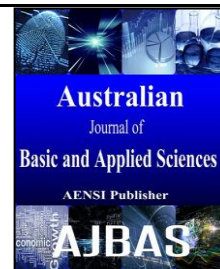




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### Theoretical Review of Safety Climate in Malaysian Construction Industry

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#### ABSTRACT

In order to survive in the competitive environment, it is critical for the construction company to maintain their good performance in term of health and safety. Since the industry that has a reputation due to the high rates of incidents, injuries and fatalities, the management team needs to begin by giving attention to health and safety management approach that integrate between safety systems and people. An improvement to safety will only be achieved if all project stakeholders recognised the need to change their belief, attitude, commitment and behaviour to create a good safety culture. This paper presents an extensive literature review to highlight the need for establishing a positive safety climate towards better construction safety. Construction safety managers need to adapt more holistic strategies which focus on not only improving physical working environment and employees' safety knowledge, but also on shaping employees' beliefs and attitude which lead to safe behaviour and ultimately healthy safety culture.

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#### INTRODUCTION

Construction industry has been recognised as one of the major economic forces that has contributed vastly in developing Malaysia on becoming a developed nation by the year 2020. It also undeniable that the construction industry is a very active and booming industry worldwide and consider as one of the highest contributing industries towards the country's economy. Unfortunately, its reputation and image has been tarnished by high rates of accidents and fatalities incidences that have occurred on construction sites.

Statistics reported by the Department of Occupational Safety and Health Malaysia in 2012 to 2014 shows that there are 513 accidents happen throughout the year with 208 (40.5%) cases of fatalities.

Many approaches have been adopted by construction companies towards safety, but most of them are focused on improving physical working conditions and safety management system/procedure which have led to some limited safety performance improvement. The construction companies nowadays are actively searching for the better approach to improve safety performance.

Ai-Lin Teo and Dong Ping Fang (2006) emphasized that many construction companies

heavily relying on lagging indicators such as accidents or historical statistics to evaluate safety performance. This paper argues that integration between organisational system/ procedure and human-value systems will facilitate the development of good safety culture and safety improvement will only be achieved if all involved recognise the need to change their belief, attitude and behaviour to create a good safety culture.

#### *The Concept of Safety Culture And Safety Climate:*

The concept of safety culture (Choudhry, *et al* 2007) is highly valued within the construction companies and management believes that a positive safety climate is required for improving safety performance in the construction projects. According to The Advisory Committee on the Safety of Nuclear Installations (ACSNI), safety culture is define as the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and proficiency of, an organisations health and safety management (Health and Safety Commission, 1993). Turner *et al.*, 1989 cited in Cooper, 2002) defined safety culture as the set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions

considered dangerous or injuries. The Confederation of British Industry (CBI, 1990) defined it as the ideas and beliefs that all members of the organisation share about risk, accidents and ill-health.

All these definitions are relatively similar in that they focused to varying degrees on the way people think and/or behave in relation to safety (Cooper, 2000). Safety culture is concerned with the attitudes, behaviours, systems and environmental factors that promote effective safety management. In relation to construction, the safety culture can be defined as *an assembly of individual and group beliefs, norms, attitudes and technical practices that concerned with minimising the risks and exposure of workers and public to unsafe acts and conditions in a construction environment* (Zou *et al.*, 2007).

Good safety culture according to Ostrom, *et al.* (1993) can be described as:

- a) A culture where workers have particular patterns of attitudes and belief toward safety practices;
- b) A culture where workers might be alert for unexpected changes and ask for help when they encounter an unfamiliar hazard;
- c) A culture that the workers seek and use available information that would improve safety performance;
- d) A culture that the organization rewards individuals who call attention to safety problems and who are innovative in finding ways to locate and assess hazards, and
- e) A culture that includes mechanisms to gather safety-related information, measure safety performance and brings people together to learn how to work more safely.

Fishbein and Ajzen (1975) described the theory of reasoned action as a construct for behaviour modification in the organization. They suggested that in order to change the behaviour, we need to consider the role of behaviour intentions and behavioural beliefs in shaping attitudes. Besides attitudes toward the behaviour, they also explained the subjective norms which refer to a person's belief that specific individuals or groups approve or disapprove of certain behaviour. This model gives an insight on two determinants - attitudes and subjective norms that shaped behavioural intention which lead to the actual behaviour of humans. The theory of planned behaviour, which is the extension of the theory of reasoned action, added perceived behavioural control as other determinants that shaped behavioural intention and actual behaviour. Lingard and Rowlinson (2005) described that past experiences and anticipated obstacles contribute to a person's perception about whether certain behaviours are within their control. Changing human behaviour requires changing their attitudes and belief.

In order to understand safety culture, attention needs to be directed to understanding the concept of attitudes and behaviour change. Lingard and Rowlinson (2005) show how OH&S attitudes might shape OH&S behaviour in construction and their model consists of four elements namely beliefs about jobs, job attitudes, behavioural intentions and the actual behaviour towards safety. Belief represents the perspective a worker has relative to a subject. An example would be that a worker might believe that their job is inherently dangerous, exciting or probably dangerous. These descriptions represent beliefs the individual has about the job. These beliefs may or may not be factual and differ between individuals, which then influence attitudes. For example, a person who believes his/her job to be inherently dangerous may develop a negative attitude towards OH&S rules and regulations. This unfavourable attitude towards OH&S may lead workers to choose undesirable forms of behaviour. This conscious decision to behave unsafely is the behavioural intention. Fishbein and Ajzen (1975) explain that behavioural intentions will then transform into actual job behaviour, such as the occurrence of unsafe acts and risk-taking behaviour among the workers. Lingard and Rowlinson's (2005) model also explains that individuals with negative OH&S attitudes will behave unsafely only if they make a decision to do so. Understanding the link between belief and attitudes to actual behaviour are crucial in the design of any attempts to improve OH&S performance through attitudinal change.

To promote safety in the workplace it is important that workers have the right belief, attitude and behaviour towards good safety performance. Lingard and Yesilyurt (2003) contend that the companies who manage occupational health and safety (OH&S) will typically have commonly held attitudes regarding the importance of OH&S, which are shared by employees at all levels and conveyed to sub-contractors. They added that the creation of a shared mental model of OH&S is the key to ensuring consistently good OH&S performance. In order to create a shared 'mental model' for OH&S in construction, it is important to understand the factors that affect workers attitudes towards safety. Therefore, it is essential to achieve human potential in safety by shaping a culture in which safety permeates all activities. An important element in shaping safety culture is to shape workers' perceptions and beliefs towards safety (Zou *et al.* 2007). Workers need to have optimum beliefs, and perceptions before attitudes and behaviour relative to safety can be changed. Tam and Fung (2001) maintained that the interactive relationships between how people behave, the attitudes and perceptions that people hold, and the situation or environment that people work in should be taken into account when developing the safety culture.

The safety climate concept was introduced by Zohar (1980) and can be defined as a summary of molar perceptions that employees share about their work environments. This concept refers to perceptions of policies, procedures, and practices relating to safety in the workplace. Other scholars, Flin *et al.* (2000) defined safety climate as the shared perceptions about safety values, norms, beliefs, practices and procedures. Safety climate highlights the perceptions held by employees regarding the significance of safety in their job site (Choudhry *et al.* 2007). In construction, safety climate can be defined as the *assembly of perceptions held by construction workers regarding construction safety policies, procedures and practices on construction sites* (Zou *et al.* 2006). Safety climate focusing on the worker's perceptions of the role of safety plays in the workplace or called bottom-up approach. Mohamed (2003) suggested that safety climate is a product of safety culture. Furthermore, Choudhry *et al.* (2007) provided that the definition of safety climate is the reflection of employee's perceptions about the organization's safety management system including policies, practices and procedures that show how safety is implemented in construction site environments.

Many studies in safety climate factors or determinants are varying significantly. The difference came from the content of the questionnaires, style, statistical analysis, sample size, sample composition and countries. Choudhry *et al.* (2007) asserted that safety climate investigation is very popular in the nuclear industry (Lee and Harrison, 2000) or steel, food processing, chemical and textile industry (Zohar, 1980). The study has been conducted to explore the concept of safety climate in the construction industry (Gillen *et al.*, 2002 and Pousette *et al.* (2008). Unfortunately, no agreement on the factor structure for safety climate in the construction environment been established. Therefore, this study aimed at investigating the underlying factors for safety climate from Malaysian construction industry perspectives.

### **2.1 The Need for a Positive Construction Safety Climate in Construction:**

Many researchers have studied construction safety and it appears that traditional approaches to safety management have been focused on the techniques and management tools and are related to identification of work hazards, minimizing the risks associated with these hazards, developing safety management systems, safety procedures and standards, improving physical working conditions such as design of plant and machinery and site access, training site workers, developing better planning and work methods and providing personal protective equipment (Holmes *et al.*, 1998; Reese, 2003, Biggs *et al.*, 2005). Furthermore, the construction industry also relies heavily on

traditional measures such as an accident, and workers' compensation statistics (Mohamed, 2002). Study by Peckitt *et al.* (2004) described that the functionalist approaches to safety management systems focusing on techniques and mechanics of managing safety such as rules, policies and procedures will encourage safe actions, but they are only as effective as the consequences they predict and the extent to which they are implemented.

Furthermore, research has shown that the majority of workplace accidents and injuries have been attributed to the unsafe work practices of employees rather than unsafe working conditions (Garavan & O'Brien, 2001; Hoyos, 1995 cited in Mullen, 2004). Sawacha *et al.* (1999) described that 'unsafe behaviour' is the most significant factor in the cause of site accidents. On the other hand, Clifford (1988) cited poor attitude towards safety and lack of interest towards safety issues as contributors to high accident rates on site. Attitude needs to be changed before behaviour change (Geller, 1998). Poriters (2000) also cited the 'macho image' among construction workers as the cause of poor safety performance and high accidents on site. Often, the workers believed that following all safety procedures including wearing safety equipment are not necessary for them. Review of the current practices of safety management reveals the major issue in safety is the lack of a sound safety culture within the organisation (Mahmud *et al.* 2008). In order to improve safety performance; one of the ways is to cultivate a sound organizational safety culture (Fung *et al.* 2005).

To promote safety in the workplace it is important that workers have the right belief, attitude and behaviour towards good safety performance (Mahmud *et al.* 2009). Lingard and Yesilyurt (2003) contend that the companies who manage occupational health and safety (OH&S) will typically have commonly held attitudes regarding the importance of OH&S, which are shared by employees at all levels and conveyed to sub-contractors. They further added that the creation of a shared mental model of OH&S is the key to ensuring consistently good OH&S performance. In order to create a shared 'mental model' for OH&S in construction, it is important to understand the factors that affect workers attitudes towards safety. Therefore, it is essential to achieve human potential in safety by shaping a culture in which safety permeates all activities. An important element in shaping safety culture is to shape workers' perceptions and beliefs towards safety. Workers need to have optimum beliefs, and perceptions before attitudes and behaviour relative to safety can be changed. Tam and Fung (2001) maintained that the interactive relationships between how people behave, the attitudes and perceptions that people hold, and the situation or environment that people work should

be taken into account when developing the safety culture.

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### **2.2 Review on the Safety Climate Constructs:**

Safety climate has been researched for many years, dominantly in several directions such as designing the psychometric measurement instruments, developing and testing theoretical safety climate model, examining the relationship between safety climate determinants and safety performance and exploring the relationship between safety climate and organizational climate (Cooper and Phillips, 2004).

A number of attempts have been made to construct the dimensions of safety climate. The quantitative research on safety culture and safety climate was begun by Zohar (1980) in 'Safety climate in industrial organization: Theoretical and applied implications. He introduced the concept of safety climate and develops the safety climate survey and validated a 40-item measure for safety climate on twenty (20) industrial samples in Israel. Zohar's model was developed by first reviewing the safety literature then organized the questionnaires into eight (8) different dimensions based on perceived management attitudes on safety, perceived effects of safe work practice on promotion, perceived effects of safe conduct on social status on individuals, status of

safety officer, status of safety committee, perceived effectiveness of safety training, the perceived level of risk at the workplace and the importance of safety training. Zohar concluded that safety climate is directly related to a company's safety record and could provide a means for identifying the areas of safety within a company that can be improved.

Brown and Holmes (1986) attempted to validate the Zohar's safety climate model on a sample of 425 American production workers with the questionnaire. They reduced the original eight-factor climate model to three factors which are management attitudes, management actions, and level of risk. They also related their measure of safety climate to actual safety performance, and differences in safety perceptions were detected between the accident and non-accident groups. DeDobbeleer and Beland (1991) tested Brown and Holmes's safety climate model among construction workers. The result shows strong correlations between management concerns and reduced the model to two factors which are management commitment and worker's involvement.

In 1997, the Health and Safety Executive of the United Kingdom (HSE) developed and published a Health and Safety Climate Survey Tool (HSCST). In the survey tool, the dimensions of safety climate were constructed with 10 factors which are organizational commitment and communications, line management commitment, the supervisor's role, personal role, fellow worker influence, competence, risk taking behaviour and some contributory influences, some obstacles to safe behaviour, permit-work, and reporting of accidents and near misses (HSE 1997). By reviewing 18 safety climate reports published from 1980 to 1998, Flin *et al.* (2000) identified the common features of safety climate as management, safety system, risk, work pressure and competence.

Glendon and Litherland (2001) examined the safety climate determinants in road construction and found six (6) factors. The factors include communication and support, adequacy of procedures, work pressure, personal protective equipment, relationships and safety rules. Using Structural Equation Modelling (SEM), Mohamed (2002) identified 10 dimensions to describe the safety climate on the construction site environment. This includes management commitment, communication, safety rules and procedures, supportive environment, supervisory environment, worker's involvement, personal risk appreciation, appraisal of work hazards, work pressure and competence.

More recently, Fang *et al.* (2006) conducted a survey in Hong Kong and found fifteen (15) factors but only ten (10) are considered important dimensions for safety climate. These 10 dimensions were safety attitudes and management commitment, safety consultation and safety training, the supervisor's role and work mates' role, risk taking behaviour, safety resources, appraisal of safety

procedure and work risk, improper safety procedure, worker's involvement, workmate's influences and competence. Reviews on other determinants that

shape safety climate highlighted by Abdullah, *et al.* (2009) are shown in Table 1 below:

**Table 1:** Determinants of Safety Climate Based on Literature Review

Authors	Constructs
Smith <i>et al.</i> (1978)	Management complexity, management commitment, management involvement, management efficiency, safety policy, safety rules, staff involvement, plant solvency.
Zohar (1980)	Safety training program, management attitudes towards safety, Effects of safe conduct on promotion, level of risk in workplace, effects of required work pace on safety, status of safety officer, effects of safe conduct on social status, status of safety committee.
Glennon (1982)	Safety and health legislation, corporate attitudes to safety and health, status of safety officer, importance of training, management encouragement, promotion, risk level, safety and production targets.
Brown and Holmes (1986)	Management concern and attitudes, employee perception on safety, employee physical risk perception, safety training, promotion, work pace, safety officer status, safety committee, social status.
Cox and Cox (1991)	Personal scepticism individual responsibility, work environment, safety arrangements, personal immunity.
DeDobbeleer and Beland (1991)	Management commitment to safety, worker's involvement in safety, management concerns, management safety activities, employee risk perception.
Ostrom <i>et al.</i> (1993)	Safety awareness, teamwork, pride and commitment, excellence, honesty, communications, leaderships and supervision, innovation, training, customer relations, compliance, safety effectiveness, facilities.
Donald and Canter (1994)	People, attitudes, workmates, supervisor.
Niskanen (1994)	Worker attitudes towards safety, change in work demands, appreciation of the work, safety as part of productive work.
Rundmo (1994)	Safety and contingency factors, commitment and involvement in safety work, social support, attitudes to accident prevention.
Coyle <i>et al.</i> (1995)	Maintenance and management issues, company policy, accountability, training and management attitudes, work environment, policy and procedures, personal authority.
Alexander <i>et al.</i> (1995)	Conflict and control, supportive environment, attributions of blame, personal appreciation of risk, personal need for safety, overt management commitment.
Philips <i>et al.</i> (1993)	Management attitudes, safety training, promotion, risk, work pace, safety officer status, social status, safety committee.
Hofmann and Stetzer (1996)	Role overload, perceptions of work group processes, approach intentions, unsafe behaviours.
Diaz and Cabrera (1997)	Company policies towards safety, emphasis on productivity versus safety, group attitudes towards safety, specific strategies of prevention, safety level perceived in the airport, safety level perceived on the job.
Williamson <i>et al.</i> (1997)	Safety awareness, safety responsibility, safety priority, management safety commitment, safety control, safety motivation, safety activity, safety evaluation.
Budworth (1997)	Management commitment, supervisor support, safety systems, safety attitudes, safety representatives.
Cheyne <i>et al.</i> (1998)	Safety management, communication, personal involvement, safety standards and goals, individual responsibility.
Carroll (1998)	Management support, openness, knowledge, work practices, attitudes.
Mearns <i>et al.</i> (1998)	Speaking up about safety, attitudes to violations, supervisors commitment, attitudes to rules and regulations, management commitment, safety regulations, cost versus safety, personal responsibility for safety, safety system, over-confidence in own safety, hazards to installation, occupational hazards, accident prevention, incident mitigation, emergency response.
Hinze and Raboud (1998)	Commitment, co-workers attitudes towards safety, supervisor's commitment, worker's involvement, work pressures, worker's competence.
Cox and Flin (1998)	Management action, quality of safety training, personal safety actions, employee appraisals of organizational commitment.
Lee (1998)	Safety procedures, risk, permit to work, job satisfaction, safety rules, training, participation on safety, control of safety, plant design.
Thompson <i>et al.</i> (1998)	Organizational politics, management support for safety, supervisor support, supervisor fairness, workplace safety perceptions, goal congruence.
Robson (1999)	Commitment, safety rules and procedures, co-worker attitudes towards safety, supervisor's commitment, personal risk appreciation, worker competence, shoestring budget, subcontracting system.
Clarke (1999)	Unsafe conditions, managerial decisions, working conditions, local management, line function.
Tomas <i>et al.</i> (1999)	Supervisor's safety response, co-workers safety response, worker attitudes towards safety.
Sawacha <i>et al.</i> (1999)	Communication, safety rules, worker's competence, safe working environment.
Brown <i>et al.</i> (2000)	Supervisory influences, upper management's influences on safety.

Cox and Cheyne (2000)	Management commitment, priority to safety, communication, safety rules, supportive environment, involvement in safety, personal priorities and need for safety, personal appreciation of risk, work environment.
Langford <i>et al.</i> (2000)	Commitment, supervisor's commitment, personal risk appreciation, industry norms, management behaviour.
Neal <i>et al.</i> (2000)	Organizational climate, safety performance, safety compliance, safety knowledge, safety motivation, safety participation.
Zohar (2000)	Supervisory action, supervisory expectation, role overload, expert ratings of submits risk, supervisor ratings of job risk.
Wong (2000)	Management commitment, safety communication, safety rules and procedures, work pressure.
Glendon and Litherland (2001)	Communication and support, adequacy of procedures, work pressures, personal protective equipments, relationships, safety rules.
Wu (2002)	Management's commitment, manager's commitment, personal commitment to safety, perceived risk, emergency response.
Moleenar <i>et al.</i> (2002)	Management commitment, communication, co-worker's attitudes towards safety, supervisor's commitment, worker's involvement, personal risk appreciation.
Mearns <i>et al.</i> (2003)	Safety policy knowledge, involvement in safety, communication about safety issues, job satisfaction, satisfaction with safety activities, perceived management commitment, perceived supervisor competence, written rules and procedures, willingness to report incidents, general safety behaviour, safety behaviour under incentives.
Chan <i>et al.</i> (2005)	Organizational commitment and communication, line management commitment, the supervisor's role, personal role, workmate's influence, competence, risk taking behaviour and contributory influences, some obstacles to safe behaviour, permit to work, reporting of accidents and near misses.
Choudhry <i>et al.</i> (2007)	Inappropriate safety procedure and work pressure, management commitment and employee involvement, satisfaction with resources and training, appraisal of hazard and reporting, personal risk appreciation, competence, co-worker's influence.
Choudhry <i>et al.</i> (2008)	Safety policy and standards, safety organization, safety raining, inspecting hazardous conditions, personal protection program, plant and equipment, safety promotion, management behaviour.
Abdullah <i>et al.</i> (2009)	Safety communication, training and competence, health and safety reporting, work duties, safety satisfaction, management safety commitment, errors and incidents, role of supervisor in safety and health, safety rules, supervisor's leadership style, health and safety goals and safety responsibility.

This paper reviewed a total of 318 determinants affecting the safety climate in several industries together with 46 authors from all over the world. The determinants are then divided into 8 categories namely safety technology, safety management system, safety commitment, safety activities, safety training, safety communication, safety environment and safety-self related factors. Figure 1 shows the number of determinants that fall into each category.

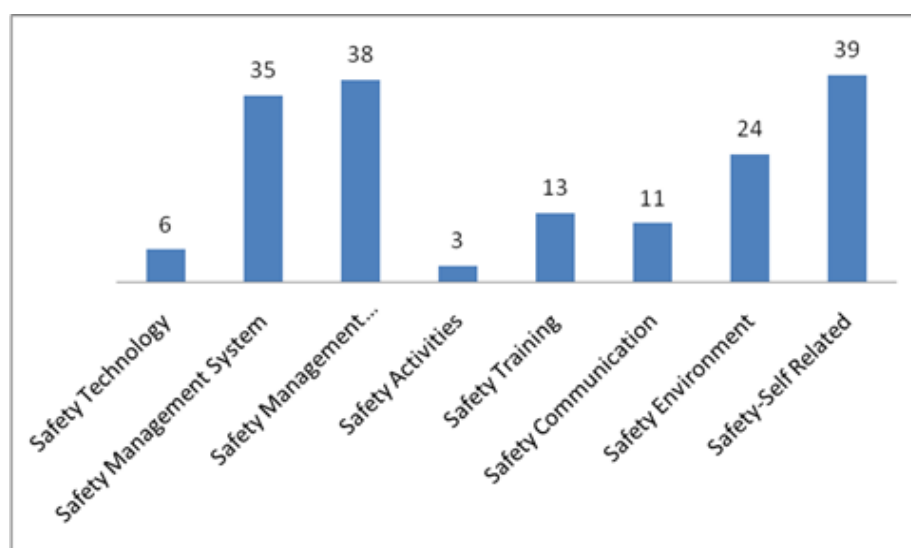


Fig. 1: Safety Climate Categories

### Conclusions:

The success of any system depends as much on people changing their attitude and behaviour as it does on a well-designed system and one must remember that while it is easy to bring about behavioural change, it is extremely difficult to keep it changed (Loosemore and Zou 2006). Furthermore, developing a safety construction culture is something which cannot occur overnight. It is a journey rather than a destination which takes time and commitment over an extended period (Loosemore and Zou 2006). To this end, it is essential that any organisation that has adopted a new approach to construction safety management continues to champion its new philosophy and monitor its performance on a continual basis, learning lessons, feeding them back into business processes and refining management practices. This must be supported by an effective training, motivation and performance appraisal system to reinforce appropriate behaviour (Loosemore and Zou 2006).

It is concluded that besides concentrating on the safety management system and new technologies, focus on the human side of safety is an important aspect and the vision of incident and injury free construction sites is achievable when the management and workers have the right beliefs, attitudes and adopt appropriate behaviour and the organisation has an integrated safety management systems that focus on not only policies, regulations, and site conditions, but also the human factors.

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