

Factors that Contribute to Positive and Negative Health and Safety Cultures in Construction

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Abstract

Although there is no consensus on how to define the safety culture of an organisation, the concept is now recognised as an essential contributor to improved occupational safety performance in construction. Indeed, the subject of safety culture has attracted considerable attention in the literature in recent years. The health and safety culture in an organisation is determined by the social and psychological relationships in the workplace. Some view safety culture as a management issue but so fuzzy to the extent that it cannot be measured or reliably changed. The concepts of organisational culture and climate are discussed. The concept of health and safety culture is evaluated including the factors that influence it; its assessment and measurement methods. Results of interviews with site safety managers of construction companies that exhibit strong safety cultures are reported. The objective of this work was to determine what works for them. The results reveal that the factors that contribute to positive and negative safety cultures in construction can be grouped into six categories: organisation factors, individual factors, team factors, job design factors, management factors and supervisory factors. The overall aim of this research is to recognise and understand the complexity of health and safety culture on construction sites, to develop successful measurement methods and intervention tools to create a positive culture on a construction site.

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1. INTRODUCTION

It has been recognised that cultural change in organisations in the construction sector is essential to bring about a fundamental change in performance to deliver improved safety. It is for this reason that the concept of safety culture has attracted significant attention in safety science research over the last three decades. Safety culture may be considered as a sub-set of organisational culture. The concept of organisation culture is reviewed in this paper including an assessment of its key characteristics. This is followed by a discussion of the concept of safety culture although it should be made clear that there is at present no universal agreement on its definition. A review of research studies on safety climate and safety culture is provided. Results of interviews with site safety managers of construction companies that exhibit strong safety cultures are reported. The objective of this work was to determine what works for them. This study was motivated by the desire to answer a number of fundamental questions on safety culture in construction. These questions are: Can safety culture be measured? Can it be changed? Can it be controlled or managed? Is there empirical evidence linking safety culture and safety performance?

2. ORGANISATIONAL CULTURE

Organisational culture can be defined in a number of ways. For example, Schein (1992) defines organisational culture as a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration; that have worked well enough to be considered valid and therefore to be taught to new members as the correct way to perceive, think and feel in relation to these problems. Another definition of culture is a common set of ideas, values, attitudes, and norms that characterise a group of people. Culture is an aspect of all sides of a society and influences how we approach safety, technology, politics, economics, etc. It influences how we think and act in our everyday lives. Thus, culture is something that has an influence on most things and perhaps everything that we do (Haukelid, 2008).

Organisational culture can be placed alongside other organisational parameters such as organisation structure, the goals and corporate strategic plans, the competence and talents of staff, management style, and the systems and procedures. Culture is one of the organisation's variables that influence its performance. All these variables are however interactive and interdependent. Organisational culture has a number of important functions. It can specify values and goals that are important in an organisation. It can prescribe appropriate relationships between the employer and employees and vice-versa. It can indicate how behaviour is controlled in the organisation and the controls that are legitimate.

Organisational culture can be influenced and changed but perhaps over a period of time. Guldenmund (2007) argues that within organisations, there are three major forces that operate at the same time and are interrelated. They are: organisation structure, culture and processes. The organisation structure outlines the formal organisation and the mechanisms of communication, coordination and control. Organisation structures allocate formal power. However, alongside these formal structures are informal structures. Informal structures are equally important to understanding the culture of an organisation. The processes are the actual primary and supporting processes going on throughout the organisation. If we accept that safety culture is part of the organisational culture, then it is influenced by both structure and processes.

There is general consensus that there is a difference between the terms organisational culture and organisational climate although in some literature there is a tendency to treat them as synonymous. Cox and Cheyne (2000) take the view that culture in general and safety culture in particular, is often characterised as an enduring aspect of the organisation and thus not easily changed. On the other hand, organisational climate can be viewed as a manifestation of organisational culture. In other words, climate follows naturally from culture. Cox and Cheyne (2000) argue that climate is a temporal manifestation of culture, which is reflected in the shared perceptions of the organisation at a discrete point in time.

Guldenmund (2000) states that the term organisational culture refers to a global, integrating concept underlying most organisational events and processes, whereas the term organisational climate means the more overt manifestation of the culture within an organisation. Climate is commonly conceived as a distinct configuration with

limited dimensionality surveyed through self-completion questionnaires and that it is up to a certain point, objective and semi-quantitative. On the other hand, organisational culture is often determined through a combination of methods including observations, focus groups, interviews, through mutual comparisons and so on. Measures of organisational culture are thus qualitative and difficult to quantify.

3. SAFETY CULTURE AND SAFETY CLIMATE

Safety culture can be considered as a particular aspect or subset of organisation culture. No review of safety culture would be complete without an evaluation of the relevant aspects of organisational culture. The definition of safety culture must therefore be consistent with the parent term organisational culture. Establishing a link between safety culture and safety of construction operations requires an understanding of the characteristics of safety culture. Such characteristics must be consistent with the definition and key attributes of organisational culture. No attempt will be made to distinguish between safety culture and safety climate in this paper. Many authors use the term safety climate and safety culture interchangeably, for example Wu, et al (2010), and Rollenhagen (2010). However, it should be noted that safety climate is now accepted as a surface expression of a safety culture.

Wu, et al (2010) using a stepwise regression model analysed the influence of higher level managers (employers), mid-level or operations managers and safety professionals on various factors that shape safety culture. They found that four safety leadership factors significantly affect safety culture. These are *safety caring* by employers, *safety informing* by operations managers, *safety co-ordination* and *safety regulation* by safety professionals. Of these four predictive factors, safety informing had the most significant effect on safety culture.

Safety caring refers to a paternalistic style or approach to safety management, achieving consensus in working practice, showing respect and trust for employees, showing care about employees' needs and empathy with their problems. Safety informing includes three aspects: safety monitoring, safety dissemination, and safety representing. Safety monitoring means collecting relevant safety information through a monitoring system. It is vital that this information is then continuously circulated so that employees receive important updates. Safety committees improve safety culture by enabling communication between management, safety representatives, safety professionals and employees. Safety co-ordination refers to safety policy development, safety information management, and safety communication. Organisations with positive safety cultures are characterised by open channels of both formal and informal communication up and down the organisation structure. Safety regulation involves safety inspections, safety audits, and safety incentive systems. Their research implies that certain role behaviours demonstrated by senior managers, operating managers and safety professional can significantly shape or change safety culture (Wu, et al, 2010). However, the authors acknowledge that this change cannot be achieved at a stroke.

Although it has been commonly argued that many problems associated with risk and safety can be addressed from a human and organisational perspective, Rollenhagen (2010) cautions against focussing on safety culture and not rethinking design of

technology in the pursuit of solutions to safety problems. He argues that the concept of safety culture, if misused, could lead to adoption of non-effective change strategies. He therefore advocates adopting a balanced safety management approach recognising that safety is a dynamic property that arises from interactions with components and sub-components of people, technology and various institutional arrangements.

One question in the safety culture debate is whether safety climate or culture in an organisation can be considered as an important indicator of safety performance in construction. This question was raised by Wamuziri (2007) who called for research to evaluate whether this is indeed valid from a scientific point of view with specific reference to the construction sector. At the same time, Guldenmund (2007) reviewed a considerable amount of previous research and concludes that there are a large number of factors (dimensions, scales, and facets) that make up the safety climate concept and that safety climate and safety performance are weakly correlated at best. This is in agreement with Clarke (2006) who concludes following a meta-analytic review that it is unlikely that a strong relationship exists between safety climate and measures of safety performance. Choudhry et al (2007) suggest that although development of a positive safety culture can be an effective tool for improving safety, measurement of safety performance remains problematic. Indicators such as accident rates or compensation costs are lagging indicators and measure system failure rather than its success. A multi-instrument approach involving leading or upstream proactive approaches such as hazard identification and observation of percent safe behaviour is suggested. Further research into that the measurement of safety performance is recommended for the benefit of industry.

Further questions can be posed from an organisational perspective are: Can safety culture be managed or controlled and changed? Can safety culture be measured? On the first question, Haukelid (2008) argues that it is possible to change a culture, but it takes a long time. However, because culture is something more fundamental and lasting, it is something that is difficult to manipulate or control. Cultural content is seldom if ever static. Finally, culture changes over time, no matter what managers or employees think or do. On the question of measurement of safety culture, Haukelid (2008) concludes that it is necessary to invoke more than one methodological angle (triangulation). The answer to measurement of safety culture is thick descriptions and the favoured method for this is ethnographic fieldwork. Fieldwork and participant observation are especially important to map out tacit knowledge, basic assumptions and the deeper levels of any given culture. Questionnaires and interviews are seldom sufficient to reach this level of cultural expression. Despite this note of caution, there is recent research aimed at developing questionnaire-based measurement methods of safety culture and climate, for example, Hahn and Murphy (2008) and Díaz-Cabrera, et al (2007).

Several authors are in agreement with a multi-dimensional or triangulated approach to measurement of safety culture. For example, Grote and Künzler, (2000) opine that assessing safety culture requires undertaking long-term and in-depth studies of the social system using a range of qualitative methods like narrative interviews, participatory observation and analysis of company documents. However, they defend the use of questionnaires in addition arguing that their use helps to gain organisational members' views from different occupations, departments, and hierarchical levels on

the factual characteristics of the company, and perceptions regarding operational safety, safety and design strategies in order to gain a deeper understanding of safety management and safety culture in a company. However, Guldenmund (2007) is sceptical about the use of questionnaires to measure safety climate and states that previous findings from safety climate research using questionnaires might very well represent general attitudes towards management and its perceived influence on working conditions rather than an evaluation of the conditions themselves and that it may not make much sense to correlate general notions about safety management with safety performance indicators in the form of output variables (behaviour or accidents). Research by Cooper and Phillips (2004) lends support to this view and suggests that the hypothesised paths from attitudes and beliefs (i.e. climate perceptions) to behaviour, to accidents and injuries are weak and not as clear cut as is often assumed. Safety climate perceptions do not necessarily match actual levels of safety performance. Therefore industry should focus its primary safety improvement efforts on changing unsafe situations and conditions as well as people's safety behaviour at all organisational levels rather than concentrating on improving people's attitudes, beliefs, and perceptions about safety. It is reductions in unsafe behaviours, unsafe conditions or situations that reduce the opportunity for accidents to occur not perceptions on how safety is operationalised. This is not to down play the importance of perceptions about safety climate for improving safety performance. On the contrary, Cooper and Phillips (2004) recommend that all organisations should regularly survey their prevailing safety climate to highlight areas where systems and physical changes are required within an organisation as well as safety-related behaviours.

O'Connor et al (2011) reviewed several studies that have examined safety climate in commercial and military aviation. They found that safety climate factors identified in the aviation safety climate questionnaires are consistent with the literature on safety climate in non-aviation high reliability organisations. Thus aviation safety climate tools had some construct validity (the extent to which the questionnaire measures what it is intended to measure). However, the majority of the studies made no attempt to establish the discriminate validity (the ability of the tool to differentiate between organisations or personnel with different levels of safety performance). They recommended that rather than constructing more aviation safety climate questionnaires, researchers should focus on establishing the construct and discriminate validity of existing measures by correlating safety climate with other metrics of safety performance.

A recent study by Törner and Pousette (2009) identified the following preconditions and components for high safety standards in construction. They are:

- Project characteristics and nature of the work which sets the limiting conditions to which safety management must adjust;
- Organisation and structures which includes: project planning, allocation of roles and responsibilities, procedures and resource allocation;
- Collective values, norms and behaviours which includes climate and culture, interaction and cooperation;
- Individual competence and attitudes which includes knowledge, ability, and experience characterised by personal engagement, taking personal responsibility and prioritising safety.

Thus achieving high safety standards in construction involves effective management of several interactive factors incorporating organisational, group, individual and technical aspects.

4. RESEARCH AIMS AND METHOD

After nearly three decades of intensive research on the subject, safety culture remains a fuzzy concept for which there is no unanimously accepted definition. Furthermore, there is very minimal agreement on its indicators. Nevertheless, Fernández-Muñiz et al, (2007) recommend research into organisational factors that encourage or hinder the creation of a safety culture and implementation of a safety management system. This will be invaluable to organisations in defining areas where they need to progress if they wish to improve their safety performance. Literature on the effectiveness of such organisationally based intervention measures to improve safety performance remains sparse. However, a recent study (Hale, et al 2010) reports that although such change is hard, interventions bringing about constructive dialogue between shop-floor and line management, providing motivation to line managers and strengthening the monitoring and learning loops in the safety management system appear to be successful. The amount of energy and creativity injected by top management and the safety coordinator (safety professional) appear also to be a distinguishing factor. Training and publicity are at best necessary but were found not be sufficient requirements for improvement.

The overall aim of this study is to evaluate the factors that contribute to positive and negative safety cultures in construction organisations. This was achieved by interviewing six senior safety/project managers from construction companies that exhibit strong safety cultures. Safety managers operating at a senior level in construction organisations were considered best placed to provide descriptions of the real world with respect to interpretation and meaning of safety culture. The objective of this work was to determine what works for them. Characteristics of the interviewees are as follows:

- **Interviewee one:** A project manager with over 10 years experience in construction project management in one of the world's largest construction companies with offices across Australia, the UK, Germany, India, South East Asia and the United Arab Emirates. The company is 100 per cent privately owned, with approximately 36,000 employees' worldwide and gross revenues in excess of US \$11 billion a year. The project manager also oversees site safety throughout the group.
- **Interviewee two:** A site manager in a UK-based construction company with origin stretching back as far as 1874. The company has a large network of offices covering England, Scotland and Wales and projects in the education, retail, mixed use development, health, office, leisure and law order sectors.
- **Interviewee three:** The divisional project manager with 20 years experience in a UK leading construction company into building construction and refurbishment with offices spreading throughout the U.K.
- **Interviewee four:** A Health and Safety Manager of a civil and construction engineering company involved in high value projects such as house building, leisure management and retail. The Company has completed in excess of 60

projects for the retail sector, ranging from renovations to new-build superstores.

- **Interviewee five:** A director with over 10 years experience in design and construction project management and supervision in a construction company based in Scotland with expertise in design and construction of commercial and industrial facilities ranging in value from £50,000 to £5m. The company employs over 2000 people.
- **Interviewee six:** The head of health and safety, quality and environmental department in a multidisciplinary Scottish construction company providing services to the private, public, corporate, retail, leisure, health, education and industrial sectors.

5. ANALYSIS AND DISCUSSION OF RESULTS

Perception of the safety culture approach to improving safety performance

In recent years there has been a shift from technological and management system approaches for enhancing health and safety performance in organisations to understanding human attitudes, norms, beliefs and psychological factors that contribute to accidents and health and safety failures. Opinion was sought on the effectiveness of this new approach to enhancing safety performance in organisations.

All the interviewees agreed on the need to better understand the factors that influence employee safety behaviours and attitudes as most accidents or safety failures on construction sites have been attributed to unsafe behaviours employees' exhibit on site which sometimes is times is not explainable.

Interviewee two estimated that 80% of workplace accidents are as the result of unsafe acts, not unsafe conditions. He stressed that although safe procedures could be made available, some individuals are sometimes overconfident and daring to the extent that their actions result in accidents. *'If unsafe attitudes can be pre-empted and corrected it is likely that most accidents on site could have avoided'*.

Interviewee three noted that the effectiveness of a cultural approach to safety improvement can be achieved from shared norms and values about safety that permeates an organisation. He stressed that where a safety culture exists, thinking about safety and prioritizing safety permeates all the organisational levels such that there is a consensus on safety and how it should be managed from top management to blue collar levels. *'People at all levels are involved in safety and take responsibility for safety, such that there is a rich communication concerning safety issues'*.

Interviewee six concurred that successful development of a safety culture in organisations can help realize immediate and tangible results in reducing workplace accidents and their associated costs, including decreased productivity, employee morale and increased hiring and training costs.

Overall there was a general consensus on the need to better understand behavioural and attitudinal factor that affect construction safety.

Relationship between safety culture and safety performance

Many organisations use records of their health and safety performance as an indication of the effectiveness of their health and safety management and systems. Opinion was sought on whether lagging indicators of health and safety performance can be taken as good indicators of the health and safety culture within an organisation.

Interviewee two asserted that the link between safety culture and performance is a complex one, he indicated that the link has no simple and direct correlation, stressing that the culture contributes significantly to the performance, while performance may not truly indicate the existing culture. *‘traditionally safety in most organisations is measured based on lost time injury for small organisation while larger organisation go as far as yearly health and safety audits to check laid down management procedures, so safety performance are usually based on outward records which are influenced by legislative requirements but safety cultures are in-built norms, attitudes and practises which are hardly assessed’*.

Meanwhile, interviewee three stated that safety performance cannot stand to indicate safety culture and went on to state that *‘ a strong safety culture is critical to long-term safety performance, there are many challenges to ensuring a positive safety culture in all business operations at all locations, with additional challenges posed by acquisitions, mergers, and divestiture, long term safety performances will eventually result in strong safety cultures but where there seem to be incoherence between the two, a system failure will eventually expose cultural lapses over time ’*.

Interview six stated that using performances to indicate cultures can be problematic; and stated that *‘accidents can be relatively rare events, they may not be recorded accurately or routinely, and risk exposure may not be taken into account’*. Other measures, such as safety behaviour and minor injuries, have also been used, and more modern approaches tend to focus on current safety activities and systems to measure success as opposed to failure, perhaps in combination with the more traditional approach to measuring performance. This more predictive approach to safety culture measurement can also mean that organisations do not have to wait for a system failure before identifying and acting on problem areas.

Influence of Management Commitment and Employee Involvement

Writers on subject of safety culture assert that management commitment to safety and active employee involvement in health and safety through adequate resource allocation, putting safety before production, designation of safety roles to supervisors, middle managers, managers and top managers, timely response to safety action plans, holding consultations with employees on safety matters and decisions etc, are the key factors that contribute to a positive health and safety culture within in an organisation. Opinion was sought on this and interviews were asked to explain how this relates to their own organisations.

All subjects rated the importance of management commitment to health and safety very highly and added that it is the key to promoting positive health and safety cultures within their organisations. Interviewee one went to say that management

commitment has the main influence on employees' safety commitment; he made known that he has noticed that employee behaviour towards safety is usually in line with those of their front line managers and supervisors. *'Although senior management might show good attitudes and behaviour to safety, but their efforts are sometimes subject to negative stereo-typing by middle managers and supervisors on the site, who we do hand over safety responsibilities to'* this suggests that management actions have to be backed with trust among supervisors and managers to represent the top management efforts.

Interview two stated: *'Top management do want safety to be a key element within their company, but there are always barriers between senior managers and workers, these barriers are created by middle managers being resistant to change. Middle managers may hear safety rhetoric from senior management but are confronted daily with other, often stronger messages of cost cutting, downsizing and productivity levels, which makes it quite difficult for them to implement safety culture elements within the organisation'*. He stressed that for top management commitment to be driven down to front line workers there must be agreement between top management, middle managers and supervisors. Supervisors must be accountable and there should be an active involvement of middle managers.

Interviewee three referred to management commitment as the cornerstone for a strong safety culture. He stated that it is not enough to designate roles or to have procedures on how safety is to be managed but there must be a reflection in behaviour. This helps employees to perceive the safety culture better. He made known that his organisation have adopted senior management visibility at working and operational stages of projects. *'We make sure that senior managers spend adequate time alongside safety officers on safety issues with front line employees. As a project progresses, project managers spend at least one hour per day. First line managers spend 30% of their time and senior executive usually schedule at least an hour per week for concentrating on safety with employees'*. This approach obviously will help employees perceive safety better in the organisation helping them to frequently open up on safety issues.

Interview four stressed the link between management commitment and employee involvement and suggested: *'Listening to one's employees is a form of true management leadership and commitment. The role of management to provide a safe work place should not exist in a vacuum'*. He explained that there must be an active and a working trust between management and employees in order for the company to stay with a safe working system. *'Here supervisors and worker safety representatives are fully aware of their responsibility for safety. Supervisors and worker representatives react swiftly and act resolutely. The safety representative has a mandate to act. The supervisor follows up to ensure that safety measures have actually been implemented. The supervisor plays an important role in developing a good safety culture that permeates all levels. In organizing the site, there is a centrally placed person with generic responsibility for safety and to whom anyone can turn, since such a person can bridge the organizational divisions between different work teams'*.

Interviewee five and six expressed the view that a corporate safety culture of a construction company to be a precursor to job safety. Interviewee five stressed that

the culture of safety is strongest when top managers are committed to safety as a value that is shared and internalized by everyone in the organization. He referred to an instance when the owner of a prominent design and build construction firm hired his college age Son to work as a labourer on a construction site for the summer. When the Son reported to work without a hard hat and wearing flip-flops instead of the required steel-toed boots, his father literally chewed him up out in front of a group of older workers and sent him home for the day. That safety lesson came from the very top, and it was never forgotten.

Interviewee six stressed that safety programmes should be initiated from the top management of an organization. *'The top management should formulate a policy indicating a commitment to safety'*. This step will lead other policy changes and procedures concerning safety. Without it, it is very difficult to achieve a successful safety programme. He further explained that management commitment was the most significant measure that helped to determine and influence safety performance on all their building sites.

Influence of Project type on Employee Behaviour

In construction, project sizes, types and the work environment e.g. bridge construction, road construction and other high risk jobs may influence personal safety behaviour and performance based on the perception of risk and the work environment. Opinion was sought from the interviewees on the extent to which these factors may help to ingrain and maintain safety attitudes in employees.

The factors here refer to the nature of the construction project related to: the physical structure being built (e.g., a building, a tunnel, or a road), the physical possibilities at the worksite for securing the work area, related to the physical situation of the structure, and the complexity of construction work as such. All these conditions create restrictions that "set the stage" on which the work is performed and thus define the limiting conditions according to which all parties involved must adjust their safety management.

Interviewee one was of the view that, the state and the nature of the work environment helps to some extent to alert employees at the jobsite on the risks that they may face *"Sometimes in our daily work it is all the machines that surround us, loaders or trucks or saws or reinforcement stations. A lot of tools all the time, which pose a risk making employees perceive some hazards and adjust their acts and behaviours towards safety"*

Other respondents said they have been involved in consistently similar job patterns but acknowledged that project sizes do affect the effective management of site safety. Interviewee four stated that: *'The specific conditions at the worksite, the characteristics of the project, and the preconditions for securing the work area specific to the structure under construction are the limiting conditions to which safety management must be adjusted by all parties involved'*. A construction project being executed in the midst of city traffic is associated with different restrictions for workplace layout than the construction of an industrial building in the country. In construction work, people inevitably move around in non-standardized patterns near any number of machines. Building and construction work also differ from much other industrial work in that it evolves constantly. The work site does not look the same

from day to day, and different groups of professionals come and go from the project at different stages. Often several companies are involved, and the personnel representing each company may differ from one project to another.

When questioned if these conditions help employees maintain better attitudes towards safety, all respondents made known that bigger projects call for notifications to the enforcing agencies i.e. the Health and Safety Executive (HSE) and local authorities under the Law so they thus require that the management allocates more resources and time to managing of safety on site. Interviewee one, three, four agreed that such practise over time help enhance the safety culture within the organisation and across projects. Interviewee two, five and six were of the view that large projects do involve some sub-contracting and working with unknown staff and teams on site amidst a wider range of hazards, so that there is usually a need for a higher level of caution and understanding among operatives. They went on to say that there are usually manifestations of poor cultures of different teams and organisations which makes it a challenge for principal contractors to create high safety standards given these characteristics.

Influence of subcultures on change programmes

Organisations are characterised by work groups based on department and expertise. These groups do have their own styles of management and have different levels of concern for safety issues; in effect, they have their own safety subcultures. The subcultures do vary mainly by occupation, age, shift pattern, prior accident involvement and grade. Safety climate surveys do ignore the contribution subcultures make to workers' perception of safety. Can a safety culture change programme be designed for large organisations without taking into account the subcultures in place, how they interact and power relations between them? The interviewees were invited to respond to this question.

Four of the respondents agreed that it is important to take into account different subcultures within an organisation for a successful cultural change programme. Subcultures may develop when employees working in the same organisation experience different working conditions. It was stated that a lack of communication and risk sharing between subgroups might result in accidents. Shift patterns such as day and nights shifts should be characterised with good communications and hazard sharing that enables different work groups to share and understand the other group's risks. It was further stated that terms and conditions of agency and other contractor workers also bring about subcultures which must be taken into account in a safety culture change programme. For example, interviewee two made known that some agency staff or contract staff may not receive holiday or sick pay. *'They were employed to do the most dangerous and physical work. Their working experience resulted in them becoming distanced from the operating company and its safety culture, viewing safety as something that was subordinated for the demands of production; unsurprisingly they experienced more accidents than company employees'*. The presence of a subculture will result in the lack of a cohesive safety culture in an organisation. However, subcultures can be a positive influence on safety, by bringing different perspectives and a diversity of views to safety problems.

On the other hand, two of the respondents believe the recognition and existence of subcultures within large organisations do create some conflict between professional and technical staff and front line employee safety culture. In some cases such cultural differences do create differences between managers and workers and could potentially cause problems for communication and risk taking behaviour as well as other safety issues. Such a difference in job perception results in the technicians carrying out their tasks differently to how the company prescribes.

Influence of managerial training in safety on safety culture

Competence factors in organisations include: qualifications, knowledge and skills and taken into account in recruitment and selection, training and assessment of competence. While some construction companies require some level of employee competence in health and safety for appointment, some organisations pay little attention to such requirements. In some organisations, managers appear to receive little health and safety training. Interviewees were asked to evaluate whether establishing competence standards within the construction industry at all levels can help bring about a desired health and safety culture.

All the respondents agreed that competence standards in the construction industry are necessary for enhancing health and safety cultures across sites. The CSCS - Construction Skills Certification Scheme was highlighted to have been set up to help the construction industry to improve quality and reduce accidents. *‘CSCS cards are increasingly demanded as proof of occupational competence by contractors, public and private clients and others. They cover hundreds of occupations so that whatever you do in construction there will be a card that is suitable for you, that is the standard we have set for employees coming to work on our site’* Workers' adequate knowledge, skill and ability to undertake their work, especially their attitudes towards risks and dangers in their work, may minimize accidents. These competences can be enhanced through training and appropriate worker selection. Interviewee four noted that although his organisation requests some level of standard at recruitment in relation to both that task and safety, continuous training is usually provided in house to help employees to improve their knowledge of job safety and risk assessments.

Interviewee four made known that whilst front line employees and supervisors receive a great deal of training in health and safety issues due to legal requirements, managers did not. He noted that around sixty percent of company executives had received basic health and safety management training, while 20% have “very basic” training and others have never had any safety training at all. He stressed that to derive better management commitment; top managers in construction should improve the level of health and safety management training- *‘they may not have strength to be firm on a safety issue if they don’t have the experience or necessary training’*.

Influence of communication on safety culture

One of the identified causes of accidents is poor communication. Good communication is founded on shared beliefs of the importance of safety and mutual trust as well as confidence in effectiveness of preventive measures. Communication modes can range from formal to informal, written and unwritten to face-to-face discussions and other open approaches. While some organisations tend to rely heavily

on formal processes and modes of communicating safety issues, some welcome all forms of communication. Interviewees were invited to provide perspectives on their experience of the impact of communication forms in influencing employee attitudes towards safety in their organisations.

Interviews one and three were of the view that open communication forms such as open confrontation on safety issues, employee being able to speak out and receive responses on safety matters aids quick dissemination of information on safety matters to authorities and encourages employees to speak out and not cover up issues that are not open to people in authority or management. *‘health and safety professionals spend most times of the day communicating by emails, telephone, writing instructions and responding to technical and not so technical queries from employees and other colleagues. This approach is always required and should be backed up by informal talks and discussions on site by front line supervisors and managers in a manner that encourages front line employees to speak up on safety matters without waiting for their safety officers. In doing this we receive a lot of information on other risks that may not be channelled or identified through pre-planned risk assessments’.*

Interviewee four expressed the view that in a system of open and two way communications, management provides information to employees on hazards and risks associated with the organisation’s operations to build understanding on how to work safely. *‘Our supervisors and managers in turn listen and act on concerns of employees; in this case people contribute more efficiently in this environment that provides a framework for consultation and communication and creates conditions where individuals are encouraged and prepared to report hazards, near misses and incidents’.*

Interviewee six indicated that toolbox talks and health and safety tours are very important tools of communication that have been developed within his company and have consistently helped to identify relevant issues of safety. He stressed that team leaders and supervisors are encouraged to undertake toolbox talks at the beginning of shifts to remind employees on the need for safety and the hazards around; they bring up issues affecting their own health and safety on the job as well. In this manner management also communicates their commitment to health and safety to employees thus enhancing safe behaviours in employees. Findings of risk assessments are also required by the management of health and safety regulations to be made available to all employees by their employers as a way of communication.

Relationship between behaviour-based safety and safety culture

Some organisations have introduced behaviour-based safety (BBS) methods in a bid to reduce work-related incidents and accidents. Behavioural theory focuses on the main behaviours that lead to accidents rather than the accidents themselves, which are relatively infrequent and difficult to investigate objectively, or attitudes which are difficult to change. It is claimed that behavioural methods are proactive and focus on potential risky behaviour. BBS involves identifying, through observation; behaviours which are safe and those which involve risk of injury. However, behaviours have been distinguished from attitudes as people may sometimes behave contrary to their real attitudes based on some factors and certain reasons. Interviewees were asked to

explain whether there be any link between behaviour-based safety (BBS) and safety cultures.

This question prompted discussions into the understanding of the differences between attitudes and behaviour. It was noted that cultures are firmly rooted in the norms and beliefs which people develop by virtue of the environment or childhood. Interviewee four stated that behavioural based safety is directed to study people's behaviour with respect to safety on their job. Attitudes are portrayed through behaviours and behaviours can be independent of attitudes when people are made to behave contrary to their attitudes, concluding that behaviour based safety can perhaps be a tool for assessing safety cultures within organisations through behaviour observation.

Likewise interviewees five and six were of the opinion that BBS programmes play a major role in promoting a positive health and safety culture. Interviewee five made known that behaviour safety interventions have been implemented across their building sites in the UK to correct employee unsafe behaviours when performing their duties on site. He found that a high level of management commitment played a vital role in implementing behavioural safety interventions. Interviewee six expressed the view that BBS can be used to discover reasons for the success or failure of safety culture programmes and requires continuous management support.

Behavioural based interventions appear to be a useful tool to improve safety behaviour within an organisation. Interviewee three believes BBS can put emphasis on safe behaviour on the worker rather than addressing the safety culture of the organisation. He cited an instance that if an employee is trained on safe behaviours, for example what to do if a machine gets stuck, if the safety culture of the company puts production pressures over safety that employee may still try to fix the machine themselves rather than following procedures and waiting for maintenance to fix it, adding that companies may find that BBS techniques are of more use in getting workers to adhere to health and safety procedures than bonus schemes.

Interviewee two made mention of the safety triad, which is a combination of three measurable components: work environment, person (employee) and behaviour, stressing that only when these three elements are combined can workplace accidents be eliminated. He said the behavioral part is often ignored and should always be implemented within organizations which show concern for safety and it's perhaps an indicator of positive safety cultures.

Influence of safety culture on subgroups

Employees tend to exhibit safe attitudes and behaviours based on experience, age and even nationalities as some people might have developed different safety attitudes by virtue of their national safety culture from where they come from. Interviewees were asked to assess the influence of subgroups such as; new workers, young/old workers, apprentices, female workers and immigrant workers on health and safety cultures in construction.

Strong health and safety cultures have a great influence on mostly new entrant workers with little experience. Interviewees stated that young and inexperienced workers are always placed under a supervisor that monitors effectively their work

procedures to ensure their safety, although it is a requirement across sites that all operatives must have a Construction Skills Certification Scheme (CSCS) certificate that ensures their competence and safety on the job.

Interview four expressed that whatever the new site employee's background they are required to have the CSCS certification and are further put through in-house health and safety training, inductions and demonstrations before they are put on the job. He however stressed that young and apprentice workers do have a gap in quickly adjusting to the safety culture, they are usually put under careful monitoring by their supervisors to see they have obtained a high level of competence before being allowed to carry out high risk jobs.

Interview six noted where a strong health and safety culture exists, it is usually an influencing factor for subgroup categories as actions of other workers will tell and make them adjust but where a poor culture exists it may further influence subgroups negatively as well. Thus it is the culture in existence that matters to how well subgroups are influenced.

Other factors that influence safety culture

Apart from factors mentioned above, there are other factors that may contribute to positive safety cultures in organisations. The interviewees were asked to highlight other measures that have been developed by their organisations to contribute to a strong health and safety culture and to suggest some other measures that could be adopted.

Here, respondents made reference to a range of initiatives which centred on caring for the employees, encouraging accident and near miss reporting so that lessons are learnt for the future. Also mentioned were use of written standard operating procedures for machinery and equipment. These procedures are usually drafted to ensure safe operation of machinery and must be adhered to by employees.

Interviewee one mentioned that a no blame policy has been adopted within his organisation, *'when near misses or minor accidents occur we ensure that no one is put on the spot for them, it is necessary that this is done so that employees can always speak and report such incidents for investigation and future improvements'*. He also mentioned that open confrontation on safety issues has been allowed such that lower employees can openly confront and correct each other and even their supervisors on unsafe acts.

Interviewee four stated that employees have been encouraged to quit and stop work processes when they feel unsafe or have not got necessary safety protection to the extent that they feel safety is uppermost than the job and wouldn't be blamed for such. Also mentioned is supervisors and managers setting good examples by always having their Personal Protective Equipment (PPE) and frequently welcoming and discussing safety issues with their employees, noting that when such enthusiasm is seen among them, employees are usually obliged to follow suit on such actions, bringing about a culture of safety first.

Also mentioned by respondent three is the issue of supervisors ensuring that the right thing is done at the right time such that there is no conflict between duties and processes. This has been said to help oversee site processes better and safely. Managers are also required to perform routine safety inspections often and intelligently, this is backed by the need to ensure that they have higher health and safety training to be able to identify and correct hazards on site. Continuous learning was also identified as a way of enhancing health and safety cultures, *'our employees are given safety training periodically and as new hazards arise from technology and projects, this has helped to maintain safe working systems across our sites and projects'*.

6. CONCLUSIONS

Although there is no consensus on how to define organisational safety culture, the concept is now recognised as an essential contributor to improved occupational safety performance in construction. Indeed, the subject of safety culture has attracted considerable attention in the literature in recent years. The health and safety culture in an organisation is determined by interaction of the social and psychological relationships in the workplace. Other factors that influence safety culture in an organisation include its structure and work processes.

The safety culture in an organisation is part of the organisation culture. Indeed we can talk of other cultures such as a production culture, an innovating culture, etc. The safety culture in an organisation can change. The literature reviewed suggests that this takes place slowly and over a considerable period of time. The safety culture in an organisation can be assessed through qualitative methods such as ethnographic field surveys, focus groups, interviews and participant observation. Questionnaire-based methods are however useful in gauging the safety climate in an organisation. Safety climate is now accepted as a surface expression of a safety culture.

There is no empirical evidence suggesting a link between safety climate and safety performance. If there is any link, it is at best very weak. There is also no universal agreement on the on the factors that make up the safety climate concept. Furthermore, measurement of safety performance remains a challenge. Use of lagging indicators such as accident rates and compensation costs is a measure of system failure, not safety performance. Leading indicators such as: risk exposure, unsafe behaviours, etc must also be taken into account.

Factors that influence positive safety cultures in construction have been evaluated by interviewing six safety managers in large construction organisation that are known to exhibit strong safety cultures. The factors that have been identified to positively influence safety culture are these:

- Top management commitment to safety and leadership
- Employee involvement including middle level managers and supervisors
- The type, size and location of project thus dictating the inherent risks
- Senior management training in safety
- Formal and informal communications on safety matters founded on trust
- Use of programmes such as behaviour based safety

- Initial close supervision of at risk groups such young and inexperienced workers.
- Insisting on industry recognised qualifications such as CSCS cards in recruitment and selection decisions.
- Encouraging open reporting of accidents and near misses
- Periodic training to identify hazards arising from new technology, construction plant and projects

In summary, the factors that contribute to positive and negative safety cultures in construction can be grouped into six categories: organisation factors, individual factors, team factors, project related factors, management factors and supervisory factors. This work is part of an ongoing research project with the overall aim of recognising and understanding the complexity of health and safety culture on construction sites, and to develop successful measurement methods and intervention tools to create positive cultures on a construction sites.

7. REFERENCES

Choudhry R. M. Fang D. and Mohamed, S. (2007). The nature of safety culture: A survey of the state-of-the-art. *Safety Science*. 45, 993-1012.

Cooper, M. D. and Phillips R. A. (2004) Exploratory analysis of the safety climate and safety behaviour relationship. *Journal of Safety Research*. 35, 497-512.

Cox, S. J. and Cheyne, A. J. T. (2000). Assessing safety culture in offshore environments. *Safety Science*. 34, 111-129.

Díaz-Cabrera, D. Hernández-Fernaud, E. and Isla-Díaz, R. (2007). An evaluation of a new instrument to measure organisational safety culture values and practices. *Accident Analysis and Prevention*. 39, 1202-1211.

Fernández-Muñiz, B. Montes-Peón, J. M. and Vázquez-Ordás, C. J. (2007). Safety culture: Analysis of the causal relationships between its key dimensions. *Journal of Safety Research*. 38, 627-641.

Guldenmund, F. W. (2000). The nature of safety culture: a review of theory and research. *Safety Science*. 34, 215-257.

Guldenmund, F. W. (2007). The use of questionnaires in safety culture research – an evaluation. *Safety Science*. 45, 723-743.

Grote, G. and Künzler, C. (2000). Diagnosis of safety culture in safety management audits. *Safety Science*. 34, 131-150.

Hahn, S. E. and Murphy, L. R. (2008). A short scale for measuring safety culture. *Safety Science*. 46, 1047-1066.

Hale, A.R. Guldenmund, F. W. Loenhout van P.L.C.H, and Oh J.I.H. (2010). Evaluating safety management and culture interventions to improve safety: Effective intervention strategies. *Safety Science*. 48, 1026-1035.

Haukelid, K. (2008). Theories of safety culture revisited – an anthropological approach. *Safety Science*. 46, 413-426.

O'Connor, P. O'Dea, A, Kennedy, Q and Buttrey S. E. (2011) Measuring safety climate in aviation: A review and recommendations for the future. *Safety Science*. 49, 128-138.

Rollenhagen, C. (2010). Can focus on safety culture become an excuse for not rethinking design of technology?. *Safety Science*. 48, 268-278.

Schein, E. H. (1992). *Organisational Culture and Leadership*. Second Edition, Jossey Bass, San Francisco.

Törner, M. and Pousette, A. (2009). Safety in construction – a comprehensive description of the characteristics of high safety standards in construction work, from the combined perspective of supervisors and experienced workers. *Journal of Safety Research*. 40, 399-409.

Wamuziri, S. C. (2007). Safety culture in the construction industry. Proceedings of the Institution of civil engineers. *Municipal Engineer*. 159(ME2), 167-174.

Wu, T. –C, Lin, C. –H, and Shiau, S. –Y (2010). Predicting safety culture: The roles of employer, operations manager and safety professional. *Journal of Safety Research*. 41, 423-431.