

Towards a positive railway safety culture

Abstract

At present, the railway sector has no body of reference or tools to evaluate the maturity of or improve its safety culture. This gap is potentially due to the multiple definitions and interpretations that exist for a 'safety culture'. It is also perhaps because regulatory demands being made on railway companies and their own will to improve safety culture are still a relatively recent development. The purpose of this study is an attempt to bridge this gap.

The first step in the study is to establish a set of references to indicate what constitutes a good safety culture, based on the knowledge and expertise of member railways of the UIC Safety Platform.

The second step identifies the links between a positive safety culture and safety management. The aim of this is to use safety management as a lever to improve safety culture.

To this end, a SMS approach is adopted, grounded in the principles of ongoing improvement that are advocated by ERA. This approach has been enshrined in European regulatory and legislative frameworks (new safety directive, and CSM currently being revised) through the introduction of human factors, just culture, safety leadership, stakeholder engagement at all levels. These ingredients are the foundation of a positive safety culture.

Based on this premise, it is possible to identify how an SMS can be implemented as a lever for ongoing improvement to create a positive safety culture.

For each of the constituent parts of an SMS, this study:

- Gives recommendations on implementation; and
- Describes the expected effects on the culture of the organisation and safety culture.

This third part of this study concentrates on evaluation of safety culture within an organisation. This evaluation is based on an evaluation on three aspects: rules, perceptions, actions.

The main results of this study are presented.

Introduction

In 2012, the UIC Safety Platform held three one-day conferences on the theme of safety culture. These conferences brought together railway operators and representatives of other industries (energy, healthcare, chemicals, aviation) and gave rise to two major questions:

- What are the links and interactions between safety management and safety culture?
- How can we measure safety culture?

These two questions were explored at greater length by the UIC Human Factors Working Group and a dedicated "Safety Culture" task force.

This report presents the conclusions of their work.

Whereas the concept of safety management is nowadays fairly well defined in a number of legal texts, the same cannot be said of the concept of safety culture.

However, if a company wishes to improve and evaluate its safety culture, it needs to define its goals and have at its disposal a set of relevant metrics against which to measure its performance.

This report therefore comprises three parts:

- 1) A detailed definition of a positive safety culture
- 2) An analysis of the links between safety management and safety culture
- 3) Recommendations and proposed evaluation and assessment methods for a safety culture

What is a positive safety culture?

An "integrated" safety culture¹ is said to exist when a company has reached the highest level of maturity in terms of safety: management takes the lead on safety whilst ensuring that operators are heavily involved in some management activities and in the rigorous application of safety measures. In other words, the "shop-floor" and "bureaucratic" cultures are both strong and are integrated with one another. Changes in the safety management system and changes in operators' behaviour will together influence safety performance.

An integrated culture therefore refers to the highest level of cultural maturity that a company can have.

Such an integrated safety culture, which is what we mean by a "positive safety culture", is characterised by 9 features.

Features of a positive safety culture

2.1 Engagement and involvement in safety

Safety, like industrial production, is the outcome of the activity of the company as a whole, meaning that the engagement and involvement in safety of all stakeholders are critical.

Managers and operators will feel engaged in safety matters if they are involved in identifying and resolving safety issues. The company needs to put in place processes to involve managers and operators in safety matters (IAEA, 1991).

Involvement also concerns other stakeholders, who are many and varied: contractors, suppliers, shippers, neighbours, customers, authorities, trade unions, etc. The company needs to identify these and strive to involve them in safety issues. This is one of the roles of management.

2.2 Leadership and leading by example

The engagement and involvement of all of an organisation's stakeholders cannot be taken for granted, but must be constantly maintained and promoted. This task largely falls to managers. Leadership is a key part of management since it aims to "positively influence the behaviour of people". Leadership is essential because it moulds company culture in general and attitudes to safety in particular. It will also be pivotal in sealing the success or failure of the preventive policies implemented in the company. When staff are genuinely convinced that safety is central in the organisation and is an absolute priority, then leadership will have a positive effect. As a consequence,

¹ François Daniellou, Ivan Boissières, Marcel Simard. Les facteurs humains et organisationnels de la sécurité industrielle: un état de l'art.. FonCSI. FonCSI, pp.125, 2010, Les cahiers de la sécurité industrielle.

given the close link between management and leadership, it is crucial for managers to appear credible to employees in order to ensure that the latter perceive the status of safety positively.

Leadership in safety can be defined as the practical application of various principles: championing a concept of safety which matches the organisation's values; ensuring that safety occupies its rightful place on a daily basis; achieving buy-in to this view (by making a convincing case and encouraging the reporting of information); being credible through exemplary, consistent behaviour; fostering team work and cross-functional cooperation (observation, listening and communication); and recognising/rewarding good practice and taking a "just and fair" approach to disciplinary matters

It should be noted that leadership is not exclusively displayed through a managerial role, but can also be shown in:

- company schemes (tutoring, training, coaching, team work, etc.),
- outside of assigned tasks or duties, whenever one worker exerts a natural influence over his/her colleagues in the interest of safety.

2.3 Just culture

A just culture is an intrinsic feature of a positive safety culture and can help boost the involvement in safety of everyone within the organisation. It is an environment in which worker contributions are encouraged and where the underlying causes of events are analysed in order to distinguish between what is due to systemic failure and what is due to individual responsibility.

A just culture seeks to:

- instil a climate of trust,
- encourage voluntary reporting of risks, errors or proposals from the workforce,
- understand the strengths and weakness in systems and learn from mistakes.

A just culture thus helps foster [A learning organisation](#) on safety.

The principles underpinning such a culture will seek to promote practices which will foster trust at all levels of the organisation (Reason, 1997; Daniellou, 2010), such as:

- guaranteeing a just and fair form of management, i.e. neither excessively punitive nor too lenient,
- recognising that mistakes are possible,
- distinguishing between errors and violations (errors are an unintentional inappropriate action, while violations represent voluntary non-compliance with a standard or rule). Both are deviations from what is expected, and both represent a loss of control over a situation,
- distinguishing between what is acceptable and unacceptable (infringement or not),
- rewarding positive behaviour and positive contributions,
- protecting individuals from summary judgement in the event of deviations from the rules and offering the appropriate assistance.

2.4 Suitable rules

In order to foster a positive safety culture, rules should be appropriate, well designed and revised regularly, taking into account individual needs and their interactions with the organisation as a whole, the organisation's ultimate aims and objectives, the features of any technical equipment used, and the environment in which the work is performed. Good rules are the fruit of a long process of identifying threats and analysing risks in order to generate higher compliance levels: if managed in

this way, rules will match the situations encountered daily by operators, generating buy-in to the rules.

Participatory methods of rule-writing will tend to result in a closer match between rules and the situations they govern. Such methods may include, for instance, testing the wording of a rule to check it is properly understood, asking the operators concerned how they would act in a specific situation, or simulating the application of the rule.

2.5 Suitable resources

Resource allocation processes are defined by the company and described in the safety management system. This general description is then elaborated upon in internal documents, e.g. for local application or on a job/skill-specific basis.

- Roles and responsibilities are clearly defined. Tasks, objectives and performance standards are defined for each employee and understood by all members of the team. Duty holders have the proper powers, skills, and resources to carry out their delegated tasks.
- Human resources: The number of workers and the skills they possess are commensurate with the work to be done, including managing any contingencies.
- Documentation
- Must be exhaustive and user-friendly. Training documents must be consistent with working documents.
- These documents must be easily accessible and suitable for use in the workplace environment.
- Tools and equipment: These must be readily available and suited to the work to be carried out. They should be designed with human physical and psychological features in mind. Their condition (wear) is monitored and they are maintained or replaced as necessary.

2.6 A learning organisation

The capacity for a learning organisation can be considered as part of an organisational philosophy whereby any problem is regarded as an opportunity to learn, reflecting a willingness to learn from others and share your own experiences with them.

An organisation with a strong learning culture collects information from various sources, distils and applies useful lessons, shares knowledge and follows up on lessons learned by improving processes and risk-protection barriers (J. Reason, 1997; F. Daniellou et al, 2010; E. Marsden, 2014).

Such an organisation:

- seeks opposing views for effective learning,
- is open to bad news, and encourages full disclosure of information before it is passed to managers,
- has trusting & honest relationships and reporting systems,
- visibly responds to reports,
- is sensitive to lessons from various sources such as internal reporting systems (included reported information from frontline staff) and systematic root cause analyses as well as studying incidents external to the organisation. Lessons may also be drawn from events, behaviours and positive outputs,
- capitalises on problems and lessons learned,
- develops action plans with local managers and staff to rectify the problems,
- implements lessons learned across the entire organisation.

2.7 Cooperation and trust

A work group can be defined as “a set of individuals with skills which complement each other and agree to pool their potential and their efforts to achieve a common identified goal.” In practical terms this can be felt through team spirit which is the bond between the individuals in a group, the ingredient which instils cohesion within a team and the incentive for this group to work towards a common interest (Dédale, 2010).

Having a common goal is vital if each member of the team is to pull in the same direction - this presupposes good communication. Equally, it is indispensable for the team members to have the necessary complementary skills - and for them to recognise this - if the goal is to be seen as achievable. All this presupposes good resource management and exemplary conduct by management.

The group also needs motivation and cohesion, which must be created and maintained over time in order to build a collective identity which makes room for individual identity while preserving a sense of mutual assistance in a motivating work environment.

Trust cannot be imposed but is built reciprocally. Managers and workforce must be credible in order for there to be mutual trust. The three fundamental pillars underpinning a trust-based relationship are goodwill, integrity and competence of management (Karsenty, 2015).

To build trust, there needs to be regular contact between managers and workforce - not just in the context of accidents or audits - in order to facilitate open dialogue and thus reporting of information on difficulties or successes. Taking a just and fair approach will enable appropriate disciplinary action to be taken, where necessary, without upsetting the balance within the group.

2.8 Good Communication

Good communication is central to an organisation: for example, it is the basis of reporting and experience-sharing systems, and guarantees effective transfer of management and operational information, including the formal and informal exchange of safety related information at all levels.

One important part of a positive safety culture will inevitably be to actively encourage and practise communication throughout the organisation.

Good communication includes top-down information, bottom-up information, cross-functional communication. A good communication is where safety is a topic for discussion.

2.9 Safe change management

A positive safety culture is one where great attention is paid to organisational, operational and technical changes with a potential bearing on safety. An awareness of the challenges surrounding such changes leads to forward thinking and planning such that all the necessary steps are taken to avoid negative consequences. For this subject to be given proper attention, a formalised change management process must exist. This will take account of the current state of knowledge and any remarks or suggestions made by any of the stakeholders concerned, in particular those made by future users or operators (including front-line operators).

The organisation plans ahead to ensure it can adapt to internal and external changes: new competencies, rules and regulations, commercial aspects etc. Plans should take into account that changes are not always immediate, and sometimes take time to appear.

Consequently, in an organisation with a positive safety culture, the effects of the change must be leveraged, using a system whereby experience can be shared with and factored in by anyone involved in similar changes in future (applicant, client, contractor).

First conclusion

This model of a positive safety culture highlights the interdependencies between the nine features described. That means that, by virtue of a domino effect, a weakness in any one of them will inevitably have repercussions on the others. The maturity of the company culture is heavily dependent on the most fragile parts of said culture. However, that does not mean that each of the above features carries equal weight or should be considered identically in the context of an appraisal of safety culture.

Four of these concern the bases of the culture in place in the sense that they express fundamental changes in the company's collective values and attitudes. These are:

- Engagement and involvement of all stakeholders
- Leadership and leading by example
- Just culture
- A learning organisation

Three others refer to key safety management processes, which need to be implemented properly or the aforementioned changes in values and attitudes are highly unlikely to happen. These are:

- Suitable rules
- Suitable resources
- Safe change management

Lastly, the final two features are in some ways the result of the other seven, but are deserving of mention in their own right since they are measurable and may be leveraged in order to bring about change within the company. These are:

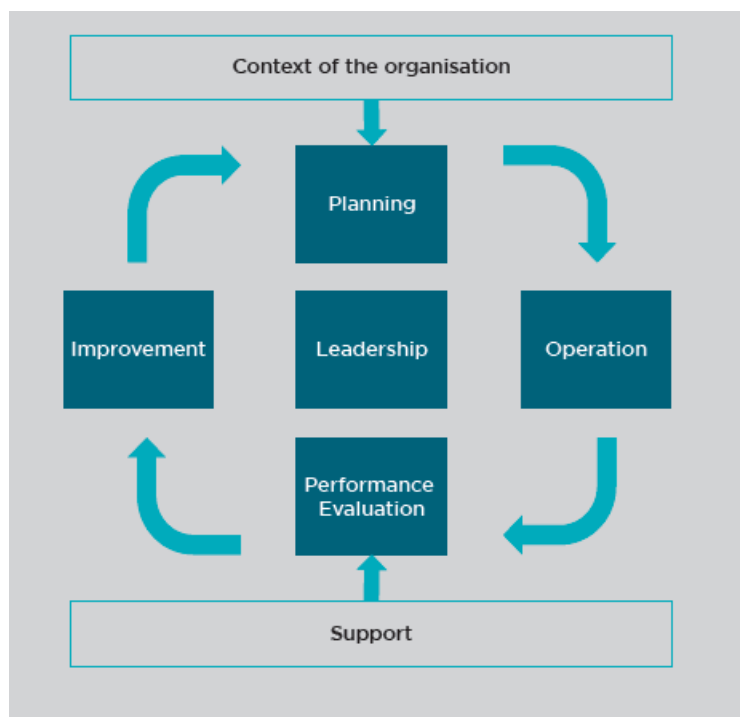
- Cooperation and trust
- Good communication

A detailed description of this "yardstick for a positive safety culture" will serve to inform management actions. Safety management processes can be leveraged in support of achieving this aim, but may also lead a company astray depending on how they are defined and applied.

Towards a positive railway safety culture

The second step is to identify the links between a [positive safety culture](#) and safety management. The aim of this is to use safety management as a lever to improve safety culture.

To this end, a SMS (Safety Management System) approach is adopted, grounded in the principles of ongoing improvement that are advocated by 'the Agency' (European Railway Agency). This approach has been enshrined in European



regulatory and legislative frameworks (new safety directive, and CSM for safety management system requirements) through the introduction of human factors, a just culture, stakeholder engagement at all levels to avoid externalisation of risk, and the notion of safety leadership. These ingredients are the foundation of a positive safety culture.

Starting with the new CSM, the UIC Human factors working groups have attempted to identify elements of the security management system that can influence a positive safety culture.

The group has identified more than 86 elements where one or more coincidences emerged. Volume two of the study retakes these elements. The last work of this second part of the study has consisted to select by the experts one element or maximum two essential key elements for each point of the SMS having a good impact on safety culture. This work is presented in a folder.

CONTEXT OF THE ORGANISATION

Incorporation of stakeholders

Encourage a healthy exchange with all stakeholders, take into account feedback from these parties on any mismatch between rules and resources in order to foster the climate of trust and cooperation that is needed for smooth operations and create a learning organisation conducive to ongoing improvement.

LEADERSHIP

Leadership and engagement

- Managers develop a positive safety culture as one of their primary objectives.
- They show the example by complying with its principles.

Safety Policy

The safety policy is consistent with three essential principles needed to build a positive safety culture:

- a just culture,
- a learning organisation,
- importance placed in a climate of trust.

Organisation of roles, responsibilities, accountabilities and authority

The apportionment of roles and responsibilities is described in the SMS and all related internal documents. Everyone in the organization is aware of this.

Consultation of staff and stakeholders

Consultation of all staff and stakeholders on matters related to safety facilitates the voluntarily observation of instructions, helps construction of realistic organisations and requirements and reinforces a climate of trust and cooperation.

PLANNING

Action to address risk

- Planning of operations factors in the outcome of risk evaluations.
- Risk evaluation is not limited to action taken by operational staff, but includes organizational risks.

Planning for change

The purpose of planning in the case of change is to anticipate any risks related to the scheduled change itself (proactive safety management).

Safety objectives and planning

- Objectives are realistic, which means that rules match available resources.
- Each person's contribution to achieving the goal is made clear.

SUPPORT

Resources

- Resources are managed in consideration of the requirements found in rules, standards and procedures, to ensure they are always sufficient and relevant.
- Training and skills match the work to be carried out.

Competence

- Non-technical skills are part of the skills that must be acquired through initial and ongoing training; they are checked.
- Management ensure staff are able to recognise a hazard and to manage it. This means ability to survey one's surroundings, personal skills and ability to take a suitable decision.

Awareness

Top management must ensure that themselves and all their staff involved in key safety roles are aware of the importance of what they do and the consequences of their actions on safety, including how they contribute to safety targets.

Information and communication

- Information about safety - policy, objectives, risk evaluation, processes, changes, results – is disseminated through official channels.
- Staff can also inform management the way in which work is carried out, of any problems and of possible solutions, ensuring that this input is used in safety management at all levels in the company.

Documented information

- Documented information is suitably communicated to the relevant personnel (including partner company staff and suppliers, when applicable). It is easily accessible for reference by staff with their available means.
- Having reliable, practical and accessible documented information serves to reinforce the trust that employees have in the company's management.

Integration of human and organisational factors

- Incorporation of Human Factors into the organisations processes includes design and use of equipment, tasks and working conditions, as well as their breakdown.
- Taking into account HOF involves all personnel in order to ensure that all possible difficulties encountered on an operational level are considered.

OPERATION

Operational planning and control

Make realistic and achievable plans, involve knowledge of people from all layers of the company and improve where necessary.

Asset management

- Management encourage staff to report on the state of equipment being used and take into account staff feedback on non-compliance of equipment.

- Equipment and installations are designed to permit staff to work safely from a technical, organisational and human factor point of view.

Sub-contractors and partners

- Include your outside contractors in the process of risk management and in consequence extend just culture and continuous learning procedures to them.
- Do not externalise risk to contractors.

Safe management of change

- Plans for change include anticipated impact on safety. Care is given to the effect of modifications on daily operations.
- Change management addresses human factors requirements.

Emergency management

- Management show leadership by putting safety first in all their decisions and ensuring that operations run as smoothly as possible.
- Each emergency event is followed by a debriefing session with all relevant players including external parties.

PERFORMANCE EVALUATION

Monitoring

- Monitoring carried out by line management is an opportunity to engage and involve staff in safety issues.
- Monitoring is organised and carried out in an open way with staff properly informed and aware of the purposes of the evaluation.
- Any deviation detected during a monitoring activity is analysed in the same way as any other deviation or safety event in accordance to the principles of just culture and learning organisation.

Internal audits

- Management should encourage open discussions because the audit is the opportunity to progress.
- Audit results is be made known to the company and its staff.

Management reviews

- Feedback and contributions of staff are taken into account and staff are kept informed about follow-up made in relation to their input.
- The conclusions of in-depth analyses into deviations (feedback and safety events) are presented in a way which helps decide the priority of changes to be made whilst ensuring that resources and rules remain consistent or adjusting them.

IMPROVEMENT

Learning from accidents and incidents

- Make people talk and report, analyse the information and if applicable devise measures for improvement, then communicate and train or make technical improvements.
- Thank and encourage feedback from “the real world” even without accidents to increase the knowledge base.
- Successes are dealt with in the same way as failures.

Continual improvement

Improvement measures are always consistent with the principles underpinning a just culture and a safe management of change.

Second conclusion

Safety management is a catalyst for improving safety culture, so long as certain principles and methods are observed.

As such, the recent addition into the regulatory framework of notions related to a just culture, engagement of all stakeholders and safety leadership acts as a cornerstone to the reinforcement of safety culture.

The shift towards a positive safety culture should be reflected through various changes. All these changes should be aimed at achieving the common goal of ensuring that safety appears in all strategic decisions and in the daily running of the company. These developments should also tend towards greater involvement of all levels of staff in safety, a central role played by managers in safety leadership, trust and cooperation and provision of suitable resources.

Evaluation of safety culture

The third part of the study concentrates on evaluation of safety culture within an organisation: which can either be the whole company or a part of it. At this juncture, it may be more appropriate even, to talk of 'self-evaluation' since the content of the study is primarily aimed at company's themselves.

Dashboard safety indicators are generally presented as numbers, in the form of absolute values (number of incidents, ...) or ratios. However, using values to 'measure' safety culture is unlikely to produce a useful result: Culture is all about values, beliefs and behavior, which cannot be reduced to a set of data, even though a statistical approach may be effective in certain cases.

For this reason, the term 'evaluation' is preferred over 'measurement'.

Notwithstanding, literature on safety culture does contain opinions to the contrary, saying that safety culture cannot be evaluated and cannot even be described: "Certain sociological and anthropological schools of thought consider that a culture is a complex historical construction which... cannot be described exhaustively" (ICSI 2017).

Others do not consider 'safety culture' to be a proper target because it is only the "reflection of the influence of a greater organisational culture" (ICSI 2017).

This study posits that it is possible to evaluate safety culture, and that the real question, of the intrinsic link that ties it to the overarching organisational structure is not an obstacle: it simply needs to be taken into account when information is collected and analysed.

The majority of indicators used in companies measure safety output, and not safety culture. Accidents, incidents and precursor events are all the result – whether final or intermediary – of the way the railway system works. Indicators that measure such events are therefore by definition only a response: they are lagging indicators, and do not reflect (or are a poor reflection of) the surrounding safety climate. Measuring the level of safety equates to measuring the consequences of the way in which an organisation functions. It does not help to explain the causal factors and influence that include culture.

Measuring the level of safety and evaluating the culture of safety are therefore two very different things. A culture of safety, as will be expanded on later, is just one ingredient that shapes human activity. Human activity is then transposed into behaviour that either fosters safety or jeopardises it.

Unwanted events (accidents, incidents and precursor events) are a result of this.

“Measuring safety culture is a ‘leading’ rather than a ‘lagging’ indicator of safety” (Health Foundation 2011)

Information collection methods centring on culture are only used sporadically. Furthermore, results that are obtained are not necessarily always linked to other available results.

Information collection methods that are more systematic, generally focus on detecting deviations. They rarely go as far as questioning the relevance and quality of an instruction, or the reasons for the deviation, even though of course a culture of safety is not only made up of rules and instructions (voluntary proactive feedback on safety, for example).

Evaluating a culture of safety is therefore about grasping a picture of an organisation as a whole, its nominal *modus operandi*, the way it works in practice, and results achieved.

People form part of this organisation or are interacting with it, and should therefore be the main focus of observations. However, they cannot be examined in isolation outside the social-technical system with which they interact. The sociotechnical system is comprised of three components: technical, organisational and managerial, and the body of personnel.

These three pillars underpin safety performance. They are in turn each moulded by the surrounding safety culture, and inversely they have an impact on the culture of safety.

DO, THINK, FIX

“A safety culture is made of the way things are done, and the way people think (values, implicit evidence)” (ICSI 2017).

Evaluation should therefore focus on both aspects.

Certain evaluation methods aim to capture the complex reality of a culture through a simple survey of what people think (c.f. Chap. 4.2, “measuring safety climates”). In sum, the safety climate is just one component and cannot be used to define a whole culture within an organisation.

Collecting and analysing information about what and how things are done, and on perceptions and through processes provides much deeper insight to understand the nature of interactions between individuals.

Perception guides individuals, and the result of their actions reinforces perceptions.

Individual perceptions are also influenced by the actions and perceptions of others. Culture is therefore the produce of an infinite chain of ongoing interactions between individuals either within or outside the organisation.

The purpose of an evaluation is to gain insight into the key underlying mechanisms.

In addition to this, it should be noted that every organisation will have its own unique structure, set of rules, processes and way of working. A railway undertaking is like any other industrial business that involves risk and binding environmental constraints. The need to operate within a narrow framework of constraints inevitably influences behaviours and perceptions of those working in the organisation. Inversely, the framework is also the product of the perceptions and actions of those who are tasked with defining, enforcing and updating it.

As such there is a strong incentive to include this framework in any kind of evaluation.

Evaluation of a safety culture should therefore rest on the following key components:

- What is prescribed (written down)
- What is perceived
- What is done

HOW SHOULD AN EVALUATION BE MADE?

For evaluating what is prescribed: observation of documents

For evaluating perceptions: one-on-one or group interviews and questionnaires

For evaluating action : on-site observation, through recorded data in a database or through decisions recorded in meeting minutes.

WHAT INFORMATION SHOULD BE COLLECTED?

Information to be collected must cover the nine characteristics of a positive safety culture in the three components of a culture.

	Engagement	Leadership	A just culture	Suitable rules	Suitable resources	A learning organisation	Cooperation and Trust	Good communication	Safe changes and transitions
Prescribed action									
Perceptions									
Action									

32 types of information are proposed in the field of the prescribed action.

38 types of information are proposed in the field of perceptions.

42 types of information and 18 indicators are proposed in the field of action.

ANALYSING THE RESULTS

Collected information has to be analysed so that it can be used as input to evaluate a safety culture.

Using this evaluation, the company can see where its safety culture stands in relation to the target of a 'positive safety culture' as defined in Part 1 of this study, entitled, "what is a positive safety culture."

The evaluation uses the work of Westrum and Hudson on safety culture maturity, as a reference.

Each of the characteristics that make up a positive safety culture need to be evaluated. The evaluation is based on information collected in the three fields entitled: prescribed action, perceptions and action.' Information collected under these three headings, together, make it possible to position the safety culture on the maturity scale.

Should, and is it possible for, the link between the various types of collected information and the different stages of maturity be modelled even further?

This study takes the position that the answer to this is no.

Given the current knowledge and practices observed in industry today, it appears neither possible nor desirable for this relationship to be examined in further detail in this study.

Each company must define its own evaluation template.

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