

## Organisational and safety culture models

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Keywords: Organisational Model, Safety Culture, Safety Culture Model, Tool, Assessment, Safety, Human Factors.

### Introduction

“It could be argued that the most dangerous element in any process plant is not the plant, or the chemicals in it, but the people operating it.” This statement by Flavell-While [7] in the August 2012 issue of *The Chemical Engineer* (tce) sums up the importance of Human Factors in industries. In the world of Human Factors, Safety Culture plays a key role in determining the level of risk that personnel are willing to take in order to complete the task at hand, despite time constraints.

Every organisation experiences some form of change during its lifetime. It can be difficult to control “the number of affected variables changing at the same time” [2] such as the magnitude and range of changes to organisation structure, management practises, policy and procedure, work climate etc. The definition of a variable adhered to in this paper relates to a feature that contributes to positive Safety Culture. However, organisational events and literature research show that certain relationships amongst variables have been found and can be used to analyse these variables. These ‘relationships’ and other variables can be combined together to form organisational models. These models can then help investigate how the proposed change could impact the behaviour of individuals, groups and structures within the organisation.

Different tools have been created to try and assess the Safety Culture of an organisation and different organisation models have to been developed to aid organisational change. Here lies the objective of this study, which is to determine whether Safety Culture Models consider organisation features such as organisation change and organisation culture. This research will review Organisational Models and Safety Culture Models within different industries (e.g.: defence, oil & gas, railway, healthcare etc) to determine if a combined tool already exists or if one could be developed and used across a range of industries.

### Organisation Models

Organisational studies is “the examination of how individuals construct organisational structures, processes and practises and how these shape social interactions within the organisation and create institutions that ultimately influence people” [5]. In the last few years, a wide variety of specialists have remodelled the hierarchical approach with the addition of variables such as strategy, mission, leadership etc in order to create a model for organisation structure that represents the most effective ‘routes’ to communicate and hence establish good safety culture. A selection of these models will be discussed in this section.

#### The Chosen Models

A number of organisational models were identified and reviewed but only three have been shortlisted because of their three distinct features. The three models are:

1. The Burke-Litwin Model [2]
2. Kotter 8-Step Change Model [10]
3. Mintzberg Model on Organisational Structures [11]

Other identified models such as the 7S Model, Congruence Model and The Six-Box Model were not down-selected because their features were already exhibited and further developed in the chosen models<sup>1</sup>.

These models were reviewed with various safety professionals to understand the potential value and issues of using an organisational model to establish a safety culture baseline and then influence improvement.

#### *The Burke-Litwin Model*

The original thinking underlying the model came from George Litwin and others during the 1960s but has been refined through a series of studies directed by Burke and his colleagues (Bernstein & Burke, 1989; Michela, Boni, Schecter, Manderlink, Bernstein, O’Malley, & Burke, 1988). Recent collaboration has led to the current form of this model shown in Figure 1.

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<sup>1</sup> Detailed descriptions of these models can be found in the source paper of this research [16]

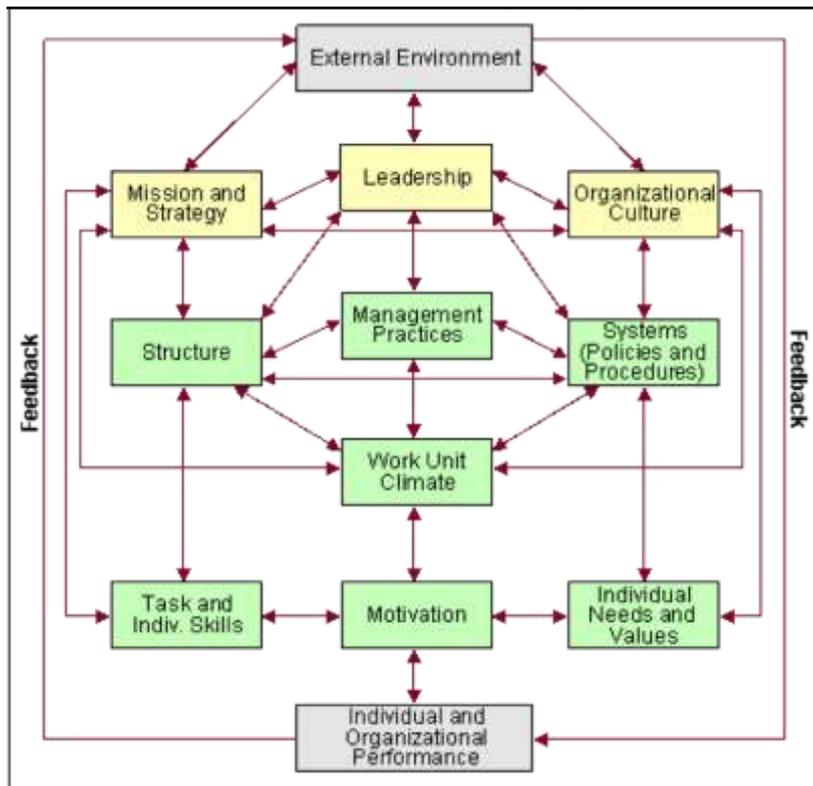


Figure 1: The Burke-Litwin Causal Model of Organisational Performance and Change [2]

This model was not created using a knowledge-to-practice direction, meaning that the model was not created based on the research and theory first and then combined with practice. With this model, W. Warner Burke and George H. Litwin wanted to link what they understood from practise to what was known from research and theory.

The model was constructed to serve as a guide for both organisational performance and planned organisational change. Two types of variables are incorporated within the model, which are Transformational and Transactional variables. These two types of variables collectively include the twelve variables shown in Figure 1.

The Transformational variables include the External Environment, Mission and Strategy, Leadership, Organisational Culture and Individual and Organisational Performance (i.e. the grey and yellow boxes in Figure 1). Transformational “means areas in which alteration is likely caused by interaction with environmental forces and will require entirely new behaviour sets from organisational members” [2]. The organisation leaders directly initiate a majority of the organisational change. But these leaders can experience influence and direct forces from the organisation’s external environment as well.

The Transactional variables include Structure, Management Practices, Systems (Policies and Procedures), Work Unit Climate, Task Requirements and Individual Skills, Motivation, Individual Needs and Values and Individual and Organisational Performance (i.e. the green and lowest grey box in Figure 1). Transactional means primary exchange of benefits, in other words, “you do this for me and I’ll do that for you” [2]. This explains the relationship between these variables.

“The transformational variables have more ‘weight’ than the transactional variables” [2] because transformational change, for example, change in leadership, affects the total system whereas transactional change, such as change in structure, may or may not affect the total system. The ranking order by which the greatest impact of change can be influenced by, is the external environment followed by the transformational variables and then the transactional variables.

*Kotter 8-Step Change Model*

Recognising that a change needs to be made in an organisation and knowing how to practically make that change are two different concepts. The Kotter 8-Step Change Model proposes a process of how a change can be integrated smoothly within an organisation.

There are many theories about how to ‘do’ change. Many originate with leadership and change management guru, John Kotter. A professor at Harvard Business School and world-renowned change expert, Kotter introduced his eight-step change process in his 1995 book, “Leading Change”. Kotter [10] eight-step process is shown in **Figure 2**.

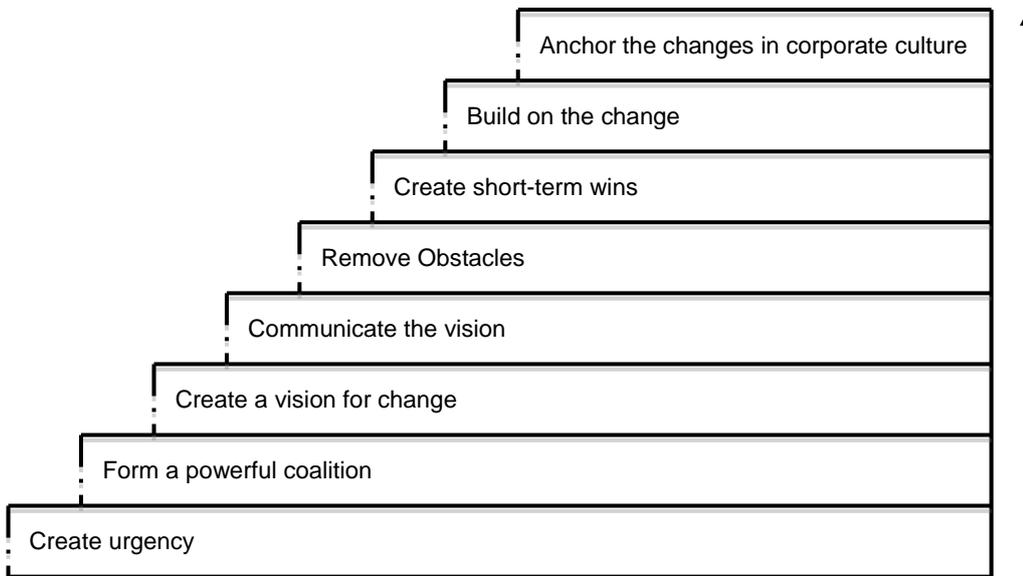


Figure 2: Kotter 8-Step Change Model

*Mintzberg Model on Organisational Structures*

According to management theorist Henry Mintzberg [11], an “organisation’s structure is formed of five parts: Strategic Apex, Middle Line, Operating Core, Support Staff and Techno Structure”. These five parts are shown in **Figure 3** and further explained in **Table 1**. When these fit together, they combine to create organisations that can perform well. When they do not fit, the organisation is likely to experience severe problems.

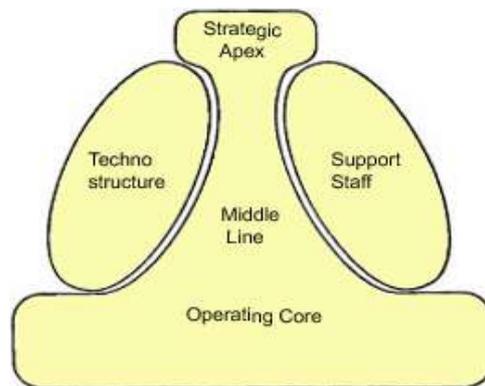


Figure 3: Mintzberg model of the ideal organisation [11]

Operating core	Those who perform the basic work related directly to the production of products and services
Strategic apex	Charged with ensuring that the organisation serve its mission in an effective way, and also that it serve the needs of those people who control or otherwise have power over the organisation
Middle-line managers	Form a chain joining the strategic apex to the operating core by the use of delegated formal authority
Technostructure	The analysts who serve the organisation by affecting the work of others. They may design it, plan it, change it, or train the people who do it, but they do not do it themselves
Support staff	Composed of specialised units that exist to provide support to the organisation outside the operating work flow

Table 1: Explanation of the five parts within the structure of the Mintzberg Model [11]

Each of these five parts has a tendency to pull the organisation in a particular direction favourable to them as shown in Figure 4.

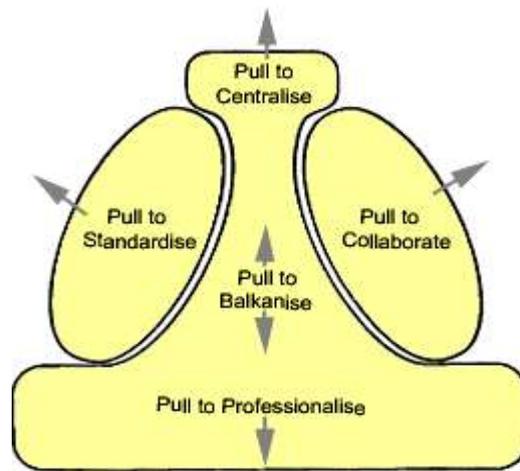


Figure 4: The effect of various pressures on the model [11]

*Conclusion*

The Burke-Litwin Model, Kotter 8-Step Change Model and the Mintzberg Model on Organisational Structures were shortlisted for the safety professional reviews because they each had something different to offer. The Burke-Litwin Model is a causal model that includes important variables needed to be considered within an organisation. The recognition of the importance of the external environment as a variable is a positive quality. The model is a causal model, which means that a change in one or more of the variables can impact the others differently. The Kotter 8-Step change model is more of a process that can be used to slowly integrate the proposed change within the organisation instead of forcing the change. A unique feature of the model is that it does not support a hierarchy approach, but good leadership and a strong coalition is needed for this model to be put into practise. The Mintzberg model focuses on how the ‘pressures’ from the different parts of the organisation can pull the organisation apart and cause unexpected change. Acknowledging ‘pressure’ is a distinctive feature of this model and no other model researched showed this quality. These differing strengths of the three models could possibly aid safety culture assessment.

**The Safety Professional Reviews**

Semi structured interviews were chosen for their repeatable format that generates a level of similar data. This produces a repeatable format which offers a level of consistency between interviews which is important for information comparison. As these semi structures interviews were limited by the amount of time and people, the level of data gathered did not allow for statistical comparison. The purpose of the semi structured interviews with safety professionals was to determine the variables within an organisational model that they consider important to aid safety culture understanding and if any of these variables were present within any of the shortlisted models. The semi structured interviews involved the following professionals<sup>2</sup>:

Interview 1 - Ministry of Defence (MOD) Safety Engineer

Interview 2 - Atkins Safety Consultant.

Interview 3 - Safety and Environmental Management Specialist for Defence Equipment and Support (DE&S).

Interview 4 - Aerospace Safety Specialist from DE&S.

Interview 5 - An academic safety professional from the University of Aberdeen.

In general, all the interviews concluded that not all of the variables from the organisational models were ideal for assessing safety culture but each had something positive to offer. In relation to the models, the Burke-Litwin model suggests the ‘External Environment’ variable to be on the top of the model, but the safety professional reviews behind interviewee 1 – interviewee 4 agreed that it would be practical to move this variable to the side of the model and link it to the whole organisation.

Then it was agreed that recognising the ‘main influential character’ of an organisation was important because this character could easily impose a particular change. ‘Influence’ was unanimously agreed by all the safety professionals to be contributing factor to change and when analysing ‘Influence’, Figure 5 shows how the influential diagram could be taken into consideration.

Interviewee 0 showed interest in the Burke-Litwin and Mintzberg Models. There was an agreement that the ‘main influential character’ was an important factor in the organisational structure and was not shown on any of the three models. An influential diagram shown in Figure 5 was created, to show that ‘Management’ were the most influential throughout the whole organisation.

<sup>2</sup> Detailed information about the interviews can be found in the source paper of this research [16].

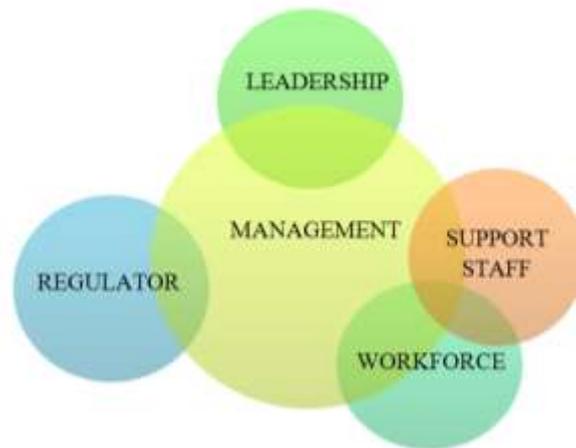


Figure 5: The Influential Diagram

Interviewee 0 showed interest towards the Mintzberg Model (Figure 3) as it could be applied to all industries. It was stated that the ‘operating core’ should focus on the work climate and they should truly understand all the risks involved in their jobs since they are at the forefront of risk. Regarding influence, the techno structure was stated to be the most influential because the organisation needs them as no one else can do their jobs as required. Overall, the Burke-Litwin combined with the Mintzberg model would create an ideal balance and then the Kotter 8-Step change model could be applied. But the Kotter model cannot be applied if the organisation structure is not ‘perfect’ or practical.

Interviewee 0 was more inclined towards the Burke-Litwin and Kotter 8-Step change model. It was stated that some organisations tend to put “commercial first and safety second”. If commercial pressure is applied, any change will be put in place as fast as possible and everyone would comply. Finding one main influencer in the organisation is not possible due to external pressures. This was the only safety professional that emphasised the ‘external environment’ as the main influential character.

Interviewee 0 dismissed all the models because none of them supported the kind of change experienced by the organisation.

Interviewee 0 was intrigued with the Mintzberg model and the effect of ‘pressure’ within an organisation. In relation to combining organisational model variables to assess safety culture measurement, the professional stated that scientists choose to have an idealistic view of the organisation instead of a practical view. Scientists assess safety climate at a point in time, but the fact that safety climate is not constant and might change the following week is not considered. The professional reviews behind interview 0 and interview 0 both concluded and agreed that when trying to implement change, it is necessary to thoroughly research on two questions; what is the main purpose of change? What are the long-term effects of this change? This is what is represented behind the variable of ‘effective change’.

## Findings

All the safety professionals agreed that the Burke-Litwin model variables could be used to assess safety culture but variables such as “main influential character”, “pressure” and “effective change” needed to be considered too. The variables from the organisation model assessment that are going to be used to assess the safety culture tools are <sup>3</sup>:-

- |  |                                      |
|--|--------------------------------------|
| 1. Individual needs and values               | 8. Systems (Policies and procedures) |
| 2. Individual and Organisational Performance | 9. External Environment              |
| 3. Motivation                                | 10. Main influential character       |
| 4. Task and Individual Skills                | 11. Management                       |
| 5. Organisational Culture                    | 12. Work Climate                     |
| 6. Structure                                 | 13. Effective Change                 |
| 7. Mission and Strategy                      | 14. Pressure                         |

## Safety Culture

“The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation’s health and safety management” [13]. This is a definition that has been widely used and was developed by the Advisory Committee on the Safety of Nuclear Installations (ACSNI). A number of other definitions have been established but even though the definitions vary there is a general agreement that safety culture should be a “proactive stance to safety” [13]. The purpose of this section is to identify key variables that aid safety culture assessment.

<sup>3</sup> Detailed descriptions of the variables can be found in the source paper of this research [16]

## Safety Culture Variables

In attempting to assess the Safety Culture of an organisation, a literature review was carried out to identify the variables that will aid safety culture assessment. The University of Aberdeen recommended a few literature papers which suggested Safety Culture Models and the papers used for this research are shown in the reference list. The variables shown below are those that were most popular during the literature review<sup>4</sup>:

1. Leadership
2. Management
3. Cohesive Culture
4. Rewards
5. Just Culture
6. Safety Archetypes<sup>5</sup>
7. Artefacts<sup>6</sup>
8. Risk
9. Beliefs
10. Safety Values
11. Behaviour
12. Attitudes
13. Training Programmes
14. Communication
15. Working Conditions

## Safety Culture Models

Due to time constraints, the safety culture models and tools discussed in this section were limited. The purpose of this section was to review the suggested models and tools, and assess if any of the chosen models (i.e. The Burke-Litwin Model, Kotter 8-Step Change Model and Mintzberg Model on Organisational Structures) acknowledge either all or more of the variables.

### *Hearts and Minds*

“Winning Hearts and Minds” is about getting everyone to work safely, not because they have been told to, but because that is the way they want to work and know how to work.” [8] The Hearts and Minds safety toolkit was developed by Shell Exploration and Production (E&P), based upon 20 years of university research. Hearts and Minds uses a range of tools and techniques to help the organisation encourage all staff in managing Health, Safety and Environment (HSE) as an integral part of their business. The model within the toolkit is shown in Figure 6.

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<sup>4</sup> Detailed descriptions of the variables can be found in the source paper of this research [16]

<sup>5</sup> Marais and Leveson [3] state that safety archetypes are system dynamic models that can be used to describe the safety culture of an organisation. In accident analysis, the safety archetypes can be used to identify and highlight change processes and the causal factors that allowed the system to migrate towards an accident state. But they also state that like all models, system archetypes are merely approximations of systems and their behaviour.

<sup>6</sup> Taylor [14] states that the strength of an organisation’s safety culture can be indicated by the presence or absence of artefacts. Artefacts can be formal, documented and physical reminders to all staff of their shared-beliefs, values and behaviours.



Figure 6: The HSE Culture Ladder [8]

The purpose of this study is not to test this toolkit, but to focus on the tools/variables that this model suggests is important to assess safety culture. The tools available in the Hearts and Minds kit are [8] [9]:-

1. *HSE Understanding Your Culture*: This tool can be used to understand the culture of the organisation. It can identify strengths and weaknesses and identify ways to improve.
2. *SAFE: Safe Appraisals for Everyone*: This is an upward appraisal process that compares how an individual sees themselves and how other people see them. It is evaluated against four aspects of HSE which is “walking the talk, informedness, trust and priorities.”
3. *Making Change Last*: This tool is for managing change and supporting any improvement process or organisation change programmes.
4. *Risk Assessment Matrix*: The Risk Assessment Matrix (RAM) is a tool to rank, assess these risks and discuss what changes need to be made so that the risk is as low as reasonably practicable (ALARP).
5. *Achieving Situation Awareness*: This tool is to help people recognise the importance of realising the dangers in their environment. Accidents rarely occur because of a single catastrophic failure, except when that failure is at the end of a chain of non-catastrophic failures and organisational oversights.
6. *Managing Rule Breaking*: This tool will promote understanding of why people intentionally break rules and how to manage and change this.
7. *Improving Supervision*: This tool is to help types of people; individuals that are new to the role as a supervisor and individuals who have been supervisors but need to refresh their skills.
8. *Working Safely*: This tool provides a structure for understanding causes of unsafe behaviour and addressing them. It contains how and why people fail to act properly around hazards. It also provides guidelines for managers on how to set clear expectations and improve safety reporting systems.
9. *Driving For Excellence*: This tool is to help improve the behaviour of drivers and the people who manage them.

#### *PhD Thesis – ‘Bus Driver Well-being Review: 50 Years of Research’*

This thesis attempted to consolidate the key research on the occupational health of urban bus drivers since the 1950s. The authors [4] state that “bus drivers are liable to suffer ill health as a result of the job”. The ill health of bus drivers consequently result in poor performance in their work place due to “employee absence, labour turnover and accidents”. Different stressors such as “poor cabin ergonomics, rotating shift patterns and inflexible running times” are just a few causal factors of the ill health. The authors mention that “bus drivers must successfully balance the competing demands of safety, customer-focused service and company operating regulations. The physical and psychological health of the bus driver is a critical factor in driving performance. Any impairment can have undesirable consequences for passengers and bus operating companies alike”. The thesis states that “by improving this ‘human side’ of the role, it is expected that the efficiency of this transport will be enhanced for bus drivers, operators and passengers alike”. The ‘variables’ that the thesis [4] recognises as important to improve the occupational health of these urban bus drivers are shown in Figure 7.

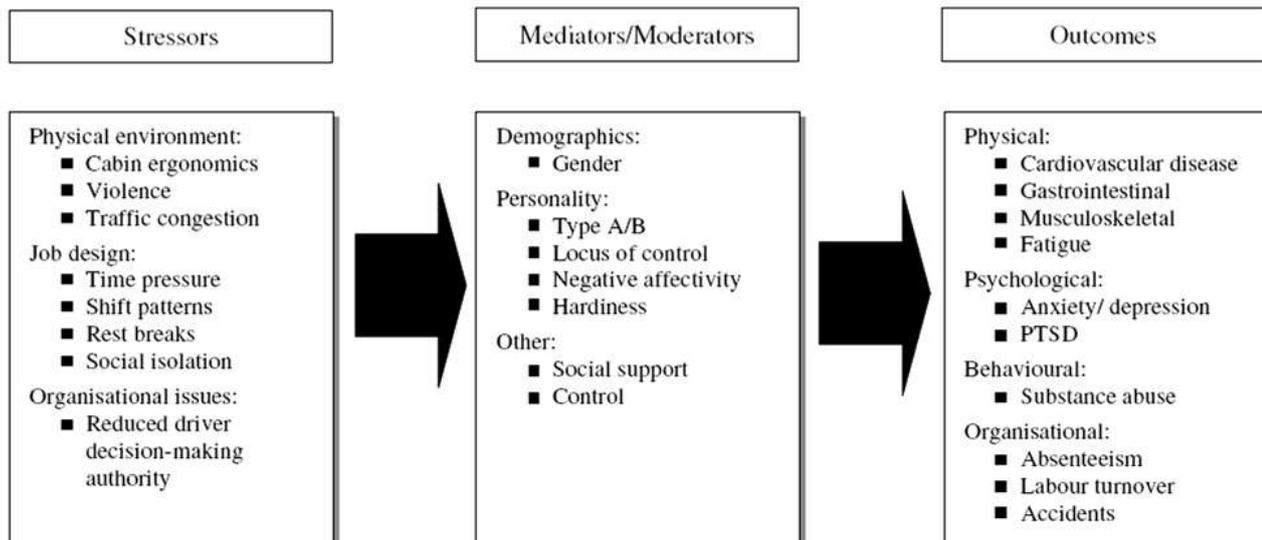


Figure 7: Key Job Stressors, Mediating/Moderating Variables and Outcomes of Occupational Stress for Bus Drivers. [4]

*PhD Thesis – ‘Safety in Shipping: The Human Element’*

“Shipping is perhaps the most international of all the world’s great industries and one of the most dangerous” [15]. The paper reviewed the “causal factors within accidents in shipping” [15] and the key safety variables that were tested in the thesis are:

1. Demographics: e.g. gender, age, disabilities
2. Personal Values: e.g. respect for the job, importance of job security
3. Personal Characteristics: e.g. determined, alert, hostile
4. Communication
5. Involvement: e.g. including employees in safety meetings
6. Management Commitment
7. Safety Satisfaction: investigating and follow-up measures after injuries and accidents have taken place
8. Competence and Training
9. Safety Rules: e.g. written safety rules
10. Reporting
11. Safety behaviour
12. Performance
13. Client interface
14. “Company” corporate interface such as leadership.

*PhD Thesis – ‘Influence of Leadership and Safety Climate on Employee Safety Compliance and Citizenship Behaviours’*

This thesis aimed to provide an “understanding of some of the human and organisational factors that influence safety behaviour of employees in the UK oil and gas industry. Leadership (transformational and transactional) and safety climate were the two key areas investigated” [6]. The variables discussed in this thesis are listed below:

1. Demographics
2. Transformational leadership – what the leader does to encourage employees to be safety conscious e.g. complying with safety rules and regulations, carrying out the job safely, taking time for safety if unsafe situations arises
3. Transactional leadership – how the leader is proactive, provides rewards for safety efforts
4. Safety Climate
5. Trust in leader
6. Leader fairness
7. Communication

- 8. Management commitment
- 9. Safety compliance – obedience to safety
- 10. Safety citizenship behaviour – safety related helping, voice, stewardship. Whistle-blowing, safety oriented civic virtue, workplace change.

**Conclusion**

The Safety Culture variables consolidated from the research are shown in Table 2.

<b>Literature Review:</b> Leadership, Management, Cohesive Culture, Rewards, Just Culture, Safety Archetypes, Artefacts, Risk, Beliefs, Safety Values, Behaviour, Attitudes, Training Programmes, Communication, Working Conditions.
<b>Hearts and Minds:</b> HSE Understanding your Culture, SAFE: safe appraisals for everyone, Making Change Last, Risk Assessment Matrix, Achieving Situation Awareness, Managing Rule Breaking, Improving Supervision, Working Safely, Driving for Excellence.
<b>Bus Driver PhD Thesis:</b> Physical Environment, Job Design, Organisation Issues, Demographics, Personality, Social Support, Control, Physical Outcomes, Psychological Outcomes, Behavioural Outcomes, Organisational Outcomes.
<b>Safety in Shipping PhD Thesis:</b> Demographics, Personal Values, Personal Characteristics, Communication, Involvement, Management Commitment, Safety Satisfaction, Competence and Training, Safety Rules, Reporting, Safety Behaviour, Performance, Client Interface, ‘Company’ Corporate Culture.
<b>Influence of Leadership and Safety Climate PhD Thesis:</b> Demographics, Transformational and transactional Leadership, Safety Climate, Trust in Leader, Leader Fairness, Management Commitment, Safety Compliance Behaviour, Safety Citizenship Behaviour, Communication.

Table 2: A Summary of Variables Discussed in the Section that Could Aid Safety Culture Assessment

As shown in Table 2, none of the models reviewed in this section matched the variables shown by the literature review. The Hearts and Minds model was not chosen for comparison in section 4 because variables such as working conditions, leader fairness, rewards were not tested in the tool.

The model in the bus driver PhD thesis was not chosen for comparison in section 4 because the thesis only included variables that related to stress experienced by bus drivers. In relation to the literature review, the thesis acknowledges variables such as personality, social support, control, job design but the model does not consider variables such as situation awareness, rewards, just culture, risk.

The PhD thesis on influence of leadership and safety climate on employee safety compliance and citizenship behaviours was primarily focused on leadership, leader fairness, safety behaviour which are important variables, but variables such as risk, rewards, working conditions, health implications, decision making etc was not considered for a safety culture assessment. Therefore, this PhD thesis was not chosen for comparison in section 4.

The safety in shipping PhD thesis was used in section 4 because compared to the other three models, the variables considered in this thesis closely matched the variables considered in the literature review. Unlike the other models, this thesis considered more variables that were not concluded from the literature review and was therefore valuable for section 4.

The literature review was chosen as a ‘back up’, in case none of the PhD thesis variables were useful in combination.

**Comparison Between the Findings of the Organisational Model and the Safety Culture Model**

The concept of combining organisational models and safety culture models is nothing new. Flin and Cox [1] state that “most of the conceptualizations, definitions, and ‘measures’ developed for safety culture have been derived from the more general notion of organisational culture as used throughout the social and management sciences, and given prominence by organisational theorists”. A range of meanings has been attached to safety culture which relate to the concept of organisational culture, three of which were reviewed by the Institution of Occupational Safety and Health (1994). “The first meaning includes those aspects of culture that affect safety (Waring, 1992). The second refers to shared attitudes, values, beliefs and practices concerning safety and the necessity for effective controls. The third relates to 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 safety programs (Health and Safety Commission, 1993)” [12].

A tool combining the two models should enable easier analysis of the organisation safety culture, predicting the effect of enforcing a particular change and detecting a weakness in the organisation structure. In addition, this ‘combined tool’ would aid risk management techniques such as Cost Benefit Analysis and in general, the overall process of measuring the health and safety performance of the organisation.

**The Comparison**

The combined findings from section 2 and 3 are shown in Table 3. The table lists all the variables and a tick box presentation style was used to exhibit the common features between the organisational model findings, safety culture literature review and safety shipping PhD thesis.

Variables	Organisational Model findings	Safety Culture Literature review	Safety in Shipping PhD thesis
Individual needs and values	✓		✓
Individual and Organisational Performance	✓		
Motivation	✓		
Task and Individual Skills	✓		
Organisational Culture e.g. Just Culture and Cohesive Culture	✓	✓	✓
Structure	✓		
External Environment	✓		✓
Main Influential character	✓		
Management	✓	✓	✓
Work Climate	✓		
Effective Change	✓		
Pressure	✓		
Leadership		✓	✓
Rewards		✓	✓
Safety Archetypes		✓	
Artefacts	✓	✓	✓
Risk		✓	
Beliefs		✓	
Safety Values	✓	✓	
Behaviour		✓	✓
Attitudes		✓	
Training Programme		✓	✓
Communication		✓	✓
Working conditions		✓	
Situation Awareness			
Decision Making			
Health & Well-being			
Demographics			✓
Personal Characteristics			✓

Table 3: A Tick Box Showing Common Variables Between The Organisational And Safety Culture Models

For the sake of simpler presentation, a few variables have been grouped under one name since they had similar meaning but just different titles.

Table 3 shows that the common variables between the organisational model findings, safety culture literature review and safety shipping PhD thesis are organisational culture, management and artefacts. Since not all the variables were matched, the tool used in the safety in shipping PhD thesis was dismissed for this research. On the other hand, comparing the organisational model findings and safety culture literature review showed similar variables such as organisational culture, management, artefacts and safety values.

The results conclude that the tool used within the safety in shipping PhD thesis and the organisational model findings are best not combined. But the result from combining the safety culture literature review variables and the organisational model variables has potential to develop into a tool. Another positive feature is that these combined findings are not just relating to one industry but a wide range of industries.

## Conclusion

The objective of this study was to determine whether Safety Culture Models consider organisation features and a model that combined both organisation and safety culture model variables was not found. Here lies an opportunity for further research that would enable complete analysis of the organisation safety culture, predicting the effect of enforcing a particular change and detecting any weaknesses in the organisation structure. This 'combined model' would aid risk management techniques such as Cost Benefit Analysis and in general, the overall process of measuring the health and safety performance of the organisation.

None of the reviewed literature or safety culture models addressed 'effective change' and 'detecting a weakness' as a variable that would aid safety culture assessment. The variable 'effective change' is important to the safety culture of an organisation because it promotes learning from past changes and encourages continuous improvement. 'Detecting a weakness' within an organisation is important for safety culture assessment because if a weakness cannot be detected then how will the organisation be able to prevent it causing a hazardous event.

My opinion is that variables such as pressure, work climate, motivation are not only important to organisational culture; these variables contribute to the safety culture of an organisation too. As none of the tools reviewed within the safety culture models included all the variables that were understood from a safety culture/organisation point of view, this indicates that a new model should be developed that addresses this wider scope.

### Recommendations and Suggestions for Future Work

Recommendations from this study would be to continue work on the list of combined variables shown in section 4 in order to develop a tool that could be used across all industries. Further research on a greater selection of organisational models and safety culture models and tools would aid the development of a combined tool.

As semi-structured interviews were carried out for organisational models, a similar process could be carried out with the safety culture models, to get professional opinions on the important variables needed to assess safety culture.

Suggestions for aiding future work would be to research capability maturity models and developing a link/tool that could link organisational models, safety culture models and capability maturity models.

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