flin, 1998).

Dov Zohar is considered one of the originators of the safety climate approach, starting his research some thirty years ago (Zohar, 1980). Since then, much research and many publications have focused on theoretical and practical issues relating to the topic (see e.g., Flin et al., 2000; Seo et al., 2004; Haukelid, 2008; Guldenmund, 2010). In a recent article, in which thirty years of safety climate research is evaluated, Zohar (2010) stresses three particular targets of safety climate perceptions, which distinguish them from other perception/climate-based concepts, and which should thus be included in further safety climate research:

- Relative priorities of competing demands: safety climate should look at the way workers prioritise safety in comparison to other competing tasks (e.g. safety versus productivity or efficiency).
- Gaps between words and deeds: safety climate should also concentrate on the gap between how line managers prioritise safety (stating how important safety is) and how, in practice, safety is possibly compromised under operational demands.
- Internal consistencies among policies and procedures: safety climate should also focus on the potential inconsistencies between how employers and top managers draw-up policies and procedures, and how these are put in practice by supervisors at lower organisational levels (local adapation).

As will be further discussed in chapter 3, safety climate is assessed by means of quantitative, psychometric questionnaire surveys, so-called 'safety climate scales', measuring the shared perceptions/opinions of a group of workers on certain safety related dimensions or factors. Examples are perceptions towards management, commitment to safety, leadership safety support, worker communication, participation and competence (incl. training aspects) with regard to safety, safety systems (policies, rules, reporting, preventive measures, etc.), risks, and work pressure (see Flin et al., 2000; Seo, 2004). The outcome of such safety climate scales are regarded by many researchers as a predictor or indicator of safety performance (see below).

A key issue with regard to the assessment of an organisation's safety climate is that the outcomes of safety climate scales (i.e. espoused values) are often used to draw direct conclusions about the safety culture (i.e. basic assumptions). Antonsen (2009, p. 17) raises this as a problematic strategy, for the reason that there might be a substantial discrepancy between what people claim to do (i.e. how workers complete (standardised) safety climate questionnaires) and what people actually do and how they behave. This view is supported by Guldenmund (2010, p. 98). He stresses that safety climate surveys tempt people to solely look at an organisation's culture from behind a desk, whereas culture should be "experienced" at all levels of an organisation, exploring the total interplay between the different organisational aspects (structure - processes - culture; see section 2.1-2.2).

▪ *Safety performance*

The key issue of the safety culture approach is evidently to find and demonstrate a link between an organisation's *safety culture* (i.e. the way cultural traits of an organisation influence safety) on the one hand, and *safety performance* on the other. Indicators of safety performance can be the number of safety incidents (official accident data, self-reported or observed incidents/near misses), workers' compliance with safety related rules and procedures, and workers' (unsafe) behaviour. The underlying reasoning is that by enforcing and enhancing an organisation's safety culture - assuming that this is feasible - workers' behaviour, compliance and participation (i.e. their willingness and motivation to contribute to safety beyond the minimum requirements) would be influenced positively, eventually leading to a higher level of safety in an organisation (Guldenmund, 2010, p. 97).

There exists increasing evidence, based amongst others on meta-analytic reviews, that safety climate (i.e. workers' shared perceptions measured by means of questionnaire surveys) is a predictor for safety performance, and this across industries and countries (Clarke, 2006; Nahrgang et al., 2008; Christian et al., 2009; Kuenzi and Schminke, 2009). A recent study by Smith and Wadsworth (2009) not only showed a link between safety climate and safety performance at corporate level, but also a consistent and independent association between employees' perceptions and individual safety performance, health, and wellbeing.

The fact that safety climate can be regarded as a predictor for safety performance, is of course appealing, as this can form a basis for a more proactive approach toward OSH - i.e. taking preventive actions before work related accidents actually occur (Flin et al., 2000; Antonsen, 2009, p. 61). The research findings mentioned above, revealing the predictive value of safety climate, are however mainly focused on *occupational accidents* as a safety performance indicator. Antonsen (2009, p. 62) argues that this might not be the case when looking at major *organisational accidents* or disasters (in the high-risk industry). Based on a case study of a serious incident at a Norwegian oil and gas platform ('Snorre Alpha', 2003), Antonsen (2009) reveals a gap between the outcomes of a safety climate survey conducted in the year before the incident and the conclusions of the post incident investigations. He therefore favours, together with other researchers such as Guldenmund, a more holistic, 'triangulation' approach for assessing an organisation's safety culture (see section 3.2.5).

2.4.3. Patient safety culture

A related topic with regard to the safety culture concept, is 'patient safety culture'. The European Society for Quality in Health Care (ESQHC) adopted, in 2006, the following definition of patient safety culture: (cited from EUNetPaS, 2010a)

> "An integrated pattern of individual and organisational behaviour, based upon shared beliefs and values that continuously seeks to minimise patient harm, which may result from the processes of care delivery."

As the patient safety culture concept is more directed towards the protection of patients instead of the employees of hospitals and other healthcare organisations, the subject of patient safety will not further be discussed in this report.

It is however worth noting that the European Network for Patient Safety (EUNetPaS)[10] has recently published a catalogue of Patient Safety Culture Instruments (PSCI) used in the different EU Member States (EUNetPaS, 2010a, 2010b). The most frequently used instruments appear to be the following instruments:

- the 'Hospital Survey on Patient Safety Culture' from the Agency for Healthcare Research and Quality (AHRQ, USA)
- the 'Safety Attitudes Questionnaire' from the University of Texas / Johns Hopkins University (USA)
- the 'Manchester Patient Safety Assessment Framework' (UK).

Another interesting document on patient safety, including patient safety culture, is a recent publication by the World Health Organisation (WHO) (Flin et al., 2009).

2.4.4. Health culture

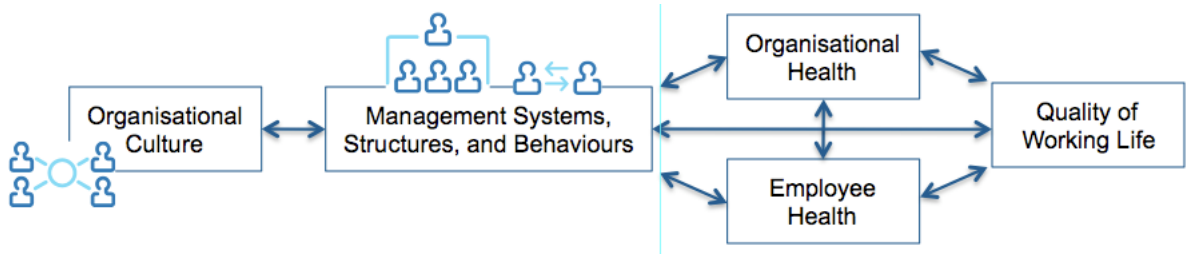
Organisational culture is often emphasised as an important determinant of behavioural change regarding OSH. However, as is mentioned and shown in the sections above, elaboration is mainly on how culture relates to safety: the so-called safety culture (and safety climate). Whereas a tradition of safety culture exists, the topic of organisational health culture is relatively underdeveloped. Consequently, tools and instruments concerning corporate health culture are hardly found (see below). In the (scientific) literature however, there are some developments concerning organisational culture in relation to health that are worthwhile to describe.

The impact of the social environment on health is often demonstrated, as in well-known models like the job-demand-support framework (Karasek and Theorell, 1990), the effort-reward-imbalance (ERI) model (Siegrist, 1996) and the Job Demands-Resources (JDR) model (Demerouti et al, 2001; Bakker and Demerouti, 2007). These models are often used to explain the type of social environment that should be created in order to improve (psychosocial) health. However, in this research tradition the connection with organisational culture development is only marginally made explicit so far. Possible links between the social environment and workers' health have not been explored extensively in the psychosocial research literature.

The term ‘health culture’ indeed exists in the literature and is used to denote the connection with organisational culture. Creating ‘a culture of wellness’ (Stokes, 2006) or ‘a culture of health’ (Crimmins, 2009) is often recommended to enable participation on worksite wellness programs and creating management commitment to health. Health culture in this definition refers to employees’ values and attitudes towards health promotion at worksites (Crimmins, 2009). Other studies emphasise a closer connection between health and organisational culture development. Peterson and Wilson (1998) already introduced their Culture-Work-Health model in 1998 (see figure 4).

[10] The European Network for Patient Safety (EUNetPaS) is a project which was funded and supported by the European Commission within the 2007 Public Health Programme. More information on: http://www.eunetpas.eu/

Figure 4: Culture-Work-Health model



Source: adapted from Peterson and Wilson, 1998.

In this model, Peterson and Wilson (1998) recommended that occupational health professionals and organisational development professionals focus their research and interventions efforts on understanding and addressing organisational culture from both an individual and an organisational health perspective. The health of an organisation in this model refers to organisations being adaptable, flexible and productive. For an organisation to be adaptable, flexible and productive, it necessitates that workers possess a sufficient level of physical and psychological well-being. Therefore a strong, interdependent relationship between individual and organisational health was recommended, based on a cooperative social exchange between workers.

In 2002, Peterson and Wilson refined this Culture-Work-Health model regarding work-related stress. Organisational culture was seen as an important component of work stress and was suggested to be key to creating effective organisational stress interventions. The Culture-Work-Health model provides the opportunity to address work stress from a positive managerial perspective.

Traditionally, work-related stress is framed within a problem solving health context. From this focus on adverse health effects, a main aim is to diminish the impact of a harmful social work environment. From a health perspective, organisational culture therefore often is recognised as a determinant of adverse health effects. From a management perspective, organisational culture is positively framed, closely related to company identity and business success. Managers should aim to develop their organisational culture in a positive way, instead of reducing the impact of a harmful culture from the risk based work stress perspective. The Culture-Work-Health model inspires health researchers to frame organisational culture in a positive way, as an enabling factor to develop a health promoting social work environment. Peterson and Wilson concluded that by using the Culture-Work-Health model, and framing work stress in a cultural context, work stress becomes a simultaneous managerial and business concern.

Recently, partially based on the above-mentioned notions, the literature reveals different approaches that show a more profound connection between organisational culture development and health. In this section we mention three of them: social capital, psychosocial safety climate and the concept of healthy organizations.

- Organisational **social capital** is operationalised as justice, trust and cooperation (Kristensen et al., 2007; Kristensen, 2010). It is closely connected to organisational culture and has also demonstrated a positive impact on health (Hasle et al., 2007, Kouvonen et al., 2008, Oksanen et al., 2008). The concept of organisational social capital is useful for a further exploration and development of tools and materials that measure organisational health culture.
- Dollard and colleagues (Dollard, 2007; Dollard and Bakker, 2009) introduced the topic of **Psychosocial Safety Climate (PSC)** (not to be confused with Patient Safety Culture/Climate, see section 2.4.4). PSC is defined as policies, practices and procedures for the protection of worker psychological health and safety (Dollard 2007). PSC is seen as an organisational resource that would precede the work context and in turn would predict psychosocial health

and work engagement. PSC is suggested to be a key upstream component of work stress theory and a logical intervention point for work stress interventions. Suggestions to develop tools and instruments are currently limited to build PSC through senior management (top management) involvement and commitment and the enactment of related policies, practices and procedures.

- A more managerial and business aspect of health in relation to organisational culture is further explored in the concept of 'healthy organisations'. A **healthy organisation** is "one whose culture, management, working climate and other business practices create an environment that promotes the health, effectiveness and performance of its employees" (Enterprise for Health network (EfH), 2008). Healthy organisations are able to balance economic performance goals with employee health and wellness goals, and can adapt the balance within the context of a continuously changing economic and social environment. Likewise, the European Network of Workplace Health Promotion (ENWHP)[11] strive for 'healthy employees in healthy organizations'. Management and business traditions are used to develop tools and instruments to create a health culture, but so far it is still in its infancy.

Based on this short overview of research developments, it is concluded that different research traditions recognise the mutual interaction between organisational culture and health. However, so far it has not resulted in theory or research-based health culture tool development. The managerial and business concerns of health, when framed in a cultural context, are not fully applied yet in health research. Considering the above-mentioned initiatives on social capital, PSC and healthy organisations, the development of interventions, tools and instruments will probably happen in the near future.

2.5. Conclusion

This chapter aimed to give a brief insight into the subject of OSH culture. It is a complex matter, that has been subject of research and related academic discussions. Although the term OSH culture is used here, research has, for the most part, been focusing on cultural aspects linked to occupational *safety* (safety culture and climate). Conversely, the topic of corporate *health* culture has received less attention from research. As the European Agency for Safety and Health at Work (EU-OSHA), amongst others, aims to address work-related safety and health issues as one joint matter, the term of 'OSH culture' is applied in this review.

OSH culture can be seen as a concept for exploring how informal organisational aspects influence OSH in a positive or negative way. This involves a holistic approach, in which not only organisational cultural aspects, but also other structures and process related issues should be included and addressed. This does not, however, imply that OSH should only be seen in terms of, and reduced to a matter of, culture (Antonsen, 2009, p. 45).

This vision on OSH culture might also require a broader view on occupational safety and health. Whereas OSH is still mostly approached from a traditional *risk based* perspective (see also the Framework Directive 89/391/EEC (European Union, 1989)), a more *resource based* approach can provide new opportunities to better understand and explore the influence of cultural aspects of OSH. In the research literature related to occupational health for example, there is a growing focus on personal growth, wellbeing and health, which can be endorsed by a corporate culture. The same is true in safety research, where the concept of 'resilience' gains attention.

[11] See also: European Network of Workplace Health Promotion (ENWHP), http://www.enwhp.org.

Resilience Engineering focuses, in contrast to traditional safety thinking, on the ability of a system to actively anticipate changes and threats, and to take actions to prevent occupational accidents and major economic losses.[12] As this resilience approach implies a good understanding about the way a system actually performs, information retrieved from a cultural viewpoint (i.e. exploring the match between formal and informal aspects of work) can absolutely provide an added value (Antonsen, 2009, p. 129).

Taking a cultural approach towards OSH does not mean that the key focus should be on *changing* the corporate OSH culture (Antonsen, 2009, p 141). Looking at the different layers of an organisation's culture, attempting to change the core cultural elements, (i.e the shared basic assumptions), would require a lot of time and energy (Guldenmund, 2010, p. 54, 196). OSH culture should, therefore, be seen as an approach to look in a different way at an organisation, at how OSH is dealt with at all hierarchic levels. The knowledge and information, gained from such a cultural approach and assessment, can then in turn be very useful in the process of changing OSH-related policies, processes, and practices step by step, adapting them to the existing local culture and circumstances, and eventually leading to better OSH performance (Guldenmund, 2010, pp. 188 f., 196).

The question is how an organisation's OSH culture can be explored and assessed in practice. This is discussed in the next chapter.

[12] Adapted from the Resilience Engineering Consortium (USA), http://resilience-engineering.com. Resilience Engineering is a paradigm within safety research that looks at how complex systems show a capability to recover the balance after a mishap, or keep the balance in the presence of continuous stresses like production pressures and economic challenges such as being involved in mergers and acquisitions. More information on the technical discipline of Resilience Engineering is also available at www.resilience-engineering.org. A reference publication in the matter is one by Hollnagel and Woods (2006).

3. Assessing an organisation's OSH culture

3.1. Introduction

The previous chapter discussed the meaning of a cultural approach towards OSH and what this entails (the 'why' question). This chapter deals with the 'how' question, i.e. which methods and tools exist to assess the OSH culture in an organisation, which one(s) should be used in a particular organisation or situation, and what can be done with the assessment outcomes. The next chapter, Chapter 4, will then focus on a selection of tools that are free at the point of use and freely available.

As previously stated and explained (see section 2.4.4), the literature review didn't identify any specific tools for the assessment of corporate health culture. The focus of this review will therefore be on safety culture and related assessment tools. The assessment approaches to safety culture that will be discussed in this chapter could, however, be applied to the assessment of the health culture(s) in an organisation. There is, in this regard, a need for developing specific health culture assessment tools and/or integrated OSH culture assessment tools.

In addition, the topic of patient safety, and related instruments for measuring and assessing patient safety culture (PSC), are excluded from this report (see section 2.4.3).

3.2. Approaches and assessment strategies

3.2.1. Three approaches

The fact that safety culture can be approached and studied from different angles, was already mentioned in the previous chapter. Guldenmund distinguishes for example three broad approaches: the academic (anthropological), analytical (psychological) and the pragmatic (Guldenmund, 2010, pp. 183 ff., p. 197). These distinct approaches each entail specific methods and instruments to assess an organisation's safety culture. The respective characteristics of, and differences between, these three strategies are shown in table 1 and further discussed in the next sections. Table 1 provides, for each of the three approaches, information on the period in (the organisation's) time it focuses on (past, present or future), the kind of information it aims to retrieve (qualitative versus quantitative information), its specific research characteristics (descriptive versus normative) , and the related assessment strategy and methods (instruments).

Table 1: The analytic, academic and pragmatic approach towards safety culture

Main approach	Time focus	Information aimed to retrieve	Research characteristics	Assessment strategy and methods
Academic (anthropological)	Past	Qualitative information	Descriptive	Fieldwork, ethnographical-inspired methods (e.g. document analysis, observations, focus groups, interviews, etc.)
Analytical (psychological)	Present	Quantitative information, on the safety climate	Descriptive	Safety climate scales, questionnaires
Pragmatic (experience based)	Future	Safety culture maturity (level)	Normative, prescriptive	Behaviourally Anchored Rating Scales (BARS)

Source: based on Guldenmund (2010, pp. 183 ff., p. 197).

3.2.2. Analytical assessment approach

The analytical or psychological/psychometric approach is the most popular and predominant approach in safety culture assessment, and focuses specifically on organisational safety climate (see also 2.4.2; Hopkins, 2006; Antonsen, 2009; Guldenmund, 2010). Safety climate is assessed/measured by conducting questionnaire surveys among a group of workers in an organisation. In such surveys, workers are asked to complete a specific, standardised questionnaire, i.e. giving their perception/opinion (or the perception that is shared among the co-workers) on certain safety related dimensions. The resulting data of the survey are processed and analysed, providing a snapshot of the present safety climate in an organisation.

These survey questionnaires can be rather simple (one page) or more exhaustive (up to 100 and more items), using tick boxes or Likert scales for responses. The simpler it is, the rougher will be the results. On the other hand too many questions will reduce the response rate significantly. In its guideline, the IAEA recommends around 60-80 items to cover the most important topics (IAEA, 2002).

Safety climate (and underlying safety climate dimensions), is typically assessed using standardised questionnaires with numerical results. This allows comparisons to be made with past results (in order to quantify change processes or to assess the effects of interventions), and/or with results from other working groups or units. According to Guldenmund (2007; 2010, p. 118), however, this potential for comparison/benchmarking within or between organisations is rather limited.

As already mentioned above (section 2.4.2), the measured safety climate appears to be a (strong) predictor for safety performance, which makes it a very appealing construct for researchers, managers and OSH professionals (see e.g. Clarke, 2006; Nahrgang et al., 2008; Christian et al., 2009; Kuenzi and Schminke, 2009).

Zohar (1980) developed one of the first safety climate scales. Since then many safety climate scales have been developed, tested and applied worldwide, in a wide range of sectors and occupations. Several research publications have collected, examined and compared existing safety climate questionnaires in order to analyse their underlying definitions, theories, factors (dimensions), their predictive validity, etc. (see e.g., Flin et al., 2000; Davies et al., 2001; Seo et al., 2004; HSE, 2005a/b; Haukelid, 2008; Guldenmund, 2010).

A review by Seo et al. (2004), in which 16 safety climate questionnaires were examined, identified the following five core constructs/dimensions of the safety climate concept:

- management commitment to safety
- supervisor safety support
- co-worker safety support
- employee participation in safety-related decision making and activities
- competence level of employees with regard to safety.

Table 2 provides a non-exhaustive list of existing safety climate questionnaires, with their title/name, developer, and country and sector of origin.

Table 2: Non-exhaustive list of safety climate questionnaires and toolkits

Title/Name (Acronym)	Developer/Author	Country of origin	Sector of origin	Charact eristics*
Loughborough Safety Climate Assessment Toolkit (LSCAT)	Loughborough University, Health & Safety Executive (HSE), and a number of offshore organisations (Cox & Cheyne, 2000)	UK	Offshore oil and gas installations (but adaptable for broader use)	T
Safety Health of Maintenance Engineering (ShoMe) Tool	UK Civil Aviation Authority (CAA) (Developed by Health and Safety Engineering Consultants (HSEC) Ltd.)	UK	Aviation maintenance	(T)
Safety Culture Toolbox	Eurocontrol (Developed with the help of Aberdeen University)	EU	Air Navigation Services Providers (ANSP)	T, M
HRMI Safety Culture Inspection Toolkit	Her Majesty's Railway Inspectorate (HMRI) (Developed by Human Engineering Ltd. (HSE, 2005a/b))	UK	Railway	T, M, R
RSSB Safety Culture Improvement Toolkit	Rail Safety and Standards Board (RSSB)	UK	Railway	T, M
Multilevel Safety Climate (MSC) Scale (Organisational and Group-level Safety Climate)	Zohar (1980), Zohar and Luria (2005)	Israel	Manufacturing	R
Offshore Safety Questionnaire (OSQ) Offshore Safety Climate Questionnaire (OSQ99)	Robert Gordon University / Aberdeen University (Mearns et al., 1998, 2003)	UK	Offshore oil and gas installations	C?, R
Commercial Aviation Safety Survey (CASS)	Federal Aviation Administration (FAA) (Developed by University of Illnois) (Wiegmann, 2003, 2004)	US	Commercial aviation, aviation maintenance	M
Norwegian Offshore Risk and Safety Climate Inventory (NORSCI)	International Research Institute of Stavanger (IRIS) (Tharaldsen et al., 2008)	Norway	Offshore	C
Nordic Occupational Safety Climate Questionnaire (NOSACQ)	Consortium of Scandinavian organisations (Kines et al., in press)	Nordic countries	Construction (now in high-risk industries)	
HSL Safety Climate Tool (SCT)	Health & Safety Laboratory (HSL)	UK		C

Title/Name (Acronym)	Developer/Author	Country of origin	Sector of origin	Characteristics*
Safety Awareness Questionnaire (SAQ) (Arbeitstätigkeit und Umgang mit Sicherheit)	ETH Zürich and Swiss Re (Grote & Künzler, 2000; Grote, 2008)	Switzerland	Petrochemical (now in all high-risk industries)	C?, R
Organisational and Safety Climate Inventory (OSCI)	Centro de Investigacao e Intervencao Social (CIS) (Silva et al., 2004)	Portugal		R

* C = commercial, not free of charge at the point of use; M = only for members; T = toolbox/toolkit, containing amongst others a questionnaire; R = mentioned in research article(s).

Some of the instruments mentioned in table 2, such as the Loughborough Safety Climate Assessment Toolkit (LSCAT) and Safety Health of Maintenance Engineering (ShoMe) Tool, are better described as toolboxes or toolkits, providing several instruments for the assessment of safety culture, of which one is a safety climate questionnaire.

It should also be noted that some of the safety climate assessment instruments in table 2, such as the HSL Safety Climate Tool (SCT), are commercial products and thus not cost free. Other instruments, such as the Swiss Safety Awareness Questionnaire (SAQ) (Arbeitstätigkeit und Umgang mit Sicherheit) or the Portuguese Organisational and Safety Climate Inventory (OSCI) are only mentioned in scientific publications, which makes it unclear whether these questionnaires are freely available and from where they can be obtained (this is however usually by contacting the respective author). Furthermore, it is questionable whether most of these questionnaires - even if they were free to obtain and to use - are really applicable and of practical use for OSH practitioners in the field. Carrying out questionnaire surveys, and analysing and interpreting the outcome data, requires some minimum knowledge and competencies in this particular area of research.

In Chapter 4, three instruments that take an analytical approach to safety culture, are described in more detail. The LSCAT, SHoMe and NOSACQ are all publicly available, free of charge at the point of use, and contain some kind of user guidance.

Lastly, it is important to mention that, when conducting a (safety climate) questionnaire survey, some basic principles need to be taken into account (NRCWE, undated):[13]

- A safety climate survey should only be done when there is support from senior management (top management), including a clear intention of action. A survey without subsequent action is worse than no survey.
- Management, supervisors and workers should all participate and be committed during the process.
- Survey results should be seen as a constructive feedback, to be used for dialogue and improvement rather than as a basis for criticism.

[13] Adapted from: Danish National Research Centre for the Working Environment (NRCWE), NOSACQ-50, Soft Guidelines, available at: http://www.arbejdsmiljoforskning.dk/Sp%C3%B8rgeskemaer/NOSACQ-50/NOSACQ-50%20Soft%20guidelines.aspx?lang=da.

- Participation should be voluntary, and informed consent is needed from the participants. Anonymity of the respondents needs to be guaranteed. When presenting survey results, data from very small groups (e.g. less than 20 members in a working group) should be left out.
- Employees should have the right to see and discuss the survey results. This should be done in a constructive manner. This also implies that the language for example should be understandable for everyone.

3.2.3. Academic assessment approach

The academic approach focuses more on things from the past, i.e. accident statistics, policy statements, etc. (Guldenmund, 2010, p. 197). This contrasts with the analytical approach that uses questionnaire surveys to focus more on the present situation, attempting to quantify the safety culture/climate.

This is a descriptive approach, meaning that it seeks to describe and understand safety culture rather than judging it, seeking to promote change and improvement (which is also the case in the pragmatic approach, see below) (Antonsen, 2009, pp. 19 f.). For this purpose, specific data collection methods are used that are based on, or at least "inspired by", anthropological and sociological research.[14] This implies that required data and information are collected through 'fieldwork' in the whole organisation, using techniques such as observations, document analysis and interviews (Antonsen, 2009, pp. 82 ff.; Guldenmund, 2010, pp. 114 ff.). These techniques are briefly described below, making links to the specific cultural layer(s) (artefacts - espoused values - basic assumptions) that the approach specifically aims to unravel (see also above, 2.4.2).

- **Observations** function to generate an overview of typical artefacts of an organisation. Management and workers are typically observed during their normal work to get information on working practices, processes, communication channels, decision making, symbols, etc. Observations can be made discreetly or using participant observation methods.
- **Documentation analysis** can reveal artefacts or espoused values in the organisation. Internal documentation can tell much about management processes, decision-making and communication (e.g. quality management system documentation). Documentation which is directed to the public or which is channelled through media such as intranet or further internal communication channels (e.g. newsletter, self-presentation, organisation’s policy statements, business ethics, etc.) often deal with espoused values.
- **Personal interviews** with company management, safety experts or workers in sensitive areas are regularly done to learn more about management and safety practice in the company (which can be both artefacts or values) and can provide a deeper insight into complex contexts. As the aim of such interviews is to get qualitative estimations of experts. Hence, open questions are the most suitable interviewing technique, but this makes the interpretation of the results rather difficult.
- **Open discussions in groups (focus group interviews, focus groups)** can be used to discuss findings and observations, and can help to get a more qualitative insight into an organisation. They need to be conducted by a specialist as the answers will be highly influenced by group dynamics and the method is still more open than the qualitative interviews.

[14] Antonsen (2009, p. 84) uses the term 'ethnographically *inspired* methods' instead of 'ethnographic methods', pointing out the fact that pure ethnographic research is from a practical point of view rather impossible with regard to safety-related assessments. A real ethnographic study may require spending months or even years in a certain context. This is of course mostly not feasible for OSH researchers.

This makes it necessary to guide the discussion in order to keep the scope and to have an interpretable outcome.

What all these techniques/instruments have in common is that they should be preferably applied by a person from outside the organisation, who has a rather neutral point of view and who should have the expertise needed in conducting the assessment.

The use of ethnographic research methods in safety is - apart from examples by Antonsen (2009) and Guldenmund (2010) - also described by Brooks (2008), in a study of organisational safety culture in a SME (furniture-manufacturing company). He underlines the fact that such field studies can be very time consuming[15], which might encourage people to use quicker methods such as safety climate questionnaires. However, the deepest layers of an organisation's culture can only be uncovered and understood by applying a more academic approach.

3.2.4. Pragmatic assessment approach

Apart from the analytical and academic assessment approach, Guldenmund (2010, pp. 186 ff.) also distinguishes the pragmatic approach. In this approach the focus is on assessing an organisation's current state of *maturity* regarding safety culture, giving it a ranking on a predefined 'cultural maturity ladder' that shows different levels or stages of cultural maturity. The aim is not to assess the current situation as such, but to define and explore what should be done to develop the organisation's safety culture to a higher level of maturity (or at least maintain the current level of maturity). The pragmatic approach is thus future-oriented and prescriptive (normative) as opposed to descriptive.

Table 3 gives three examples of existing methods/tools that focus specifcally on such a pragmatic, normative approach towards safety culture.[16]

Table 3: Non-exhaustive list of safety culture maturity assessment tools

Title/Name (Acronym)	Developer/Author	Country of origin	Sector of origin	Charact eristics*
Hearts & Minds Programme/Toolkit	Energy Institute - Shell (Developed by Leiden and Manchester Universities) (Parker, Lawrie, Hudson)	UK	Offshore oil and gas	C (some parts are free), T
Safety Culture Maturity Model (SCMM)	The Keil Centre (Lardner, 2004; Lardner et al., 2001; Fleming, 2000)	UK	Offshore oil and gas	C

[15] Brooks (2008) for example states to have spent 500+ hours of direct observation and interaction in order to collect and analyse the necessary ethnographic data from the respective company.

[16] 'Changing Minds' is a publication by the UK Oil & Gas Industry (Step Change) which provides some useful information on certain pragmatic safety culture assessment tools. It is available in English at: http://stepchangeinsafety.net/ResourceFiles/Changing%20Minds%20Guide.PDF.
Step Change. Changing Minds - A Practical Guide for Behavioural Change in the Oil & Gas Industry. http://step.steel-sci.org.

Title/Name (Acronym)	Developer/Author	Country of origin	Sector of origin	Charact eristics*
Safety Culture Indicator Scale Measurement System (SCISMS)	Federal Aviation Administration (FAA) (Developed by University of Illnois) (Von Thaden, 2008)	US	Commercial aviation	M

* C = commercial, not free of charge at the point of use; M = only for members; T = toolbox/toolkit, containing several instruments.

The most popular example of the pragmatic approach is the 'Hearts & Minds' Programme, which is used in large parts of the world. This Programme was developed by Shell (originally for the offshore industry), and distinguishes five different stages of cultural maturity (the 'HSE Culture Step Ladder'): (1) Pathological, (2) Reactive, (3) Calculative, (4) Proactive, and (5) Generative. One of the tools of the Hearts & Minds Toolkit is the 'Understanding Your Culture Checklist', which can be used to assess the safety culture development. It is a so-called 'Behaviourally Anchored Rating Scale' (BARS)[17] (Guldenmund, 2010, p. 124). The Checklist needs to be completed by a group or team of workers during a workshop, led by an expert (focus group, see above 3.2.4). The answers to the different items/dimensions ultimately indicate the safety culture maturity i.e. one of the five stages of the HSE Culture Step Ladder. The outcomes of such an assessment are then further linked to other tools and strategies that can be used to improve the organisation's safety culture. This tool is further described in detail in section 4.3.3.

3.2.5. Triangulation

The three above mentioned assessment strategies provide each a different way of looking at and assessing an organisation's safety culture (using specific instruments). None of them should however be seen as being the one and only, true approach. On the contrary, they should rather be regarded as complementary (Guldenmund, 2010, p. 197). A questionnaire survey (i.e. quantitative, analytical approach) can, for example, result in some (numerical) outcomes, which could then be further checked and explored by means of interviews with staff (i.e. qualitative, academic, particpatory approach) (Guldenmund, 2010, p. 120). Kirwan (Eurocontrol, 2008, p. 18) compares the assessment of an organisation's safety culture in this regard with a medical diagnosis. A safety climate questionnaire survey could be seen as a general check-up with your local doctor or general practitioner. This first diagnosis can then - if necessary - be followed by more thorough investigations, using different instruments and techniques.

Many authors put emphasis on the fact that not one single approach or technique is suitable for understanding and exploring safety culture. Rather, a multi-method and holistic approach should be taken towards safety culture (see e.g., Antonsen, 2009, p. 81, Grote, 2008, Haukelid, 2008, Guldenmund, 2007). This approach, using multiple strategies, is also called 'triangulation'[18].

This triangulation approach is for example also expressed by the fact that several safety culture assessment *toolboxes (toolkits)* exist, each containing and providing different tools and instruments.

[17] Behaviorally Anchored Rating Scales (BARS) are scales used to rate performance. It is an appraisal method that aims to anchor a quantified scale with specific narrative examples of good, moderate, and poor performance. (Taken from: Wikipedia, http://en.wikipedia.org/wiki/Behaviorally_anchored_rating_scales)

[18] In the social sciences, triangulation is often used to indicate that more than two methods is used in a study with a view to double (or triple) checking results. (Taken from: Wikipedia, http://en.wikipedia.org/wiki/Triangulation_%28social_science%29)

Examples from Table 2 are the Loughborough Safety Climate Assessment Toolkit (LSCAT), Safety Culture Toolbox, HRMI Safety Culture Inspection Toolkit and RSSB Safety Culture Improvement Toolkit. The next chapter describes amongst others a publication/approach developed by the International Atomic Energy Agency (IAEA), namely the 'IAEA Guidance for Use in the Enhancement of Safety Culture', which provides multiple methods and instruments to achieve one goal: a better understanding of the organisation's safety culture.

3.2.6. Before starting - Pre-assessment considerations

According to Guldenmund (2010, p. 102) there are two major motives that might instigate a safety culture assessment in an organisation:

- aiming at (cultural) change or improvement (which is often part of a larger agenda)
- trying to solve a specific persistent problem.

In the first case, a pragmatic, prescriptive (normative) approach should be included in the process, in order to explore and define what should be done to foster an increased level of the organisation's safety culture. In the latter case, a more academic approach might be more relevant, using in-depth tools, like observations, document analyses and interviews, to try to find out which cultural/informal aspects might lie at the root of a persistent safety-related problem in the organisation.

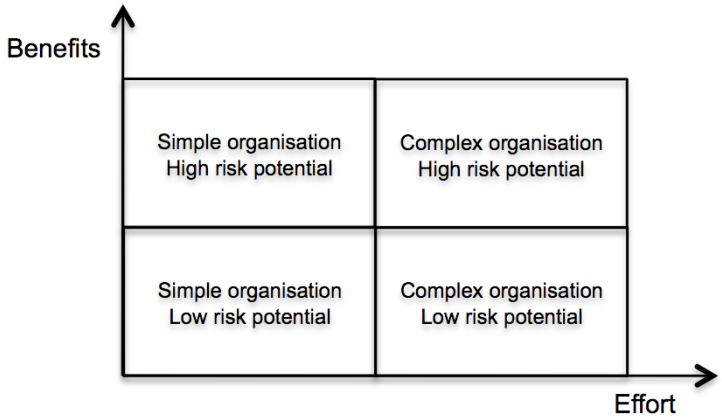
Before starting with the assessment of an organisation's safety culture, and deciding which strategy and specific tools to use, one should first try to determine the true purpose of such an assessment. The following questions need to be considered before taking further steps towards assessing safety culture (see also Guldenmund, p. 128):

- How complex is the organisation?
- Is there a concrete reason for the assessment and are there risks which should be taken into account?
- Are there areas of elevated risk for workers and/or environment that should be treated with priority?
- Can these areas of elevated risk be assessed separately or will the safety culture assessment be carried out in the whole organisation?

The more complex an organisation, the higher its potential risk[19] and the more sophisticated the safety culture assessment should be (see also figure 5). This means that more effort and resources need to be put into carrying out the assessment. On the other hand, the potential benefit will be higher. Many calculations have been done by expert organisations that demonstrate the fact that good OSH practice usually pays off in terms of more productivity, less sick leave and also in directly saved money. DGUV, the roof organisation of German Statutory Accident Insurances, calculates a 'return on prevention' of 1.6 for an average company (which can be higher if the investment in prevention used to be low). These numbers are based on a study carried out by IAG Dresden among German enterprises. This study revealed that 33 of 34 companies stated that money invested in prevention pays off in terms of monetary benefits for the company. The average of the cost benefit relation in the companies was 1:1.67 and the median 1:1.54. The company average profit was estimated 436.10 EUR per worker per year (Kohstall et al., 2008, p. 37 ff.).

[19] Risk is defined as the factor of a potential loss (in terms of work and environment safety, an event which harms workers or pollutes the environment) and the probability of its realisation. Every company is obliged to estimate risks for the workers in the workplace risk assessment process. Commonly it is done by the help of a matrix. See also: EU-OSHA, http://osha.europa.eu/en/topics/riskassessment/index_html.

Figure 5: Effort-benefit correlation

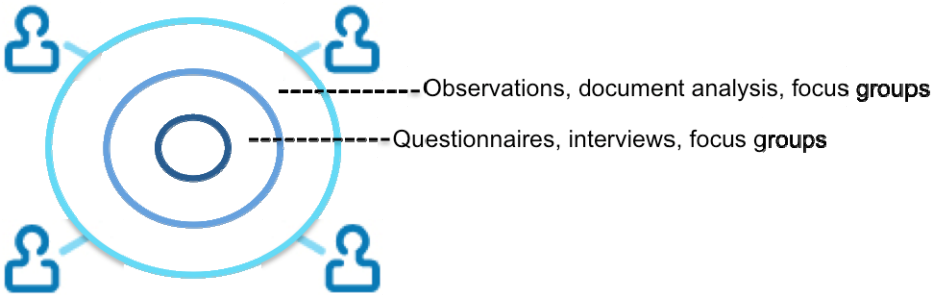


3.3. Conclusion

This chapter discussed three distinct, but complementary, approaches to studying and assessing an organisation's safety culture. Each assessment strategy has its own characteristics, ranging from descriptive to normative, and from orientation towards an organisation's past, present or future. These differences are reflected in different assessment instruments and techniques, which can be quantitative (e.g. safety climate scales, BARS) or more qualitative (ethnographically inspired methods such as observations, document analyses, interviews).

It is interesting to link the different assessment instruments to the cultural layers of an organisation, i.e. the artefacts, espoused values, and basic assumptions. This relation is summarised in figure 6 and Table 4 (Guldenmund , 2010).

Figure 6: Layers of organisational culture and related assessment instruments



Source: based on Guldenmund, 2010.

As is already noted in section 2.4.2, the core of an organisation's (safety) culture, i.e. the basic assumptions, is invisible, and cannot be assessed in a direct way. It is therefore necessary to explore the outer layers - the artefacts (behaviour, symbols, documents) and values - in order to get a better understanding of these deeper convictions.

Table 4: Overview of different safety culture assessment instruments

Tool / instrument	Layer			Focus	Remarks
	Arte-facts	Es-poused values	Basic assum ptions		
Observations (participative, structured)	x			Practices, processes, communication channels, decision making, symbols.	Observations can be time consuming. There will also be a certain bias in the observer's interpretations. Can be selective or manipulative, especially when done as participant observations.
Documentation analysis	x	x		Management processes, decision making and communication, self-presentation, company's policy statements, business ethics.	The documentation of public sector organisation will be highly selective. On the other hand this will help to describe discrepancies between artefacts and espoused values.
Qualitative interviews (audit or open)	x	x		Deeper insight into complex contexts, qualitative estimations of experts with regard to management and safety.	Qualitative interviews help to get an insight to complex contexts. Answers will probably be selective (biased) or show desirability effects.
Questionnaire surveys (quantitative interviews)	x	x		Management practice (in safety issues) from the workers' point of view, workers' own approach and perceptions towards safety.	Quantitative interviews need time and expertise. There will always be a compromise between accuracy (number of items) and length. Should not be used as only instrument.
Group discussions (focus groups)	x	x		Deeper insight into complex contexts, qualitative estimations of experts with regard to management and safety, discussion of (interim) results.	Group discussions need to be conducted in order to get the right information and to focus on the key issues. Can also be used as steering instrument for the whole process and for the discussion of findings.

Source: based on Guldenmund, 2010.

4. Selection of OSH culture assessment tools

4.1. Introduction

In this chapter, a selection of tools is provided that can be applied for the assessment of organisational OSH culture. Firstly, the criteria for selection as well as the search strategy are discussed. Then, each tool with its specific approach and features is described in detail. Finally, common features of these available tools are discussed, and practical advice is provided on how to select the most appropriate tool and on specific implementation issues.

4.2. Approach

▪ *General*

Many tools appear to be available in the EU domain, and abroad. As the European Agency for Safety and Health at Work can only promote those available to all EU stakeholders and free of charge at the point of use, 'commercial' tools were excluded from this selection.

It should be noted that the following selection of tools is not recommended or endorsed by the authors or by the European Agency for Safety and Health at Work. The selected tools should merely be regarded as suggestions, as freely available examples of the type of instruments that can be applied for the assessment of OSH culture in organisations.

The authors would also like to stress that the copyright and intellectual property rights of the tools remain with the original developer. In addition, they recommend that it is good practice to consult the developer/copyright holder to check with the current situation.

With these considerations in mind, the selected tools had to comply to the following criteria:

- The Tool should be available within the EU public domain, and preferably accessible through the Internet.
- The Tool should preferably be free of charge at the point of use (i.e. not commercial).[20]
- The Tool should be primarily aimed at OSH practitioners, and also as information to business managers in organisations. Therefore, the Tool should comprise at least some guidance for use.

▪ *Health culture, patient safety culture*

As previously stated and explained, assessment tools for patient safety culture are excluded in this review (see section 2.4.3). Furthermore, no tools for the assessment of corporate health culture were included, as none were found.

[20] The 'Hearts & Minds Programme - Understanding Your Culture Checklist' (see section 4.3.3) is included in this report although it is not really free to use (a booklet needs to be bought). The reason for this is that the Hearts & Minds Tool is very widespread, regarded as one of the "standard tools" on safety culture assessment and improvement, available in many languages, and rather easy to order and obtain (via the website).

▪ *SME specific tools*

In some EU countries, certain OSH management self-assessment tools have been developed specifically directed at SMEs. Examples of such **SME specific tools** are:

- 'GPS SST matrix' in France (Institut National de Recherche et de Sécurité, INRS)
- 'Check Guter Mittelstand' in Germany (Initiative Neue Qualität der Arbeit, INQA - Mittelstand)
- 'CASA-bauen' in Germany (Initiative Neue Qualität der Arbeit, INQA - Bauen).

These tools contain questions on several OSH-related management and organisational issues, including items linked to culture and leadership. These types of assessment tools are not within the scope of this report and therefore not selected and included.

4.2.1. Search strategy

This literature review, and related search for assessment methods and tools, was carried out by experts from the following institutes: Prevent (Institute for Occupational Safety and Health, Belgium), TNO Quality of Working Life (The Netherlands), Health and Safety Laboratory (UK), and KOOP (Kooperationsstelle, Germany).

An iterative literature search and Internet search was used to collect a broad range of OSH tools in Germany, Belgium, The Netherlands, the Nordic Countries, Spain, France, the UK, and abroad (mainly USA and Australia). In this first phase, as many tools as possible were included. This first phase resulted in an overview of existing tools. The rough findings were discussed in the project team. Additional literature and Internet searches on OSH culture assessment tools were carried out.

After the first evaluation, the commercial tools and tools other than diagnostic tools (i.e. intervention tools), were excluded because these were not available in the public domain. Also a distinction was made between tools that focused on safety culture and safety climate tools. At the request of the EU-OSHA special attention was paid towards possible SME specific tools.

Next, a template was developed to describe the selected assessment tools. All experts were asked to give feedback on this draft template. After processing this feedback the final template was completed. The completed templates were used to categorise the existing tools and to develop criteria for describing effective H&S culture assessment tools. Based on the completed templates, the tools were categorised and discussed in a teleconference and by e-mail in the project team.

4.3. A selection

4.3.1. Introduction

Based on the above mentioned approach, six tools have been selected, namely:

- Score Your Safety Culture Checklist
- Hearts & Minds programme - Understanding Your Culture Checklist
- Safety Climate Assessment Toolkit and User Guide (LSCAT)
- Safety Health of Maintenance Engineering (SHoMe) Tool
- Nordic Occupational Safety Climate Questionnaire (NOSACQ-50)
- IAEA Guidance for Use in the Enhancement of Safety Culture.

These tools, their content and features are briefly described. More specific information on each tool can be found in the templates in **Annex** (see chapter 6).

4.3.2. Score Your Safety Culture Checklist

The 'Checklist for Assessing Institutional Resilience' was developed by James Reason and John Wreathall, and was first presented at the 2000 Manley Conference in Sydney, Australia, and published in the January-February 2001 edition of Flight Safety Australia.[21] Confusingly, the Tool is also known as the 'Score Your Safety Culture Checklist'.

The Tool is comprised of 20 statements describing various aspects of an organisation's safety culture e.g. the way safety is regarded by senior management. Respondents are required to read the statements and rate each as either 'Yes', 'No' or 'Don't know', and after completion a single digit score is generated that summarises the state of an organisation's safety culture/institutional resilience. Scores are interpreted according to the following criteria:

- 16-20 : So healthy as to be barely credible!
- 11-15 : You're in good shape, but don't forget to be uneasy.
- 6-10 : No at all bad, but there is still a long way to go.
- 1-5 : The organisation is very vulnerable.
- 0 : Jurassic Park!

A freely available version of the Tool is provided by Transport Canada on their website (see http://www.tc.gc.ca/eng/civilaviation/publications/tp13844-menu-275.htm), in English and French, allowing the Tool to completed and scored on-line.

A Dutch version of this Tool can be found with the following web link: http://www.triaspect.nl/cultuurmeting.

Compared to other safety culture assessment tools, the Score Your Safety Culture Checklist is relatively uncomplicated in terms of its structure and scoring system. This makes it very easy to use, particularly for first time and inexperienced users.

However, the down side of this lack of sophistication suggests limitations in the following areas:

- A lack of benchmarking data and the potential for collecting it.
- The complexity of the language used in the items.

The Checklist may also need to be modified if is to be used effectively in other industrial sectors.

Web link: http://www.tc.gc.ca/eng/civilaviation/publications/tp13844-menu-275.htm.

4.3.3. Hearts & Minds Programme - Understanding Your Culture Checklist

The 'Hearts & Minds' Safety Programme/Toolkit was developed by Shell Exploration & Production, based upon twenty years of university research, and is being successfully applied in both Shell and non-Shell companies around the world.

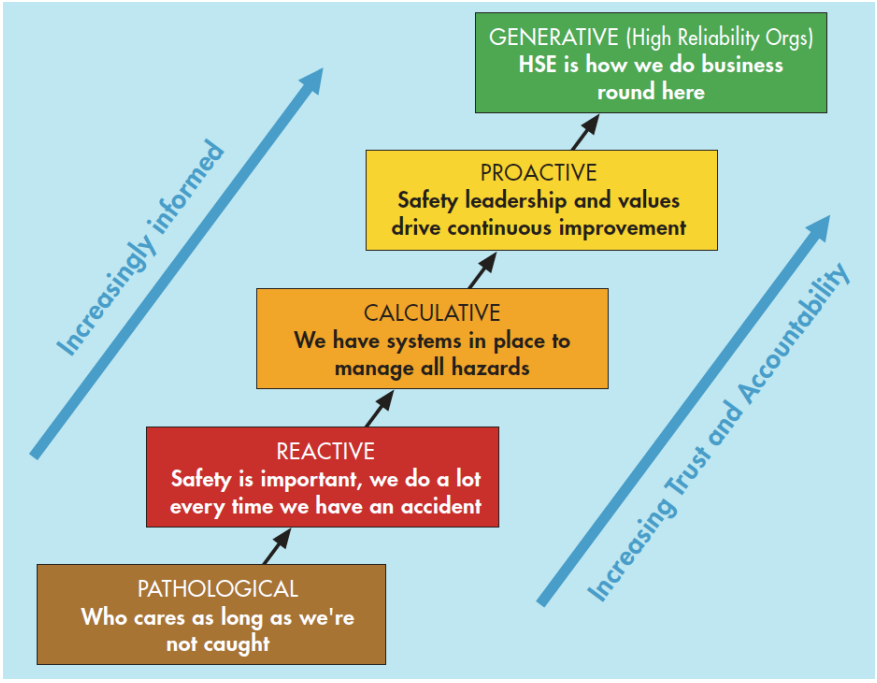
The Toolkit intends to help organisations to achieve a world-class health, safety and environment (HSE) performance by more than mechanically applying a management system: it requires the involvement of all in the organisation, from top to bottom, in a change process. This change process is described by the five stages of the 'HSE Culture Step Ladder' (see also figure 7):

- **Pathological:** people don't really care about HSE and are only driven by regulatory compliance and/or not getting caught.

[21] This publication is free to download at http://www.casa.gov.au/wcmswr/_assets/main/fsa/2001/jan/28-41.pdf.

- **Reactive:** safety is taken seriously, but only after things have gone wrong. Managers feel frustrated about how the workforce won't do what they are told.
- **Calculative:** focus on systems and numbers. Lots of data is collected and analysed, lots of audits are performed and people begin to feel they know 'how it works'. The effectiveness of the gathered data is not always proven though.
- **Proactive:** moving away from managing HSE based on what has happened in the past to preventing what might go wrong in the future. The workforce starts to be involved in practice and the hierarchic line begins to take over the HSE function, while HSE personnel reduces in numbers and provide advice rather than execution.
- **Generative:** organisations set very high standards and attempt to exceed them. They use failure to improve, not to blame. Management knows what is really going on, because the workforce tells them. People are trying to be as informed as possible, because it prepares them for the unexpected. This state of "chronic unease" reflects a belief that despite all efforts, errors will occur and that even minor problems can quickly escalate into system-threatening failures.

Figure 7: The HSE Culture Step Ladder



Source: taken from website of the Energy Institute, 2010.

One of the practical tools in the Hearts & Minds Toolkit is the 'Understanding Your Culture Checklist', which can be used without the need of consultants.[22] In this review, this Understanding Your Culture Tool is highlighted as a tool for assessing the safety culture in an organisation.

[22] Other available tools are: Managing rule breaking, Risk-assessment matrix, Making change last, Improving supervision, Seeing yourself as others see you (now: SAFE), Driving for excellence, Working safely, and Achieving situation awareness: the rule of three.

The Tool is available on the Internet. Companies can buy the booklet and scoring sheets, and are free to use the Tool the way they want to (there are no license issues; until the extent that you do not breach standard copyright laws).

By using the Tool, local strengths and weaknesses can be identified as a help to define the way to improve. The Tool can be used as an individual self-assessment, in an interview setting or a workshop setting. The workshop setting is preferable, as in this way people can compare their results and discuss it.

The Understanding Your Culture Tool consists of 18 dimensions, based on eight themes:

- leadership and commitment
- policy and strategic issues
- hazards and effect management
- organisations/responsibilities/resources/standards/documents
- planning and procedures
- implementation and monitoring
- audit
- review.

The booklet of the Understanding Your Culture Tool contains a matrix with, for each of the 18 dimensions, five specific descriptions corresponding to the five stages of safety culture development (Pathological to Generative). Not all of the 18 dimensions are applicable for all organisational levels, so firstly a selection of relevant dimensions needs to be made. Then the Understanding Your Culture scoring sheet can be completed, choosing for each dimension the cultural stage/description (1-5) that best matches the organisation (or the site, department, group, etc.). The scoring sheet can be used to calculate the overall score. In this way, the current level of an organisation's HSE culture can be defined. Suggestions for personal improvement are given by describing examples of how the culture feels personally, based on the outcome of the Understanding Your Culture assessment, for management and supervisions. This is a first step in defining personal improvements.

Web link: http://www.eimicrosites.org/heartsandminds/.

4.3.4. Safety Climate Assessment Toolkit and User Guide (LSCAT)

The Loughborough Safety Climate Assessment Toolkit is a 'free at the point of use' tool designed to help organisations measure safety culture using a combination of quantitative and qualitative methodologies. The Toolkit employs the principle of triangulation, combining data from a survey questionnaire with following additional sources of data:

- in-depth, informal discussions with individuals
- focus groups
- document analysis
- examination of records and databases.

The triangulation approach allows users to exploit a multi-methods approach to data collection that lends a greater 'robustness' to the assessment of safety climate. Utilising a multi-method approach to assessing safety culture allows different aspects of safety culture to be assessed (see table 5).

Table 5: Different perspectives on safety culture, and relating assessment methods of LSCAT.

Safety culture viewed as	Assessment methods
Objective organisational attribute	Observation, audit
Perceptions of the organisation	Interviews, questionnaires, etc.
Individual perceptions	Questionnaires, observation, etc.

The survey questionnaire comprises 47 items that examine the following organisational factors:

- organisational content
- social environment
- individual appreciation
- work environment
- organisation specific factors.

The Toolkit was developed initially for use in the offshore oil and gas industry, but (with some further development) has been successfully 'transported' for use in the UK health sector by the Royal College of nursing. A comprehensive user guide is downloadable from the Loughborough University website.[23] This document contains all the basic information required by potential users, including full instructions on how to score the questionnaire element of the Toolkit, displaying results using 'radar plots', along with useful background information that functions as a useful starting point for understanding safety culture and related issues. The user guide also includes information about how to set up and conduct interviews and focus groups and the use of behavioural indicators to help with the collection and interpretation of direct observation data e.g. unsafe acts, documentation etc. Effective analysis of this qualitative data is, however, potentially more problematic for personnel with little or no training in qualitative research methods.

Given its relative ease of deployment (compared to the qualitative aspects of the Toolkit), the survey questionnaire is potentially the most useful component of the Toolkit for assessing OSH. Potential users may also be attracted to the Toolkit because of the benchmarking data available from Loughborough University. However, given that users of the Toolkit will need at least basic levels of expertise and commitment, the suitability of the Toolkit for use in very small (i.e. micro organisations of less than five employees) is questionable.

Web link: http://www.lboro.ac.uk/departments/sbe/downloads/pmdc/safety-climate-assessment-toolkit.pdf.

4.3.5. Safety Health of Maintenance Engineering (SHoMe) Tool

The Safety Health of Maintenance Engineering (SHoMe) Tool was developed on behalf of the UK Civil Aviation Authority by Health and Safety Engineering Consultants Limited. The Tool was developed to identify indicators of 'safety health' in aviation engineering maintenance organisations.

[23] Royal College of Nursing Safety Climate Assessment Tool (SCAT), available at: http://www.rcn.org.uk/development/practice/patient_safety/climate_safety_tool.

The Tool is relevant to both larger and smaller organisations. In this context, 'safety health' is conceived as a property of the organisation, and does not relate to the health and safety behaviours of individual employees.

The SHoMe Tool consists of three questionnaires, each set aimed at one of the worker groups listed above. The sets of questions that are applicable to the different worker groups are set out in following table 6.

Table 6: Overview of the three questionnaires of the SHoMe Tool.

Worker group	Generic questionnaire	Job difficulty questionnaire	Organisational questionnaire
Technical certifying staff	Version 1	Standard	Standard
Technical non-certifying staff	Version 2	Standard	Standard
Management and technical support staff	Version 3	Not applicable	Not applicable

The 'Generic questionnaire' consists of 83 questions that are answered using a five point Likert scale where 1 = Strongly disagree and 5 = Strongly agree.

The 'Job difficulty questionnaire' consists of 32 statements requiring an initial 'Yes' or 'No' response to indicate if a task forms part of the respondent's job. If the response is 'Yes', the respondent is asked to indicate the level of difficulty experienced from the following three options: (1) 'No problems', (2) 'Some problems' or (3) 'Major problems'.

The 'Organisational questionnaire' is comprised of 92 statements about various circumstances that may arise in the respondent's organisation e.g. 'Noisy working environments' or 'The general space in and around the aircraft'. Respondents are required to indicate if any of these statements have:

- caused them, or a colleague to make a mistake or
- caused them or a colleague confusion or uncertainty over a job or
- otherwise affected airworthiness.

ShoMe is scored using a software based scoring system that takes much of the hard work out of using the Tool. The results are presented in a format developed to assist senior managers identify the most pressing human factors concerns. Results are presented in the form of scores on 19 separate human factors "root issues" that may potentially impact on safe and reliable maintenance performance, including provision of resources, training, fatigue, complacency, job pressure, etc.

The Tool is supported by 'Introduction' and 'User Guide' documentation. The latter steps potential users through all the key stages involved in deploying the Tool, including using the questionnaire, data entry and using the software and the analysis and interpretation of the results. The User Guide is helpful in setting out clear criteria for interpreting the numerical score outputs, but does not provide detailed guidance on dealing with identified issues. The developers have also considered the potential value of a benchmarking service, however at the time of writing it is not known if benchmarking data are available.

The Tool may be used as part of an audit process, or as a stand-alone measure of 'safety health'. A key objective of use is to highlight safety related issues that may be potentially problematic, but which the organisation (i.e. senior management) knows nothing about.

A key limitation of SHoMe is its focus on the aviation maintenance industry. However, this does not rule out further development in order to make the Tool relevant to other industries/sectors. It is assumed that permission from the developers would be required to do this.

Web link:

http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=1129.

4.3.6. Nordic Occupational Safety Climate Questionnaire (NOSACQ)

The Nordic Occupational Safety Climate Questionnaire (NOSACQ-50) was developed by a team of Nordic occupational safety researchers from respectively Denmark (NRCWE), Finland (FIOH), Iceland (Adminstration for Occupational Safety and Health), Norway (University of Stavanger) and Sweden (University of Gothenburg). The Tool is based on organisational and safety climate theory, psychological theory, previous empirical research, and empirical results acquired through international studies and a continuous development process.

NOSACQ-50 has been pilot tested in various industries in all the Nordic countries, and the results confirm the reliability and validity of the questionnaire. It is available in numerous languages including: Chinese (simple), Czech, Dutch (Belgium and Netherlands), Danish, English, Finnish, French (Belgium), German, Hungarian, Icelandic, Italian, Norwegian, Persian, Polish, Russian, Slovene, Spanish and Swedish, and other language versions are being prepared. This allows for studies in companies with a multilingual and/or multinational workforce. Results from around the world are currently being collected in an international database in order to allow for benchmarking and further development of the Tool.

The questionnaire has already been applied in several high injury risk sectors, e.g. construction, manufacturing, health care, transport, etc.

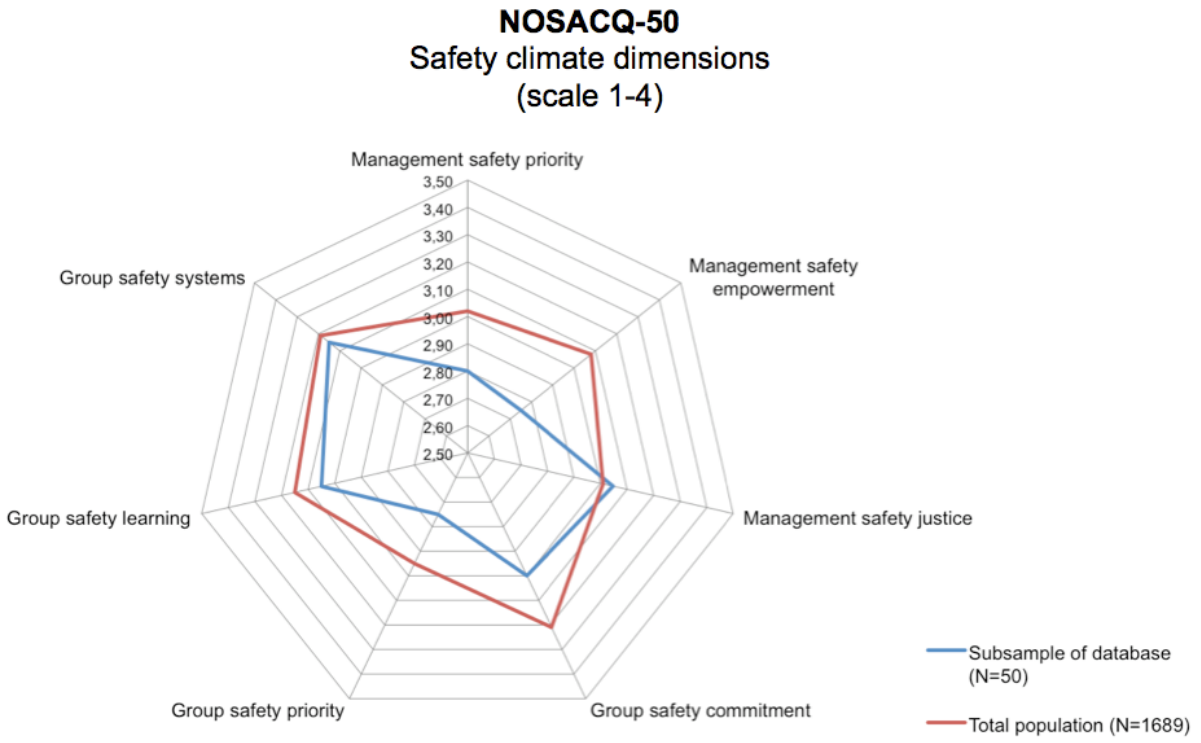
Safety climate is defined as workgroup members' shared perceptions of manager as well as workgroup safety related policies, procedures and practices. In short, safety climate reflects workers' perception of the true value of safety in an organisation.

NOSACQ-50 consists of 50 items across seven dimensions, i.e. shared perceptions of:

- management safety priority, commitment, and competence
- management safety empowerment
- management safety justice
- workers' safety commitment
- workers' safety priority and risk non-acceptance
- safety communication, learning, and trust in co-workers' safety competence, and
- workers' trust in the efficacy of safety systems.

An example of a resulting NOSACQ-50 diagram is shown below.

Figure 8: Example of a NOSACQ diagram.



NOSACQ-50 can be used in full or be tailored for specific studies using individual dimensions. Use of the questionnaire is free of charge in the interests of exchange of information (data and experience), and it may not be used commercially.

Web link: http://www.arbejdsmiljoforskning.dk/Spørgeskemaer/NOSACQ-50.aspx?lang=en

4.3.7. IAEA Guidance for Use in the Enhancement of Safety Culture

The International Atomic Energy Agency's 'Guidance for Use in the Enhancement of Safety Culture' (IAEA, 2002) was originally developed for the organisation's own safety culture services for the use in training sessions. Its development is based on the experiences gathered by the Safety Culture Service when assisting the national stakeholders in developing and improving the safety culture in nuclear installations. What makes the Guidance worth being taken into consideration in this review is its clear structure, excellent process descriptions and practical approach for the assessment of safety culture.

The Guidance explains in a very comprehensible and comprehensive way the concepts of culture as a general term, safety culture, and safety climate. Its explanations are based on the fundamental work of Edgar Schein (2004; see also section 2.4), the Guideline for ASCOT Missions (IAEA, 1996) and on the concept introduced by the IAEA's International Nuclear Safety Advisory Group (IAEA/INSAG, 1991). Based on these concepts, the Guidance considers safety culture in organisations as always being bi-dimensional and affecting structural aspects of the whole organisation as well as attitudes, practices, and commitment of the individual.

The Guidance also adapts Schein's three-layer model of culture and adjusts it to a 'three level model of safety culture' (see section 2.4, and figure 3). The Guidance transposes the culture explanations into a model of 'three development stages of safety culture':

- In the first stage, safety is only based on rules and regulations. A **rule based safety culture** is described as short term oriented, where management enforces rules and fines workers for non fulfilment.
- In the second, more advanced stage, safety has become an organisational goal. An **organisational-based safety culture** operates with short term goals (or numerical targets) and reward systems for workers who fulfil such goals.
- Finally, in the third stage safety awareness has been mainstreamed in the organisation and the awareness that safety can always be improved has become a mindset. An **awareness or improvement based safety culture** rewards long term values for example the anticipation of consequences and can be characterised by communication and collaboration between management and workers.

On this foundation of introducing a common understanding of the basic terms, the Guidance builds up a practical approach which is focused on employee surveys as the method of choice for assessing safety culture in the company. For the stage analysis of safety culture the Guidance introduces a matrix for analysis. Five characteristics are attributed to each stage of safety culture (rule - goal - improvement) and the expert can decide which of them describes best the situation in the organisation. The state of development of the existing safety culture matches the column where the most matches can be found (see table 7).

Table 7: Matrix with the three stages of safety culture and five characteristics

	Stage 1 - Rule based	**Stage 2 - Goal based**	**Stage 3 -Improvement based**
View of mistakes	People are blamed for non-compliance with rules. Organizations react defensively to criticism rather than listening and learning.	Mistakes result in more controls and training.	Mistakes are an opportunity to understand and improve
Time focus	Short-term is all important.	People are rewarded for exceeding goals, regardless of long term consequences. Numerical targets are specified for safety.	Short term performance is analysed to improve longer term performance. Longer term focus with anticipation of consequences.
Roles of management	Managers enforce rules and pressure employees for results.	Managers use techniques such as management by objectives.	Managers coach people to improve performance. Managers support collaborative work.
Conflict handling	Conflicts are rarely resolved and groups continue to compete with one another.	Conflict is discouraged in the name of teamwork.	Conflict is resolved by means of mutually beneficial solutions.
View of people	People are components in a system.	Growing awareness that people's attitudes influence their performance.	People are respected and valued for their contribution.

Source: based on IAEA, 2002, pp. 19 ff.

While artefacts and espoused values can be observed or found in documentation, the basic assumptions need to be deciphered in a deeper analysis process. The Guidance gives advice on how to combine different methods in order to carry out such deeper analysis by combining observations, matrices and (quantitative and qualitative) questionnaires. It also explains the advantages and disadvantages of the different instruments and how far they can be used to observe artefacts and espoused values and how to draw conclusions that reveal the basic assumptions by pointing at the inconsistencies between the two outer layers.

The Guidance does not offer 'ready to apply' tools for the user, but defines categories and characteristics which can be attributed to the three stages concept of safety culture presented above. Finally, it also explains how leadership and managerial approaches can foster safety culture in the company and how to use a learning culture to gain sustainability in improving the safety performance. In this context the Guidance presents the 'simple model of transformational change', which consists of a three stage process for changing organisational safety culture:

1. unfreezing the status quo / creating the motivation to change
2. mainstreaming / learning new concepts and new meanings for old concepts
3. internalising new concepts and meanings.

As the concept cannot be applied without having a basic understanding of psychological and sociological dynamics, the Guidance again attributes characteristics to each stage and explains how the process can be realised step by step by overcoming feelings of guilt or anxiety, finding new role models and self-concepts and relationships.

All these general assumptions and comprehensible explanations can be transferred from the prevention of nuclear hazards and safety culture in nuclear installations to other fields of activities, such as safety at the workplace level. Despite the fact that the Guidance is quite practical, it points out that it needs more than good will of the management for assessing safety culture successfully. Conducting a survey and the interpretation of the results needs experience. Therefore experts should be consulted when applying the instrument.

By the end of 2011 the IAEA will have developed improved guidance for self-assessment and for continuous improvement of organisational safety culture. The self-assessment will prepare an in-depth assessment of safety culture integrated into the IAEA Operational Safety Review Team (OSART) programme. In order to integrate the safety culture assessment method into the OSART missions, the OSART team will be reinforced by two experts from the field. Currently, the first missions are being prepared for the validation of the enhanced guidance documents and the new method.[24]

Web link: http://www-pub.iaea.org/MTCD/publications/PDF/te_1329_web.pdf.

[24] See also: http://www.iaea.org/newscenter/news/2010/osart.html.
OSART is the IAEA review of operational safety performance at all kinds of nuclear power plants. OSART missions consist of an in-depth examination of design features of human performance issues and an assessment of possible design weaknesses. 12 to 18 months after the first OSART visit, the plant is revisited.

4.4. Overview

An overview of the six selected tools and their specific characteristics is shown in table 8. Apart from the developer/owner, country of origin, sector of origin and available language(s), the table shows the specific assessment approaches (analytic, academic and/or pragmatic; see Chapter 3 and Guldenmund, 2010) that are included in the respective tools/toolkits.

Table 8: Overview table of the selected tools

Title of tool (kit)	Developer/ owner (Author)	Country (origin)	Sector (origin)	Language(s)	Pragmatic	Analytic	Academic
Score Your Safety Culture Checklist	Transport Canada (James Reason)	Canada	Transport (and healthcare)	English, French, Dutch	Simple checklist		
Hearts & Minds programme - Understanding Your Culture Checklist	Energy Institute (Shell in collaboration with Leiden and Manchester Universities)	UK - Netherlands	Offshore	Arabic, Chinese, Dutch, English, French, German, Italian, Korean, Norwegian, Portuguese, Russian, Spanish	Safety culture maturity ladder with 5 stages - assessment of 8 factors (18 questions) in workshop		
Safety Climate Assessment Toolkit and User Guide (LSCAT)	Loughborough University, Health & Safety Executive (HSE), and a number of offshore organisations	UK	Offshore	English		Employee attitude survey	- Face-to-face interviews and focus discussion groups Structured observation
Safety Health of Maintenance Engineering (SHoMe) Tool	UK Civil Aviation Authority (developed by Health and Safety Engineering Consultants (HSEC)	UK	Aviation maintenance	English		Questionnaires (with software and guide)	

Title of tool (kit)	Developer/ owner (Author)	Country (origin)	Sector (origin)	Language(s)	Pragmatic	Analytic	Academic
Nordic Occupational Safety Climate Questionnaire (NOSACQ)	Consortium of some Scandinavian institutes	Scandinavia	Construction	Czech, Belgium (Dutch and French), Danish, English, Finnish, German, Icelandic, Italian, Norwegian, Persian, Slovene, Spanish and Swedish		Safety climate questionnaire (50 questions)	
IAEA Guidance for Use in the Enhancement of Safety Culture	International Atomic Energy Agency (IAEA)	International	Nuclear	English	3 stages of development of safety culture - assessment of 5 factors by individuals or group	Contains information	Contains information

As is shown in Table 8, the selected tools cover a wide range of assessment approaches and related instruments:

- a simple, pragmatic Score Your Safety Culture Checklist (available in at least three languages)
- an extensive pragmatic toolkit - the Hearts & Minds Programme/Toolkit (available in more than ten languages)
- two English questionnaire survey tools - the Safety Climate Assessment Toolkit and User Guide (LSCAT) (which also contains information on other in-depth techniques) and Safety Health of Maintenance Engineering (SHoMe) Tool
- a safety climate scale - the Nordic Occupational Safety Climate Questionnaire (NOSACQ) (available in more than ten languages)
- a publication (in English) by the IAEA, giving practical guidance on improving an organisation's safety culture (incl. a pragmatic-based tool as well several other approaches)

Based on the collected information (see tool descriptions above, templates in Annex and table 8), the following issues are worth mentioning:

- **OSH:** as mentioned above (section 4.2), no tools were found that focus specifically on the assessment of corporate health culture, neither on the combination of both occupational safety and health. All the selected tools thus focus on safety culture and/or climate.
- **Availability:** all tools can be found (accessed, ordered, and/or downloaded) via the Internet (webpages and/or downloadable publications in pdf format).
- **Cost:** all tools are free of charge at the point of use. An exception is the Hearts & Minds Programme, of which the respective tools can be ordered/bought via the Hearts & Minds website (Energy Institute).

- **Copyright:** although the selected tools are free of charge[25], their copyright and intellectual property rights remain obviously with the developers/authors. It is therefore recommended to consult the developer/copyright holder to check with the current situation.
- **Language:** the Hearts & Minds Programme and NOSACQ are both available in several languages, allowing a worldwide use. The short Score Your Safety Culture Checklist is available in English, French, Dutch (and maybe in other languages as well). The other tools/publications are in English only.[26]
- **Country:** the selected tools are from all over the world. LSCAT and SHoMe Tool are from the UK. The Hearts & Minds Toolkit is from the UK/Netherlands. NOSACQ is a Tool developed in the Nordic countries. One international IAEA publication was selected as well.
- **Sector:** most of the selected tools have their origins in high-risk industries (nuclear industry, offshore) and public mass transportation (aviation). These tools are indeed mainly developed with an eye on the prevention of major/organisational accidents and disasters. The key question is whether these tools can be applied in other sectors and organisations (esp. SMEs), in order to prevent occupational/work accidents. The NOSACQ Tool which was originally tested in the construction industry, and has already been applied in a wide range of other sectors. The same is true for the Hearts & Minds Programme, which has already been applied in many sectors ranging from chemical industry to agriculture, construction and education.
- **User guidance:** all tools contain some kind of user guidance (or at least some minimum information), explaining how the respective instruments can be applied, how to process and interpret data (if applicable), points of attention, etc.
- **Benchmarking:** the developers/owners of LSCAT, SHoMe and NOSACQ have a database of comparative data, which allows benchmarking. Companies volunteering results can be provided with averaged benchmarking results from the database.
- **Further advice:** most of the tools give some generic recommendations on strategies and points of attention with regard to the process for safety culture improvement/change (planning, decision making, etc.).

[25] One exception is the 'Hearts & Minds Programme - Understanding Your Culture Checklist'. This tool is included in the report although it is not really free to use (a booklet needs to be bought). The reason for this is that the Hearts & Minds Tool is very widespread, regarded as one of the "standard tools" on safety culture assessment and improvement, available in many languages, and rather easy to order and obtain (via the website).

[26] These might have been translated in other languages, but this is outside the knowledge of the authors.

5. Overall conclusions

5.1. Theoretical framework

5.1.1. A cultural approach to OSH

Managing OSH in a systematic way, addressing regulatory, technical, organisational and managerial aspects, is vital to attain safer and healthier workplaces. However, OSH entails more than just focusing on formal issues. As risk prevention and OSH is, in the first place, about people - and preventing them from harm - attention should also be paid to behavioural aspects, and social and cultural processes. Approaching **OSH from an organisational culture perspective** can in this regard facilitate achieving sustainable improvements in organisational OSH performance.

OSH culture can be seen as a concept for exploring how informal organisational aspects influence OSH in a positive or negative way. It can have an impact on how OSH is perceived and dealt with among workers in an organisation, and on whether workers are aware of OSH-related issues and act in a safe and healthy way. OSH should however not be entirely reduced to a matter of culture. OSH culture assessment helps organisations to be viewed in a different way. The knowledge and information gained from such a cultural approach can then prove very useful in the step by step process of **changing OSH-related policies, processes, and practices**, adapting them to the existing local context and culture, and eventually leading to better OSH performance.

5.1.2. Assessing safety culture

The term '**safety culture**' appears to have been first used in a report by the International Atomic Energy Agency after the Chernobyl disaster in 1986. Since then, over the past 25 years, the concept of safety culture has been studied internationally by many academics from different scientific backgrounds (psychology, anthropology, engineering, etc.), resulting in different, but complementary, approaches for exploring and assessing an organisation's safety culture. Generally, **three assessment approaches** can be distinguished in this regard: the academic, analytical and pragmatic approach. These distinct approaches each comprise specific methods and instruments.

The **analytical (psychological) approach** is the most popular and predominant approach in safety culture assessment, and focuses specifically on organisational **safety climate**. Safety climate is assessed by conducting questionnaire surveys among groups of workers in an organisation. In such surveys, workers are asked to complete a specific, standardised questionnaire, giving their opinion (or the perception that is shared among the co-workers) on certain safety-related dimensions. The resulting survey data are processed and analysed, providing a snapshot of the current safety climate in an organisation. The measured safety climate appears to be a predictor for safety performance, which makes it a very appealing construct for researchers, managers and OSH professionals.

The **academic (anthropological) approach** seeks to describe and understand safety culture, rather than judging it. For this purpose, specific data collection methods are used that are inspired by anthropological and sociological research. This implies that required data and information are collected through 'fieldwork' in the whole organisation, using techniques such as observations, document analysis and interviews (individual or in group).

In the **pragmatic approach** the focus is on assessing an organisation's current state of maturity regarding safety culture, giving it a ranking on a predefined '**cultural maturity ladder**' that shows different levels or stages of cultural maturity. The aim is not to assess the current situation as such, but to define and look at what should be done to develop the organisation's safety culture to a higher level of maturity.

These three assessment strategies each provide a different way of looking at and assessing an organisation's safety culture. No one single approach or technique is suitable for understanding and exploring safety culture. Rather, a **multi-method and holistic approach** should be taken towards safety culture. This approach, using multiple strategies, is also called '**triangulation**'. The three approaches should thus be regarded as complementary. A safety climate questionnaire survey can, for instance, result in some (quantitative) outcomes, which should then be further checked and explored by means of interviews with management and workers.

5.2. From theory to practice

5.2.1. A selection of assessment methods

There exist many tools for exploring and assessing an organisation's safety culture. It is therefore useful to know what they can be used for, their potentials and limitations, and their pros and cons. This review aimed to give an overview and a selection of useful tools and techniques from the EU domain and abroad.

Many of the available safety culture assessment tools are 'commercial' products, provided by OSH institutions and consultants. As the EU-OSHA can only promote tools that are available to all EU stakeholders and are free of charge at the point of use, commercial tools were excluded from this selection. In some EU Member States, certain OSH management self-assessment tools have been developed specifically directed at SMEs. Such tools contain questions on several OSH-related management and organisational issues, including items linked to leadership and organisational culture. As these types of assessment tools are not within the scope of this review, they were not included either. Assessment tools for patient safety culture were excluded from this review as well. No real tools were found that are explicitly targeted at the assessment of corporate health culture.

In addition to selected tools being non-commercial, some other criteria were also taken into account. They had to be available within the EU public domain, preferably accessible through the Internet. In addition, they should be aimed at OSH practitioners, and also as information to business managers in organisations, the selected tools had to comprise at least some guidance for use, explaining how an instrument should be applied, how to process and interpret data, etc.

Based on these criteria, six diagnostic tools/toolkits were retained for a more detailed description in this review. It is important to note that this selection of six tools should not be regarded as the only, true solution for assessing an organisation's safety culture. It is, rather, a selection of (publicly and freely available) exemplary tools, giving the reader/user some well-illustrated ideas on how a safety culture assessment can be approached. The six tools are:

- a simple, pragmatic **Score Your Safety Culture Checklist** (available in at least three languages);
- an extensive pragmatic toolkit - the **Hearts & Minds Programme** (available in more than ten languages) (it should be noted that this tool is not entirely cost-free; it is nevertheless included as it offers a very widespread toolkit that is available in many languages and rather easy to order and obtain);
- two English questionnaire survey tools - the **Safety Climate Assessment Toolkit and User Guide (LSCAT)** (which also contains information on other in-depth techniques) and **Safety Health of Maintenance Engineering (SHoMe) Tool**;
- a safety climate scale, the **Nordic Occupational Safety Climate Questionnaire (NOSACQ-50)** (available in more than ten languages);
- a publication (in English) by the **IAEA**, giving practical guidance on improving an organisation's safety culture (including a pragmatic-based tool as well several other approaches).

Most of the selected tools give some generic recommendations on strategies and points of attention with regard to improvement and change in OSH management. The developers/owners of the LSCAT, SHoMe and NOSACQ Tool have a database of comparative data, which allows benchmarking. Companies volunteering results can be provided with averaged benchmarking results from the database.

Some of the tools have their origins in high-risk industries, such as the nuclear industry and offshore. These tools were mainly developed with an eye on process safety and the prevention of major accidents and disasters. The question is to what extent these instruments can be used in other sectors and organisations (including SMEs), with the aim to reduce occupational accidents. The NOSACQ Tool was originally tested in the construction industry, and has already been applied in a wide range of other sectors. The Hearts & Minds Programme has its origins in the oil and gas industry but has already been used in many sectors ranging from chemical industry to agriculture and construction.

5.2.2. Practical approach - why and how?

Before commencing a diagnosis of an organisation's safety culture, and deciding which strategy and specific tools to apply, it is important to first consider and determine the true purpose of such an assessment. Is it to try to achieve general improvements or changes in the organisation's OSH management approach and its performance in OSH (e.g. reducing accident rates, changing unsafe worker behaviour, improving worker commitment and compliance to OSH issues)? Or is it to try to solve a particular persistent problem related to OSH within the organisation? Are there high risks environments impacting on workers or specific groups (departments, teams, units) which should be treated with priority?

Considering the contextual differences between and within organisations, it is not feasible to adopt a standard, 'one size fits all' strategy. Addressing and diagnosing an organisation's safety culture comprises thus more than just simply 'taking a tool from the shelf'. It implies a **tailored approach**, taking into account the local context. It is recommended, therefore, to combine several methods and tools during the assessment process. Taking a **holistic, multi-method (triangulation) approach** towards safety culture provides the best chance of success.

The diagnosis of an organisation's safety culture requires a close collaboration between the organisation’s **internal resources** and **outside expertise**. So one important consideration is the actions that can be taken internally, and the extent to which external consultancy and support is needed. Expert guidance can add significant value - not only for steering and supporting the assessment phase, but also for interpreting the different assessment outcomes and advising which actions could be useful to achieve improvements and change in OSH management. As it concerns a very organisation-specific process, it is, on the other, hand absolutely necessary that there is a certain degree of 'ownership' of the applied tools by people within the respective organisation.

Assessing an organisation's safety culture is of course just the start. It should be the basis for further systematic actions. This requires management commitment and participation of people from all hierarchic levels (managers, middle managers, supervisors and workers). Carrying out a safety climate survey should, for example, only be done when there is clear commitment and support from senior management, including a clear intention of action. Management, supervisors and workers should all participate and be committed during the process. This can be achieved by the establishment of a steering group, consisting of all key stakeholders.

Lastly, it should be noted that the impact of organisational change is limited by the organisation’s general ability to change. Not only is management commitment to change crucial in this regard; the organisational structure, culture and learning processes as a whole are a limiting factor for change potential. One cannot expect a company that acts in a reactive way to consumer demands, to operate proactively in safety. Similarly, one cannot ask workers to change their behaviour, if they don’t believe

themselves that they will master the new type of behaviour that is expected of them. An assessment of the organisational readiness and ability to change could therefore precede, or go along with, the safety culture diagnosis.

5.3. Discussion

5.3.1. Occupational safety and health culture?

As the EU-OSHA aims to address work-related safety and health issues as one joint matter, the term '**OSH culture**' is used in this report. However, research has, for the most part, focused on cultural aspects linked to process and occupational safety (**safety culture**). Conversely, the topic of organisational **health culture** has received less attention from research. Different research traditions recognise the mutual interaction between organisational culture and health. This has so far not yet resulted in theory or research-based health culture tool development. The managerial and business concerns of health, when framed in a cultural context, are not yet fully applied in health research. The growing importance of concepts like social capital, make it likely that the development of interventions, tools and instruments related to organisational health culture will probably happen in the near future (see also 2.4.4). The question is in this regard also to what extent cultural aspects regarding occupational safety and health can and should be addressed jointly.

5.3.2. OSH culture in SMEs?

As already mentioned before, the safety culture approach and many related diagnostic tools have their origins in high-risk industries, primarily with the aim to prevent organisational accidents and disasters. Looking at OSH from a cultural viewpoint is most suitable and useful when all regulatory aspects and related risks are already addressed by the organisation in a systematic way. It is, therefore, questionable as to whether the concept of safety culture, and the use of safety culture assessment tools, is really relevant for many SMEs - particularly for the smaller and micro enterprises outside the high-risk industries.

In order to increase and broaden the acceptance and use of safety culture assessment tools, and to improve their application beyond the high-risk industries, more efforts should be undertaken to simplify and incorporate these tools into OSH management and organisational development standards. This could be done by making sector-specific safety culture assessment tools (and guidance), linking them to the typical core activities from the respective sectors and addressing specificities from certain target groups (e.g. part-time work in the HORECA or migrant workers in the cleaning and construction industry).

5.3.3. Towards a standard European tool?

Due the complexity of the concept of OSH culture and the contextual differences between and within organisations, it is not feasible to use a standard, 'one size fits all' strategy for diagnosing an organisational OSH culture. However, when investigating the feasibility of developing a standard European tool for OSH culture assessment, the Nordic Occupational Safety Climate Questionnaire (NOSACQ) appears to be the most suitable for this purpose for the following reasons (see also sections 4.3.6 and 6.5):

- the Tool was developed by a team of Nordic occupational safety researchers, and the expansion to a wider European base is currently being investigated among several OSH institutes in the PEROSH network[27];
- the Tool is based on organisational and safety climate theory, psychological theory, previous empirical research, and empirical results acquired through international studies and a continuous development process;
- the Tool has been pilot tested in various industries in all the Nordic countries and in Belgium, The Netherlands and Slovenia, and the results confirm the reliability and validity of the questionnaire;
- the Tool is already available in many European languages including Czech, Dutch (Belgium and Netherlands), Danish, English, Finnish, French (Belgium), German, Hungarian, Icelandic, Italian, Norwegian, Polish, Slovene, Spanish and Swedish. Other language versions are being prepared;
- the Tool has already been applied in several high injury risk sectors, such as construction, manufacturing, transport, etc.;
- results from around the world are currently being collected in an international database in order to allow for benchmarking and further development of the Tool;
- the use of the Tool is free of charge in the interests of exchange of information (data and experience).

The NOSACQ Tool has a lot of potential to be further developed into a real and strong European tool for the diagnosis of safety culture. It enables researchers and practitioners to gain insight into seven group safety climate dimensions.[28] It should however be noted that the NOSACQ is only a safety climate questionnaire (analytical assessment approach, see section 3.2.2). As already mentioned before in this review (see e.g. section 3.2.5), assessing an organisation's safety culture involves more than just applying one tool. A tailored and triangulation approach provides the best chance of success.

[27] PEROSH stands for 'Partnership for European Research in Occupational Safety and Health'. PEROSH coordinates and cooperates on European research and development in OSH. It is a high-level research network aiming at improving the quality and dissemination of working life research via joint collaboration on priority topics, sharing of knowledge and resources and a proactive dialogue with the EU, national and international partners. The network comprises 13 OSH institutes.The PEROSH members cooperate in eigth joint research projects. The use of the NOSACQ is amongst others discussed in the research group 'Safety culture and accidents: promotion of zero accident vision'. For more information, see: http://www.perosh.eu.

[28] The seven dimensions are management safety priority, commitment, and competence; management safety empowerment; management safety justice; workers' safety commitment; workers' safety priority and risk non-acceptance; safety communication, learning, and trust in co-workers' safety competence; and workers' trust in the efficacy of safety systems.

6. Annexes

6.1. Score Your Safety Culture Checklist

Title **(Name of the tool, abbreviation, English translation of name?)**	**Score Your Safety Culture Checklist - Checklist for Assessing Institutional Resilience (CAIR)**
Country (countries) of origin	UK, USA
Developer (Organisation that developed the tool, i.e. public body, research institute, company, ...)	James Reason
Research team (Names of researchers + organisation)	▪ James Reason, PhD, Professor Emeritus, University of Manchester, Manchester, UK ▪ John Wreathall, President, John Wreathall & Company, Inc., Dublin, Ohio, USA
Contact for further enquiries (Address, email)	
Source, access to the tool (Web link, publication, ...)	▪ A freely available version of the Tool is provided by Transport Canada on their website (see http://www.tc.gc.ca/eng/civilaviation/publications/tp13844-menu-275.htm), allowing the Tool to completed and scored on-line. ▪ A Dutch version of this Tool can be found on the following Web link: http://www.triaspect.nl/cultuurmeting.
Articles/references to the tool	▪ The Checklist was first presented by James Reason at the 2000 Manly Conference in Sydney, Australia. ▪ The Checklist was published in Flight Safety Australia, January-February 2001. The publication is available on the following link: http://www.casa.gov.au/wcmswr/_assets/main/fsa/2001/jan/28-41.pdf ▪ The Checklist forms the basis of the ATSB Research and Analysis Report 'Assessing Institutional Resilience: A useful guide for airline safety managers?', available at the following link: http://www.atsb.gov.au/media/32634/avise_20040240.pdf
In which **language(s)** is the tool available?	English, French, Dutch, ...
In which **countries** has the tool already been applied?	Canada, Australia, The Netherlands, ...

Title **(Name of the tool, abbreviation, English translation of name?)**	**Score Your Safety Culture Checklist - Checklist for Assessing Institutional Resilience (CAIR)**
Industry/Sector In which sector(s) is the tool applied? (e.g. general, offshore, nuclear, hospitals, railway, ...)	The Checklist has aviation and healthcare versions.
Is the tool applicable to different sectors?	Yes
Type of employees Is the tool applicable to different types of employees? (e.g. blue/white collar workers, incl. supervisors/line management, ...)	Respondents are asked to assess 20 organisational characteristics. The design suggests that the Checklist is aimed at one-off usage rather than as a survey instrument for distribution to a wide range of employees. Furthermore, the phrasing of items suggests that the Checklist may not be suitable for all types of employee, e.g. the complexity of the language used is fairly complex.
Is the tool focused on occupational **safety and/or health**?	Safety
Is the tool **in the public domain**? (e.g. freely downloadable from the Internet)	Yes, the Checklist is in the public domain.
Is the tool **free to use and further develop**? (if applicable, please explain which parts of the tool are cost free)	The Checklist appears to be free to use (this had not been confirmed with Prof Reason).
Other **copyright issues**? (e.g. do copyright/intellectual property rights remain with the original developer; is it good practice to consult them before use?)	Assume copyright and IP rights remain with the authors.
What **type** of assessment tool(s) is (are) provided? (e.g. quick checklist, behaviourally-anchored rating scale, employee survey questionnaire, observations, interviews, focus groups, document reviews, ...)	This tool is in the format of a quick checklist, comprised of 20 statements concerning organisational characteristic that respondents are asked to consider, e.g. 'Top managers are genuinely committed to aviation safety and provide adequate resources to serve this end.'
Is there a **user guide**?	A user guide has not be located or identified.
Paper-based, web-based or other **format**?	The Checklist was published originally in paper format but it is quite straightforward to convert this to a web based format, as has been done by Transport Canada. The web format makes scoring easy. See: http://www.tc.gc.ca/eng/civilaviation/publications/tp13844-menu-275.htm
Items? (number, factors, categories, ...)	The Checklist consists of 20 statements about organisational characteristics related to safety issues, e.g. 'Top managers are genuinely committed to aviation safety and provide adequate resources to serve this end.'

Title **(Name of the tool, abbreviation, English translation of name?)**	**Score Your Safety Culture Checklist - Checklist for Assessing Institutional Resilience (CAIR)**
Type of answer? (e.g. five point Likert-type scale from ... to ...)	Respondents are asked to rate each item in terms of either: ▪ 'Yes, this is definitively the case in this company' ▪ 'No, this is definitely not the case in this company' ▪ 'Don't know, maybe or could be partially true'.
Score system used?	The following scoring system is used: ▪ 'Yes, this is definitively the case in this company' = 1 ▪ 'No, this is definitely not the case in this company' = 0 ▪ 'Don't know, maybe or could be partially true' = 0.5
How are the **(statistical) analyses** of done?	There is no statistical analysis required to interpret Checklist scores. Response scores are simply totalled up. The following interpretation criteria are suggested: ▪ 16-20 : So healthy as to be barely credible! ▪ 11-15 : You're in good shape, but don't forget to be uneasy. ▪ 6-10 : No at all bad, but there is still a long way to go. ▪ 1-5 : The organisation is very vulnerable. ▪ 0 : Jurassic Park!
Is the tool designed to be used without **expert external assistance**?	Yes, the Checklist is straightforward and uncomplicated to use.
Is **support** available if required?	No information about support was found. It seems reasonable to assume that formal support is not (at least freely) available.
Is **advice** given on what to do with the results?	No advice is offered on what to with results.
Validation of the tool? (e.g. how many sectors, organisations, employees)	A qualitative assessment of the Checklist's validity for use in the aviation industry has been carried out by Wood, M., Dannatt, R. and Marshall, V. (2006). The study can be accessed via the following link: http://www.atsb.gov.au/media/32634/avise_20040240.pdf The authors conclude that the Checklist "is of limited value to airlines as a means of assessing institutional resilience." (page xii). These authors go on to say that the healthcare sector has found the Tool useful (page 1).
Is there a **database of results** and norms for results? **Benchmarking**?	An internet search did not turn up any benchmarking data or services related to the Checklist.
Usefulness of output for **planning of improvement actions**? Does the tool include recommendations?	As stated previously, no advice is given as to how to use Checklist scores. No recommendations have been found that relate to planning improvement actions.

6.2. Hearts & Minds programme - Understanding Your Culture Checklist

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Understanding Your Culture Checklist, as a part of the Hearts & Minds Toolkit**
Country (countries) of origin	NL, UK
Developer (Organisation that developed the tool, i.e. public body, research institute, company, ...)	The Hearts & Minds safety Programme/Toolkit was developed by Shell E&P, based upon 20 years of university research, and is being successfully applied in both Shell and non Shell companies around the world.
Research team (Names of researchers + organisation)	▪ Prof. Hudson, University of Leiden, The Netherlands ▪ G. Van der Graaf, Shell SIEP, The Netherlands ▪ Prof S. Cox, Loughbourough Business School, UK ▪ Dr. R. Bryden, Shell Aberdeen, UK
Contact for further enquiries (Address, email)	The Energy Institute Stuart King, mailto:sking@energyinst.org
Source, access to the tool (Web link, publication, ...)	http://www.eimicrosites.org/heartsandminds/
Articles/references to the tool	▪ van der Graaf, G.C. , Kalff, J., & Hudson, P.T.W. (2000) Moving towards a generative safety culture: The Hearts & Minds HSE Research Programme (Part 2). Exploration and Production Newsletter.EP2000-7006,38-40 The Hague: Shell International ▪ van der Graaf, G.C. , Kalff, J., & Hudson, P.T.W. (2000) Intrinsic motivation for HSE: The Hearts & Minds HSE Research Programme (Part 1). Exploration and Production Newsletter.EP2000-7004, 41-42 The Hague: Shell International ▪ Hudson, P.T.W., Verschuur, W.L.G., Parker, D., Lawton, R., van der Graaf, G.C. , & Kalff, J. (2000) Bending the Rules: Violation in the workplace. Exploration and Production Newsletter, EP2000-7001, 42-44. The Hague: Shell International ▪ Hudson, P.T.W., Parker, D., Lawton, R., Verschuur, W.L.G., van der Graaf, G.C. & Kalff, J. (2000) The Hearts & Minds Project: Creating intrinsic motivation for HSE. In Proceedings SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production. Richardson TX: Society of Petroleum Engineers ▪ Hudson, P.T.W. & Willekes, F.C. (2000) The Hearts & Minds project in an operating company: Developing tools to measure cultural factors. In Proceedings SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production. Richardson TX: Society of Petroleum Engineers

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Understanding Your Culture Checklist, as a part of the Hearts & Minds Toolkit**
	▪ Hudson, P.T.W. (2001) Safety Management and Safety Culture: The Long, Hard and Winding Road. In W. Pearse, C. Gallagher & L. Bluff (Eds.) Occupational Health and Safety Management Systems. Crowncontent, Melbourne, Australia. Pp 3-32. ▪ v d Graaf, G.C. & Hudson, P.T.W. (2002) Hearts & Minds: The status after 15 years research. In Proceedings 6th SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production. Richardson TX: Society of Petroleum Engineers ▪ Hudson, P.T.W., Parker, D., & v d Graaf, G.C. (2002) The Hearts & Minds Program: Understanding HSE culture. In Proceedings 6th SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production. Richardson TX: Society of Petroleum Engineers ▪ Hudson, P.T.W., Parker, D., Lawrie, M., v d Graaf, G.C. & Bryden, R. (2004) How to win Hearts & Minds: The theory behind the program. Proceedings 7th SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production. Richardson TX: Society of Petroleum Engineers ▪ Hudson, P.T.W., Croes, S.C., Parker, D., Lawrie, M., v d Graaf, G.C., Bryden, R. & Malone, C. (2004) Improving the quality of supervision in the workplace. Proceedings 7th SPE International Conference on Health Safety and Environment in Oil and Gas Exploration and Production. Richardson TX: Society of Petroleum Engineers ▪ Parker, D., Hudson, P., Lawrie, M. (2006). A framework for understanding the development of organisational safety culture. Safety Science 44 551–562.
In which **language(s)** is the tool available?	Arabic, Chinese, Czech, Dutch, English, French, German, Hindi, Italian, Korean, Norwegian, Portuguese, Russian, Spanish.
In which **countries** has the tool already been applied?	The Tool is applied all over the world, see the extended list of languages available.
Industry/Sector In which sector(s) is the tool applied? (e.g. general, offshore, nuclear, hospitals, railway, ...)	Mostly in the energy sector, but also pharmaceutical, security en defence, training & consultancy, education (universities), transport, mostly land based train, lorries and shipping, construction, agriculture, chemical industry.
Is the tool applicable to different sectors?	Yes, examples are mostly energy sector specific but the Tools are applicable in every sector.
Type of employees Is the tool applicable to different types of employees? (e.g. blue/white collar workers, incl. supervisors/line management, ...)	Yes, but the Understanding Your Culture Checklist is most suited for higher level managers (they are the ones who have problems they need to become aware of; the others are suitable for the frontline officers as well (e.g. in a training course, H&M workshop or incorporated in a toolbox).

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Understanding Your Culture Checklist, as a part of the Hearts & Minds Toolkit**
Is the tool focused on occupational **safety and/or health**?	Focused on occupational safety and safety culture/climate.
Is the tool **in the public domain**? (e.g. freely downloadable from the Internet)	The Toolkit is available on the Internet. Companies can buy the booklet and are free to use it the way they want to (no license issues).
Is the tool **free to use and further develop**? (if applicable, please explain which parts of the tool are cost free)	The Tool is free to use after you have bought the booklet. Until the extent that you do not breach standard copyright laws.
Other **copyright issues**? (e.g. do copyright/intellectual property rights remain with the original developer; is it good practice to consult them before use?)	The Tool is copyrighted by Shell. Little modifications are allowed, otherwise Shell has to approve.
What **type** of assessment tool(s) is (are) provided? (e.g. quick checklist, behaviourally-anchored rating scale, employee survey questionnaire, observations, interviews, focus groups, document reviews, ...)	The Tool consists of a checklist with 18 questions (dimensions) for 8 themes.
Is there a **user guide**?	Yes, on the website of the Energy Institute and in the booklets.
Paper-based, web-based or other **format**?	The Understanding Your Culture Checklist is available in paper and will be developed as a web based tool.
Items? (number, factors, categories, ...)	The Understanding Your Culture Tool consists of 18 dimensions, based on eight themes: ▪ Leadership and commitment ▪ Policy and strategic issues ▪ Hazards & effect management ▪ Organisations/responsibilities/resources/standards/documents ▪ Planning & procedures ▪ Implementation & monitoring ▪ Audit ▪ Review. For each dimension, characteristics of the organisation are described, at each level corresponding the five stages of safety culture development, from Pathological to Generative, are described. In this way, the current level of HSE culture in an organisation can be defined.

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Understanding Your Culture Checklist, as a part of the Hearts & Minds Toolkit**
Type of answer? (e.g. five point Likert-type scale from ... to ...)	Scores from 1 tot 5, according to five stages of cultural development (from Pathological to Generative): 1. Pathological: people don't really care about HSE and are only driven by regulatory compliance and/or not getting caught. 2. Reactive: safety is taken seriously, but only after things have gone wrong. Managers feel frustrated about how the workforce won't do what they are told. 3. Calculative: focus on systems and numbers. Lots of data is collected and analysed, lots of audits are performed and people begin to feel they know "how it works". The effectiveness of the gathered data is not always proven though. 4. Proactive: moving away from managing HSE based on what has happened in the past to preventing what might go wrong in the future. The workforce starts to be involved in practice and the Line begins to take over the HSE function, while HSE personnel reduce in numbers and provide advice rather than execution. 5. Generative: organisations set very high standards and attempt to exceed them. They use failure to improve, not to blame. Management knows what is really going on, because the workforce tells them. People are trying to be as informed as possible, because it prepares them for the unexpected. This state of "chronic unease" reflects a belief that despite all efforts, errors will occur and that even minor problems can quickly escalate into system-threatening failures. The characteristics of organisations are described at each level and typical descriptions are given for 18 'dimensions' that can be used to identify the current level of your organisation.
Score system used?	Scores from 1- 5 (see above).
How are the **(statistical) analyses** done?	This is up to the company.
Is the tool designed to be used without **expert external assistance**?	For example as an individual self-assessment, in an interview setting or a workshop setting. The workshop setting is preferable, because in this way people can compare their results and discuss it.
Is **support** available if required?	The website provides names of consultants who can give support.
Is **advice** given on what to do with the results?	Some generic recommendations are given on how to improve. No specific recommendations since they should fit the company's problems. Companies have to design their own tailor made solutions. It is a gradual process, people must become aware.

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Understanding Your Culture Checklist, as a part of the Hearts & Minds Toolkit**
Validation of the tool? (e.g. how many sectors, organisations, employees)	In Parker (2006) the tool has been evaluated. Every year an evaluation survey is sent to the users but they rarely get feedback.
Is there a **database of results** and norms for results? **Benchmarking**?	There is no database since people use booklets. With a web-based tool it should become possible collect and benchmark data.
Usefulness of output for **planning of improvement actions**? Does the tool include recommendations?	Just generic recommendations.

6.3. Safety Climate Assessment Toolkit and User Guide (LSCAT)

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Safety Climate Assessment Toolkit**
Country (countries) of origin	UK
Developer (Organisation that developed the tool, i.e. public body, research institute, company, ...)	Loughborough University, the HSE plus a number of offshore organisations.
Research team (Names of researchers + organisation)	Dr Alistair Cheyne BA, Nottingham, MA, St Andrews, Dip. App. Psyc., Nottingham, PhD, Loughborough, C. Psychol - Senior Lecturer in Organisational Psychology
Contact for further enquiries (Address, email)	Loughborough University Loughborough Leicestershire LE11 3TU +44 (0)1509 222162 mailto:a.j.t.cheyne@lboro.ac.uk
Source, access to the tool (Web link, publication, ...)	http://www.lboro.ac.uk/departments/sbe/downloads/pmdc/safety-climate-assessment-toolkit.pdf
Articles/references to the tool	Cox SJ, Cheyne AJT. Assessing safety culture in offshore environments. Safety Science, 2000, 34, 111-129.
In which **language(s)** is the tool available?	English
In which **countries** has the tool already been applied?	

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Safety Climate Assessment Toolkit**
Industry/Sector In which sector(s) is the tool applied? (e.g. general, offshore, nuclear, hospitals, railway, ...)	The toolkit has been designed specifically for the offshore industry.
Is the tool applicable to different sectors?	The overall process could be applied within other sectors. However, attention would need to be paid to the face validity of the questionnaire items (HSE, 1999, page 30).
Type of employees Is the tool applicable to different types of employees? (e.g. blue/white collar workers, incl. supervisors/line management, ...)	There appears no reason why the Toolkit could not be used with all types of employee.
Is the tool focused on occupational **safety and/or health**?	The Toolkit is safety focused.
Is the tool **in the public domain**? (e.g. freely downloadable from the Internet)	Yes.
Is the tool **free to use and further develop**? (if applicable, please explain which parts of the tool are cost free)	Yes. The Toolkit is available free from the developer by post or via their Internet site (see above link).
Other **copyright issues**? (e.g. do copyright/intellectual property rights remain with the original developer; is it good practice to consult them before use?)	Dr Cheyne informed us that although the Toolkit is freely available for use and in the public domain, the copyright and intellectual property rights remain with the University. However, the University are “happy for the European Agency to publicise a general permission for organisations to use it." A separate review of the Toolkit (see: http://stepchangeinsafety.net/ResourceFiles/Changing%20Minds%20Guide.PDF) states that the Toolkit can be used without recourse to the developers but “some companies may need initial support”.
What **type** of assessment tool(s) is (are) provided? (e.g. quick checklist, behaviourally-anchored rating scale, employee survey questionnaire, observations, interviews, focus groups, document reviews, ...)	The assessment is undertaken using a triangulation approach to assess safety climate. This includes: ▪ An attitude survey ▪ In-depth, informal discussions with individuals ▪ Focus group meetings ▪ Examination of written records and databases ▪ Document analysis.

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Safety Climate Assessment Toolkit**
Is there a **user guide**?	Yes, the downloadable material includes a comprehensive user guide giving information about the background to safety climate issues and also a description of the assessment process.
Paper-based, web-based or other **format**?	Paper based but easily adaptable to a web based format.
Items? (number, factors, categories, ...)	The survey contains 47 items covering the following areas ▪ Organisational content ▪ Social environment ▪ Individual appreciation ▪ Work environment ▪ Organisation specific factors.
Type of answer? (e.g. five point Likert-type scale from ... to ...)	Five point Likert scale as follows: 5 = Strongly agree 4 = agree 3 = neither agree or disagree 2 = disagree 1 = strongly disagree
Score system used?	A standardised scoring system is employed.
How are the **(statistical) analyses** of done?	Those items that are negatively worded need to be reverse scored (full instructions provided). Scores are then averaged for each item. The average item scores are used to calculate dimension scores, the latter requiring standardisation for which full instructions are supplied in the Toolkit. Standardised scores are then plotted and dimension scores compared.
Is the tool designed to be used without **expert external assistance**?	Yes, but it is likely that some organisations (most likely smaller ones) would require initial support.
Is **support** available if required?	No information is given about support for using the Toolkit. It is likely that support would be charged for.
Is **advice** given on what to do with the results?	Yes. The Guide shows how to plot the standardised scores on graphs.
Validation of the tool? (e.g. how many sectors, organisations, employees)	The Toolkit underwent a lengthy development process as part of a joint industry project 'The measurement of safety climate in safety cases' (HSE ref: project 3389). This development process included piloting, revision and follow-up use of the questionnaire.

Title **(Name of the tool, abbreviation, English translation of name?)**	**The Safety Climate Assessment Toolkit**
Is there a **database of results** and norms for results? **Benchmarking**?	The user guide indicates that a full profiling service is available from Loughborough University Centre for Hazard and Risk Management who hold a database of comparative data. For further information on this service users are asked to contact the Centre on +44 1509 222162, mailto:safetyprofile@lboro.ac.uk
Usefulness of output for **planning of improvement actions**? Does the tool include recommendations?	The user guide has a section on 'Developing Action Plans' that steps users through a series of questions and answers. Action planning is discussed in enough detail (in a non-technical style) to help new users of the Toolkit to map out a plan for using and interpreting the output.

6.4. Safety Health of Maintenance Engineering (SHoMe) Tool

Title **(Name of the tool, abbreviation, English translation of name?)**	**Safety Health of Maintenance Engineering (ShoMe) Tool**
Country (countries) of origin	UK
Developer (Organisation that developed the tool, i.e. public body, research institute, company, ...)	Health and Safety Engineering Consultants (HSEC) Ltd. on behalf of the UK Civil Aviation Authority (CAA)
Research team (Names of researchers + organisation)	Personnel from the CAA and Steve Mason of health and Safety Engineering Consultants Limited.
Contact for further enquiries (Address, email)	Jim Reed Aviation House Gatwick Airport South West Sussex RH6 0YR +44 1293 567171 mailto:jim.reed@caa.co.uk
Source, access to the tool (Web link, publication, ...)	▪ http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=1057 ▪ http://www.caa.co.uk/application.aspx?catid=33&pagetype=65&appid=11&mode=detail&id=1129
Articles/references to the tool	None found
In which **language(s)** is the tool available?	English

<table>
<tr><th>Title

(Name of the tool, abbreviation, English translation of name?)</th><th>Safety Health of Maintenance Engineering (ShoMe) Tool</th></tr>
<tr><td>In which countries has the tool already been applied?</td><td>The Tool has secured a following in the Middle East, Far East and Australia.</td></tr>
<tr><td>Industry/Sector

In which sector(s) is the tool applied?

(e.g. general, offshore, nuclear, hospitals, railway..)</td><td>Civil Aviation Engineering Maintenance – the Tool is specifically aimed at aircraft maintenance companies.</td></tr>
<tr><td>Is the tool applicable to different sectors?</td><td>Given the specific nature of some of the questions, applying the tool in other sectors would be inappropriate.</td></tr>
<tr><td>Type of employees

Is the tool applicable to different types of employees?

(e.g. blue/white collar workers, incl. supervisors/line management, ...)</td><td>The Tool is designed for the following groups of workers:
▪ Technical certifying staff (engineers)
▪ Technical non-certifying staff (engineers/technicians)
▪ Other workers such as non-technicians/engineering support i.e. all workers that are not involved in hands-on maintenance of aircraft e.g. managers, stores, administration, etc.</td></tr>
<tr><td>Is the tool focused on occupational safety and/or health?</td><td>Safety</td></tr>
<tr><td>Is the tool in the public domain?

(e.g. freely downloadable from the Internet)</td><td>Yes</td></tr>
<tr><td>Is the tool free to use and further develop?

(if applicable, please explain which parts of the tool are cost free)</td><td>The Tool (i.e. the questionnaires) is free to use and can be freely copied. The Tool would still be made available on request.</td></tr>
<tr><td>Other copyright issues?

(e.g. do copyright/intellectual property rights remain with the original developer; is it good practice to consult them before use?)</td><td>The CAA paper 2003/12 Introduction to the Safety Health of Maintenance Engineering (ShoME) Tool is marked copyright, so it seems reasonable to assume that intellectual property rights remain with the CAA. There were no permissions or prior agreement for its use required by the CAA and as such this remains the situation.</td></tr>
<tr><td>What type of assessment tool(s) is (are) provided?

(e.g. quick checklist, behaviourally-anchored rating scale, employee survey questionnaire, observations, interviews, focus groups, document reviews, ...)</td><td>The SHoMe Tool consists of three sets of questions, each set aimed at one of the worker groups listed above. The sets of questions that are applicable to the different worker groups are as follows:
<table><tr><th>Worker group</th><th>Generic questionnaire</th><th>Job difficulty questionnaire</th><th>Organisational questionnaire</th></tr><tr><td>Technical certifying staff</td><td>Version 1</td><td>Standard</td><td>Standard</td></tr><tr><td>Technical non-certifying staff</td><td>Version 2</td><td>Standard</td><td>Standard</td></tr><tr><td>Management and tech support staff</td><td>Version 3</td><td>Not applicable</td><td>Not applicable</td></tr></table></td></tr>
</table>

<table>
<tr><th>Title

(Name of the tool, abbreviation, English translation of name?)</th><th>Safety Health of Maintenance Engineering (ShoMe) Tool</th></tr>
<tr><td>Is there a user guide?</td><td>Yes, a comprehensive user guide is available that explains how to use, score and interpret the questionnaires. The Guide is accessible via the following link:

http://www.caa.co.uk/docs/33/CAPAP2003_11.PDF</td></tr>
<tr><td>Paper-based, web-based or other format?</td><td>The questionnaires are paper based in their basic form but there is no reason why they could not be ported to a web/on-line based format.</td></tr>
<tr><td>Items?

(number, factors, categories, ...)</td><td>The number of items in the questionnaires are summarised in the following table:

<table>
<tr><th>Worker group</th><th>Generic questionnaire</th><th>Job difficulty questionnaire</th><th>Organisational questionnaire</th></tr>
<tr><td>Technical certifying staff</td><td>83</td><td>32</td><td>98</td></tr>
<tr><td>Technical non-certifying staff</td><td>83</td><td>32</td><td>98</td></tr>
<tr><td>Management and tech support staff</td><td>83</td><td>Not applicable</td><td>Not applicable</td></tr>
</table>
</td></tr>
<tr><td>Type of answer?

(e.g. five point Likert-type scale from ... to ...)</td><td>Generic questionnaire:

Five point Likert scale as follows:

▪ 5 = Strongly agree
▪ 4 = agree
▪ 3 = neither agree or disagree
▪ 2 = disagree
▪ 1 = strongly disagree

Job difficulty questionnaire:

A series of statements requiring an initial “Yes” or “No” response to indicate if a task forms part of the respondent’s job . If the response is “Yes”, the respondent is asked to indicate the level of difficulty experienced from the following three options:

▪ No problems
▪ Some problems
▪ Major problems.

Organisational questionnaire:

Respondents required to put a tick next to statements that have:

▪ Caused them, or a colleague to make a mistake or
▪ Caused them or a colleague confusion or uncertainty over a job or
▪ Otherwise affected airworthiness.</td></tr>
</table>

Title **(Name of the tool, abbreviation, English translation of name?)**	**Safety Health of Maintenance Engineering (ShoMe) Tool**
Score system used?	Results are presented at three levels of detail: ▪ Level 1: gives a high level summary of the main results, presenting basic results from evidence of non-compliance and ranked scores for potential issues associated with non-compliance. ▪ Level 2: comprises the Level 1 information with a more detailed description indicating the rank order of human factor issues associated with non-compliance. Level 2 information enable the identification of critical “root” and other human factor issues. ▪ Level 3: adds relevant scores from the organisational questionnaire. Only applicable to technical respondents. The scoring system reflects a number that would be 0 if all respondents strongly agreed with the “correct answer”, 33 if everybody only agreed, 67 if everybody disagreed etc. etc. The generic guidance on interpretation of the scores from the generic questionnaire on specific issues is: ▪ 35 or less: good ▪ 55 and more: worthy of attention ▪ 65 and more: worthy of concern and need to be addressed. The generic guidance on interpretation of the scores from the organisational questionnaire is: ▪ 15 per cent or less: acceptable ▪ 30 per cent or higher: worthy of attention ▪ 50 per cent or greater: worthy of concern and need to be addressed.
How are the **(statistical) analyses** of done?	Scoring of the questionnaires is carried out by a software package freely available from the CAA. Questionnaire data is entered into the software manually. The software performs all required calculations.
Is the tool designed to be used without **expert external assistance**?	The Tool is supported by 'Introduction' and 'User Guide' documentation. The latter steps potential users through all the key stages involved in deploying the Tool, including using the questionnaire, data entry and using the software and the analysis and interpretation of the results.
Is **support** available if required?	Although no official support is provided for the sotware, if users experience difficulties they are welcome to contact the CAA with specific questions via the following e mail address: osdhf@srg.caa.co.uk .
Is **advice** given on what to do with the results?	Yes. Full explanations and suggestions are given in the User Guide.

Title **(Name of the tool, abbreviation, English translation of name?)**	**Safety Health of Maintenance Engineering (ShoMe) Tool**
Validation of the tool? (e.g. how many sectors, organisations, employees)	The Tool has be piloted and trialled at five UK aviation maintenance companies.
Is there a **database of results** and norms for results? **Benchmarking**?	The User Guide mentions the possibility of setting up a non-attributable database of company results. Companies volunteering results could be provided average benchmarking results from the industry wide database.
Usefulness of output for **planning of improvement actions**? Does the tool include recommendations?	Very little guidance is provided in terms of using outputs from the Tool for decision-making and planning purposes.

6.5. Nordic Occupational Safety Climate Questionnaire (NOSACQ)

Title **(Name of the tool, abbreviation, English translation of name?)**	**NOSACQ-50 (Nordic Occupational Safety Climate Questionnaire)**
Country (countries) of origin	Nordic countries (Denmark, Finland, Sweden, Norway & Iceland)
Developer (Organisation that developed the tool, i.e. public body, research institute, company, ...)	Consortium of Scandinavian organisations, lead by the Danish National Research Centre for the Working Environment (NRCWE)
Research team (Names of researchers + organisation)	▪ P. Kines & K.L. Mikkelsen - National Research Centre for the Working Environment, Copenhagen, Denmark ▪ J. Lappalainen - Finnish Institute of Occupational Health, Tampere, Finland ▪ E. Olsen - University of Stavanger, Norway ▪ J. Tharaldsen - International Research Institute of Stavanger AS, Norway ▪ A. Pousette & M. Törner - Department of Occupational and Environmental Medicine, University of Gothenburg, Sweden ▪ K. Thomasson - Administration for Occupational Health & Safety, Iceland
Contact for further enquiries (Address, email)	Pete Kines Division of Safety Research, National Research Centre for the Working Environment, Lersø Parkallé 105, DK-2100 Copenhagen Ø, Denmark mailto:pki@nrcwe.dk

Title **(Name of the tool, abbreviation, English translation of name?)**	**NOSACQ-50 (Nordic Occupational Safety Climate Questionnaire)**
Source, access to the tool (Web link, publication, ...)	http://www.arbejdsmiljoforskning.dk/Spørgeskemaer/NOSACQ-50.aspx?lang=en (New website in 2011)
Articles/references to the tool	▪ Törner, M., Pousette, A., Kines, P., Mikkelsen, KL., Lappalainen, J. & Tharaldsen, J., 'A Nordic questionnaire for assessing safety climate (NOSACQ)', Proceedings of 4th International Conference Working on Safety, Crete, September 30-Oct 3 2008, conference contribution. ▪ Kines, P., Lappalainen, J., Lyngby, M., Olsen, E., Pousette, A., Tharadsen, J., Tomasson, K., Törner, M., 'Nordic Occupational Safety Climate Questionnaire (NOSACQ-50): a new tool for diagnosing occupational safety climate and evaluating climate interventions', 2010, submitted for peer-review.
In which **language(s)** is the tool available?	Danish, English, Finnish, Swedish, Norwegian, Icelandic, Czech, Chinese (simple), German, Hungarian, Dutch/French (Belgian), Dutch (Netherlands), Italian, Persian, Polish, Russian, Slovene, Spanish, Turkish and other language versions will soon be available.
In which **countries** has the tool already been applied?	Denmark, Finland, Sweden, Norway, Iceland, Belgium, Iran, The Netherlands, Slovenia.
Industry/Sector In which sector(s) is the tool applied? (e.g. general, offshore, nuclear, hospitals, railway, ...)	High injury risk sectors, e.g. construction, manufacturing, health care, transport, etc.
Is the tool applicable to different sectors?	Yes, see above.
Type of employees Is the tool applicable to different types of employees? (e.g. blue/white collar workers, incl. supervisors/line management, ...)	Yes, see above (high injury risk sectors, e.g. construction, manufacturing, health care, transport, etc.). Not low risk jobs, e.g. office environments.
Is the tool focused on occupational **safety and/or health**?	Yes, occupational safety and safety culture/climate.
Is the tool **in the public domain**? (e.g. freely downloadable from the Internet)	Yes. Questionnaire and user guidance is available on website: http://www.arbejdsmiljoforskning.dk/Spørgeskemaer/NOSACQ-50.aspx?lang=en. (New website in 2011)

Title **(Name of the tool, abbreviation, English translation of name?)**	**NOSACQ-50 (Nordic Occupational Safety Climate Questionnaire)**
Is the tool **free to use and further develop**? (if applicable, please explain which parts of the tool are cost free)	Free to use - preferably in cooperation with the developers (or local national contacts), so results (anonymised) can be included in the international database for use in further development of the tool.
Other **copyright issues**? (e.g. do copyright/intellectual property rights remain with the original developer; is it good practice to consult them before use?)	The Nordic Council of Ministers has the copyright to present and future versions of NOSACQ. Please contact the developers (or national contacts) before use (see note above).
What **type** of assessment tool(s) is (are) provided? (e.g. quick checklist, behaviourally-anchored rating scale, employee survey questionnaire, observations, interviews, focus groups, document reviews, ...)	Safety climate questionnaire.
Is there a **user guide**?	Yes, on website.
Paper-based, web-based or other **format**?	Web and paper.
Items? (number, factors, categories, ...)	NOSACQ-50 contains seven safety climate dimensions, comprising 50 items with 22 items evaluating management policies, procedures and practices and 28 items evaluating workgroup ditto. The NOSACQ-50 safety climate dimensions and examples of items are: 1. Management safety priority and ability (9 items) 2. Management safety empowerment (7 items) 3. Management safety justice (6 items) 4. Workers' safety commitment (6 items) 5. Workers' safety priority and risk non-acceptance (7 items) 6. Peer safety communicationlearning, and trust in safety ability (8 items) 7. Workers' trust in efficacy of safety systems (7 items)
Type of answer? (e.g. five point Likert-type scale from ... to ...)	A four-step Likert type response format, using the terms Strongly disagree (1), Disagree (2), Agree (3) and Strongly agree (4).
Score system used?	Scores from 1-4 (see above).
How are the **(statistical) analyses** done?	There are two options to analyse NOSACQ-50 data:

Title **(Name of the tool, abbreviation, English translation of name?)**	**NOSACQ-50 (Nordic Occupational Safety Climate Questionnaire)**
	▪ Option 1: By submitting raw data to the NOSACQ-50 development team, a short summary report will be made. In this report the data are compared to the international database and are presented in an illustrative diagram. In addition, some basic statistics are provided in order to compare and identify differences between the population and the database and between groups (e.g. work groups, departments, gender or age) in the dataset. ▪ Option 2: Calculating the results yourself by following some procedures on the website, as well as using SAS or SPSS.
Is the tool designed to be used without **expert external assistance**?	Knowledge of the pratical and ethical use of questionnaires is necessary
Is **support** available if required?	Yes, either from the developers or national contacts
Is **advice** given on what to do with the results?	Advice is given on the website, including: ▪ Soft guidelines for use of NOSACQ-50 and inform the participants ▪ Ethical considerations in questionnaire studies ▪ Instructions for completing the questionnaire ▪ Analysing NOSACQ-50 data ▪ Interpreting NOSACQ-50 results ▪ Working with NOSACQ-50 results (forthcomming)
Validation of the tool? (e.g. how many sectors, organisations, employees)	Initial versions of the instrument were tested for validity and reliability in four Nordic studies using native language versions in each respective Nordic country. NOSACQ-50 was found to be a reliable instrument for measuring safety climate, and valid for predicting safety motivation, perceived safety level, and self-rated safety behaviour. Additional language versions are continuously being validated, e.g. French/Dutch (Belgian), Dutch (Netherlands). The following language versions have been pilot tested and validated: five Nordic countries, and Belgium (French/Dutch). The Dutch (Netherlands) version is currently in validation process.
Is there a **database of results** and norms for results? **Benchmarking**?	NOSACQ-50 will enable comparative studies between and within work groups, departments, companies, industries and countries. The developers are building an international database based on previous and ongoing studies, to allow for benchmarking.
Usefulness of output for **planning of improvement actions**? Does the tool include recommendations?	NOSACQ-50 is suitable for research purposes and for practical use in evaluating safety climate status, as a diagnostic tool and in evaluating interventions. Recommendations for working with NOSACQ-50 results will be forthcoming on the website.

6.6. IAEA Guidance for Use in the Enhancement of Safety Culture

Title **(Name of the tool, abbreviation, English translation of name?)**	**IAEA 'Guidance for use in the enhancement of safety culture'**
Country (countries) of origin	International Organisation
Developer (Organisation that developed the tool, i.e. public body, research institute, company, ...)	International Atomic Energy Agency (IAEA)
Research team (Names of researchers + organisation)	Kerstin Dahlgren Persson, Division of Nuclear Installation Safety at IAEA
Contact for further enquiries (Address, email)	International Atomic Energy Agency, Policy and Programme Support Section, Wagramer Str. 5 / P.O. Box 100, 1400 Vienna, Austria
Source, access to the tool (Web link, publication, ...)	http://www-pub.iaea.org/MTCD/publications/PDF/te_1329_web.pdf
Articles/references to the tool	International Atomic Energy Agency. Safety Culture in Nuclear Installations: Guidance for Use in the Enhancement of Safety Culture. TECDOC Series No. 1329, Vienna, 2002. Available in English at: http://www-pub.iaea.org/MTCD/publications/PDF/te_1329_web.pdf.
In which **language(s)** is the tool available?	English
In which **countries** has the tool already been applied?	IAEA Member States
Industry/Sector In which sector(s) is the tool applied? (e.g. general, offshore, nuclear, hospitals, railway, ...)	Nuclear power plants
Is the tool applicable to different sectors?	It gives general ideas of the concept of safety culture and assessment methods that can be transferred.
Type of employees Is the tool applicable to different types of employees? (e.g. blue/white collar workers, incl. supervisors/line management, ...)	The guideline is basically applicable of different kind of organisations or workers.

Title **(Name of the tool, abbreviation, English translation of name?)**	**IAEA 'Guidance for use in the enhancement of safety culture'**
Is the tool focused on occupational **safety and/or health**?	No, it focuses on the prevention of major nuclear hazards. However it gives general ideas of the concept of safety culture that could also be transferred on the prevention at workplace level.
Is the tool **in the public domain**? (e.g. freely downloadable from the Internet)	Yes. http://www-pub.iaea.org/MTCD/publications/PDF/te_1329_web.pdf
Is the tool **free to use and further develop**? (if applicable, please explain which parts of the tool are cost free)	The guidance has been developed for the use in IAEA safety culture services that aim at supporting Member States in improving the safety culture of their nuclear installations. Permission to use whole IAEA publications or parts of it whether in printed or in electronic form must be obtained and is subject to royalty agreements. Proposals for non-commercial reproductions are welcome and will be considered on a case-by-case basis.
Other **copyright issues**? (e.g. do copyright/intellectual property rights remain with the original developer; is it good practice to consult them before use?)	All IAEA technical and scientific publications are protected by the terms of the Universal Copyright Convention of 1952 (revised in 1972). Enquiries should be addressed by mail or email to the IAEA publishing section: sales.publications@iaea.org or International Atomic Energy Agency, Sales and Promotion Unit, Wagramer Str. 5 / P.O. Box 100, 1400 Vienna, Austria
What **type** of assessment tool(s) is (are) provided? (e.g. quick checklist, behaviourally-anchored rating scale, employee survey questionnaire, observations, interviews, focus groups, document reviews, ...)	Proposed tools: observations, matrices, quantitative questionnaire, questionnaire with qualitative elements, face to face interviews and focus group interviews.
Is there a **user guide**?	Yes. The Guidance that explains basic terms and assumptions of culture in general, safety culture and safety climate. It also explains how to build up and assess safety culture in organisations based on an employee survey which can be done by questionnaire.
Paper-based, web-based or other **format**?	Paper based
Items? (number, factors, categories, ...)	The Guidance introduces characteristics and three stages of development (rule based, goal based, improvement based) of safety culture. The characteristics should be taken account of when designing a survey tool: 60-80 items are considered to be adequate.

Title **(Name of the tool, abbreviation, English translation of name?)**	**IAEA 'Guidance for use in the enhancement of safety culture'**
Type of answer? (e.g. five point Likert-type scale from ... to ...)	The Guidance leaves it open to the user to emphasise quantitative or rather qualitative survey methods. The general recommendation is to combine methods and to have experienced supervision with the survey. Likert scale systems and a quantitative core survey are recommended.
Score system used?	No. But recommended, see above. The guideline also introduces a matrix system for estimating if the safety culture is rule based, goal based or improvement based. In this matrix an improvement based safety culture is considered to be the most advanced.
How are the **(statistical) analyses** of done?	N/A
Is the tool designed to be used without **expert external assistance**?	It is recommended to consult experts for assessing safety culture with the proposed instruments. Observations should be done by specialists from outside the company. Also interviews require technical expertise.
Is **support** available if required?	Support is only available for nuclear safety assessment, not for other application purposes. IAEA safety culture services support member states in improving the safety culture of their nuclear installations.
Is **advice** given on what to do with the results?	The guidance gives advice on what could be done to support the development of safety culture by managerial approaches and good leadership and how to mainstream a learning culture into the business.
Validation of the tool? (e.g. how many sectors, organisations, employees)	The guideline reflects long time practical experience of the ASCOT (Assessment of Safety Culture in Organisations Team) safety missions of IAEA and advice of the International Nuclear Safety Advisory Group, as laid down in anterior IAEA publications as Tecdoc 860 (http://www-pub.iaea.org/MTCD/publications/PDF/te_860_web.pdf). A critical reflection on the IAEA INSAG and ASCOT guidelines can be found in Büttner et al. (2007, p. 45 ff and 95ff.)
Is there a **database of results** and norms for results? **Benchmarking**?	No. A safety culture index is proposed which would enable transparency of results and the development of safety culture in the organisation. But IAEA does not provide such service for OSH performance.
Usefulness of output for **planning of improvement actions**? Does the tool include recommendations?	The Guidance includes a lot of recommendations given in a very comprehensible way. It includes the 'simple model of transformational change', which proposes a three stages model for fostering organisational development and for improving safety culture in practice.

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8. Further information

8.1. Further reading

A selection of interesting literature related to the topic of OSH culture:

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8.2. Web links

Safety culture has been studied and analysed by companies and institutions in various sectors. Below is a non-exhaustive list containing some interesting web links on safety culture in certain particular sectors.

Naval safety	Naval Safety Center (US Navy)	https://www.safetyclimatesurveys.org/
Nuclear Safety	Nuclear Safety Group: Nuclear Safety Info - Safety Culture	http://nuclearsafety.info/?page_id=79
	Energy Facility Contractors Group (EFCOG) / Department of Energy (DOE): EFCOG/DOE Safety Culture Task	http://www.efcog.org/wg/ism_pmi/efcog_doe_safety_culture.htm
Railway safety	Rail Safety and Standards Board (RSSB) (UK)	http://rssb.info-exchange.com/
Aviation safety	Air Traffic Management (ATM) - Eurocontrol	http://www.eurocontrol.int/eec/public/standard_page/EEC_News_2008_2_Safety.html
	Flight Safety Foundation, Global Aviation Safety Network (GAIN)	http://flightsafety.org/archives-and-resources/global-aviation-safety-network-gain