# Developing a Model of Construction Safety in Saudi Arabia

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## ABSTRACT

Safety is a major concern for construction companies, as it is a source of substantial direct and indirect costs. In some countries, the rate of total workplace injuries from construction activities can be as high as at least 50%. This is undoubtedly a serious matter warranting urgent attention. In the past decade, interest in the nature of 'safety climate' and its role in predicting occupational accidents and injuries has increased. However, research findings regarding the relationships between safety climate and other key outcomes constructs such as safety behaviours and safety outcomes are to some extent inconsistent. Recent safety climate literature suggests that examining the role of safety motivation may help provide a better explanation on such relationships. In view of this, the authors of this paper have developed a conceptual model depicting the relationships between four main constructs: Safety Motivation, Safety Climate, and Safety Behaviour. In particular, the model hypothesises that Safety Climate has a mediating role on the relationship between Safety Motivation and Safety Behaviour. The aim of the research study presented in this paper was to empirically assess the proposed conceptual model within the context of Saudi Construction Industry. To achieve this, a questionnaire was developed through critical review of literature and was pilot tested with a number of safety management experts. A survey was then administered in Saudi Arabia targeting project managers, site managers, site engineers and supervisors at construction workplaces. In total, 430 sets of questionnaire were distributed and 265 valid responses returned. Based on this dataset, a series of statistical analyses have been performed including basic descriptive analysis, Exploratory and Confirmatory Factor Analyses as well as Structural Equation Modelling (SEM). The results from the analysis support that Safety Climate fully mediated the relationship between Safety Motivation and Safety Behaviour, within the context of Saudi Construction Industry.

**Keyword:** Safety Climate, Safety Behaviour, Safety Motivation, Construction, Saudi Arabia

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## 1. INTRODUCTION

The National Safety Council (NSC) estimates the construction industry employs about 6% of the industry workforce; however, on average, it is responsible for approximately 21% of all industrial deaths (Rechenthin, 2004). It is in fact documented that the construction industry has the highest rate of accidents of all industries (Sawacha, Naoum, & Fong, 1999) as well as the highest rate of disabling injuries and fatalities (Hinze, 1997). As reported by Bomel (2001), up to 40% of accidents occur in the construction industry in Japan, 50% in Ireland and 25% in the United Kingdom. In some developing countries such as Saudi Arabia, around 51% of total workplace injuries occurred in the construction sector (G.O.S.I, 2010). Safety has thus become one of the primary concerns among construction organisations as well as construction researchers.

The primary aim of this paper is to develop and empirically test a conceptual model that integrates safety motivation, safety climate and individual safety behaviour to produce an improved integrative model of construction workplace safety, as well as to provide an appropriate measure for safety motivation in the workplace. In particular, the model proposes that safety motivation is a workers' safety climate is a key mechanism through which safety motivation leverages individual safety behaviour.

## 2. CONCEPTUAL MODEL DEVELOPMENT

In safety literature, essential background knowledge is generally provided in relation to how safety climate is associated with safety outcomes. One shortcoming apparent in the literature is the lack of comprehensible and consistent construct definitions and conceptualisations, in both the predictor and criterion sides (S. Clarke & Robertson, 2005). The existing inconsistencies between studies and empirical findings are not in line with theoretical predictions. Even though there have been efforts to overcome this problem in particular domains, no study to date has comprehensively addressed the deficiencies (Christian, Bradley, Wallace, & Burke, 2009). Moreover, the literature regarding safety climate and safety behaviour reveals that safety motivation (SM) plays a part in these relationships (S Clarke, 2010). These observations led to the development of a theoretical framework addressing four constructs: safety motivation (SM), safety climate (SC), safety behaviour (SB), and Safety outcomes (SO) (see Figure 1).

In particular, the framework hypothesises that SM has a primary influence on SC and SB. Moreover SC impacts safety behaviour directly, which, in turn, affect the construct of safety outcomes (SO). It should be noted that the mediating effect of safety climate between safety motivation and safety behaviour has never been tested within the construction context. The following sections provide details of each of the model's constructs. With the aim of understand the impact that safety motivation has via its influence on safety climate and safety behaviour, as well as the mediating role of safety climate between safety motivation and safety behaviour,

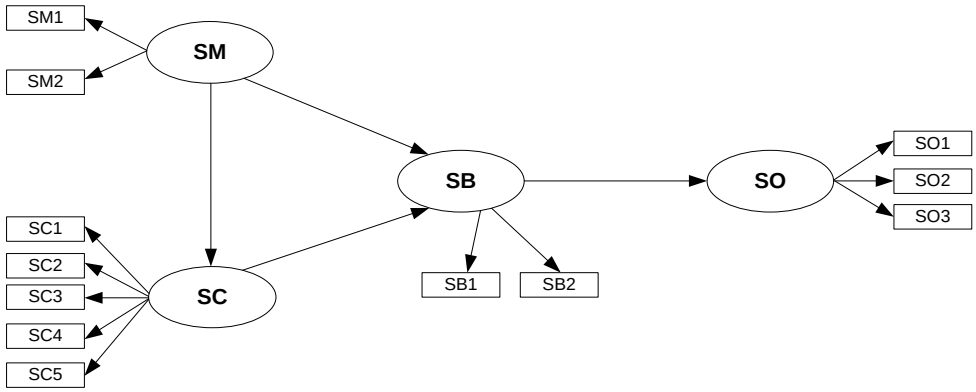



**Figure 1: The conceptual model.**

## 2.1. Safety motivation (SM) cnstruct

The study of motivation is the study of action (Eccles & Wigfield, 2002). Motivation has been defined as "the set of psychological processes that cause the initiation, direction, intensity, and persistence of behaviour" (Fey, 2005) and other definition was the idea of motivation refers to inner factors that drive action and to outside factors that can act as inducements to action (Locke & Latham, 2004; Moynihan & Pandey, 2007). Motivation, in general, is intention to do something, and can be intrinsic or extrinsic (Locke & Latham, 2004). A careful literature review of safety motivation reveals a number of theories focusing on the differences between intrinsic and extrinsic motivation. When individuals are intrinsically motivated, they engage in an activity since they are interested in and enjoy the activity. When extrinsically motivated, individuals connect with activities for instrumental or other reasons, such as receiving a reward (Eccles & Wigfield, 2002).

In the current study, it is proposed that workers' safety motivation is a key variable having a direct impact on both workplace safety climate and individual behaviour. A desired safe behaviour in workplace are usually uncomfortable and inconvenient (Geller, 2010). Without safety climate and individual motivation, shortcuts may unavoidably be taken. The motivation has to be linked to required actions for the outcome to be achieved (Gershwin, 1994) which is safety climate in the current study. The motivation alone may not produce the positive change unless there is an appropriate safety climate to maintain safe manner and no reversion to unsafe behaviour especially in the developing countries. This goes along with person organization fit (P-O Fit) concept which is one of the most popular areas of research in the general management and organizational field. This domain capture the congruence between the characteristics of individuals and the characteristics of organizations (Bright, 2007). Thus as the congruence between individuals who have the value and motivation toward safety and the construction safety climate, will drive workers behaviour to become more safe and committed. Individuals are only expected to allocate discretionary effort when they believe that their individual interests are aligned with those of the company will make a reciprocal investment in their

well-being Therefore, workers safety motivation will work when there is a constructive safety climate (Vroom, 1964). Table 1 describes the dimensions of safety motivation along with description and associated references.

**Table 1: Operational details of the 'Safety Motivation' construct**

| Dimensions | Description | References |
|---|---|---|
| Intrinsic Motivation (SM1) | Intrinsic motivation refers to desired behaviors that happen in the absence of external control. | Ferraro, 2002; Moynihan and Pandey, 2007; Neal and Griffin, 2006; Vinodkumar and Bhasi, 2010. |
| Extrinsic Motivation (SM2) | Extrinsic motivators are external motivation sources; individuals believe that the behaviors they engage in will lead to certain desired outcomes. | Teo et al., 2005; Hedlund et al., 2010; Vinodkumar and Bhasi, 2010. |

### 2.2. Safety climate (SC) construct

During the last two decades, safety climate has been researched in three principal ways: (1) designing psychometric measurement tools and determining their underlying factor structures; (2) developing and examining theoretical models of safety climate to find out determinants of safety behaviour; and (3) examining the relationship between safety climate perceptions and actual safety outcomes (Cooper & Phillips, 2004). One of the objectives of this study is to measure safety climate perceptions and develop and test theoretical models of safety climate to ascertain determinants of safety behaviour and accidents.

Many researchers have studied the factors which contribute to project safety success within various industries. The majority of these researches were conducted in high hazard industrial sectors, including transport, power generation, offshore oil and gas production, manufacturing, and construction. The results are presented thematically, under the headings managerial factors, supervisory factors, workforce factors, and other system factors (Yule, 2003). These research studies concentrated on identifying factors associated with successful safety performance in organisations. In fact, the inconsistencies in identified safety climate factors could be due to the diversity of questionnaires, samples and methodologies used by different researchers. On the other hand, even when the same questionnaire was used, e.g., by Zohar (1980), Brown and Holmes (1986), and Coyle et al. (1995), different factors were still found (Glendon & Litherland, 2001). Therefore, it can be concluded that dimensions of safety climate differ from industry to industry, and from county to county (Fang, Chen, & Wong, 2006), hence no universal set of safety climate factors. However, a number of similarities can be found between different safety climate research studies. Based on the literature synthesis particularly from the three recent investigations by Flin et al.(2000), Fang (2006), and Choudhry et al. (2009), the present paper conceptualises safety climate

as consisting of the following dimensions: worker perceptions of management's commitment and communication; worker appreciation of risk; worker competence; work pressure; and worker perception of safety rules and procedures (see Table 2).

**Table 2: Operational details of the 'Safety Climate' construct**

| Dimension | Description | References |
|---|---|---|
| Management Commitment and Communication (SC1) | The frequency and quality of communication and how keen the management is to improve safety performance. | Ferraro, 2002; Mohamed, 2002; Fang et al., 2006; Neal and Griffin, 2006; Vinodkumar and Bhasi, 2010; Al-Haadir and Panuwatwanich, 2011. |
| Competence (SC2) | The effectiveness of safety training, skills and qualifications of relevance to safety issues. | Mohamed, 2002; Fang et al., 2006; Vinodkumar and Bhasi, 2010. |
| Personal Appreciation of Risk (SC3) | An individual's subjective assessment of acceptable risk in the workplace. | Ferraro, 2002; Mohamed, 2002; Fang et al., 2006. |
| Work Pressure (SC4) | The level to which workers feel under pressure to complete work, and the amount of time to plan and perform work safely. | Glendon et al., 1994; Flin et al., 2000; Mohamed, 2002; Fang et al., 2006. |
| Safety Rules and Procedures (SC5) | The availability of safety equipment and facilities to carry out the job safely and the effectiveness of safety inspections and emergency procedures. | Flin et al., 2000; Mohamed, 2002; Fang et al., 2006. (Al-Haadir & Panuwatwanich, 2011) |

### 2.3. Safety behavior (SB) construct

Safety Behaviour (SB) has two components describing the actual performance of individuals at work. Borman and Motowidlo (1993) proposed two main components of performance: task performance and contextual performance. These two parts of performance can be used to differentiate SB in the workplace. First, based on definitions of task performance, this current study uses the term safety compliance to describe the core safety activities which need to be carried out by individuals to maintain workplace safety, such as wearing personal protective equipment. Second, based on definitions of contextual performance, safety participation is used to describe behaviours such as participating in voluntary safety activities or attending safety meetings. Safety participation behaviours may not directly contribute to workplace safety, but they do help to develop an environment that supports safety (Griffin & Neal, 2000; Schutte, 2010). The Borman and Motowidlo's (1993) concept was used by Griffin and Neal (2000) to examine the relationship

between safety climate and safety behaviour. Table 3 summarises the two dimensions of the safety behaviour construct, along with their descriptions, and associated references.

**Table 3: Operational details of the 'Safety Behaviour' construct**

| Dimensions | Description | References |
|---|---|---|
| Safety compliance (SB1) | Self-measure of performance of safety related behaviors. | Neal and Griffin, 2006; Vinodkumar and Bhasi, 2010. |
| Safety participation (SB2) | Self-measure of involvement in safety support activities. | Neal and Griffin, 2006; Vinodkumar and Bhasi, 2010. |

### 2.4. Operational definition of the safety outcomes (SO) construct

Theorists studying the relationship between safety behaviours and outcomes (e.g., Fishbein, 1979; Fishbein & Azjen, 1975) suggest that one should make a careful distinction between outcomes (e.g., accidents and injuries) and behaviours (e.g., safety compliance). Therefore, in the current research, safety outcomes (SO) refer to the frequencies of day off, types of accidents, and types of injuries, which happen in a construction workplace within a particular period. According to Probst and Brubaker (2001), safety outcomes (SO) such as injuries are best predicted by both behaviour and extraneous factors not under the control of the individual. An accident can be defined as "an unplanned, undesirable, unexpected, and uncontrolled event" (Hamid, Rahim, Majid, Zaimi, & Singh, 2008). An accident does not necessarily result in an injury, and can be in terms of damage to equipment and materials. However, those that result in injuries receive the greatest attention (Hinze, 1997). All accidents, regardless of the nature of the damage or loss, should be of concern. Accidents that do not cause damage to materials or equipment, or injury to personnel, may forecast future accidents with unwanted results (Hamid, et al., 2008).

Construction company accident statistics, for instance, can be affected by random events; can be prey to inconsistencies in reporting, and even to under-reporting of accidents. Most of the time, they are unusable due to restriction of variance, competition and insurance issues. On the other hand, self-reporting measures may also be unreliable due to reporting biases, but if collected anonymously, may be more reflective of the true state of safety than company statistics (Yule, 2003). It was confirmed in the Sellafield Study (Lee, 1998) that there is a strong and positive relationship between negative behaviour and the likelihood of an accident involving personal injury while working on a site. The study measured accident history by asking about lost time (less than/more than three days), together with accidents requiring medical treatment, and total number of injuries (Lee & Harrison, 2000).

Lusk, Ronis, and Baer (1995) compared multiple indicators of behaviour to identify the most workable measure of blue-collar workers' use of hearing protection. The three measures used were:

observation, supervisor report, and self-report. The results showed supervisor reporting was highly discrepant from both self-reported and observed use. Self-report and observations were highly correlated; discrepancies between the two were slight. Therefore, these results suggest that self-reporting is an appropriate measure, and may be the best choice when time and monetary resources are restricted (Lusk, Ronis, & Baer, 1995).

Assuming that implementing the suggested safety model in figure 1 can generally reduce accidents, more attention should be paid to the self-reporting of accidents, especially in the Saudi construction context, where everything is changing too rapidly to be effectively evaluated via historical measures. Moreover, large numbers of Saudi construction companies do not have recorded data. Even if they do, it is not released due to competition and insurance issues.

In summary, the safety outcome construct is determined by relevant measurement variables adapted from different research developed by Goldenhar (2003), Howarth and Watson (2009), Jiang et al. (2010), Lee and Harrison (2000), Oliver et al. (2002), Probst and Brubaker (2001), Siu et al. (2003), Vinodkumar and Bhasi (2010) and Zacharatos et al. (2005). Table 3 summarises the safety outcome construct measures, along with their descriptions, measurement variables and associated references.

**Table 4: Operational details of the 'Safety Outcomes' construct**

| Dimensions | Description | References |
|---|---|---|
| Day-off rate (SO1) | The number of times that the person is involved in an accident of any kind at work in the last 12 months that incurs absence due to resultant injury. | Lee and Harrison, 2000; Probst and Brubaker, 2001; Oliver et al., 2002; |
| Accidents types (SO2) | Frequencies of accident types in the last 12 months which caused injuries or not. | Neal and Griffin, 2006; Vinodkumar and Bhasi, 2010. |
| Injuries types (SO3) | Frequencies of Injury types in the last 12 months. | Jiang et al., 2010; Siu et al., 2003; Goldenhar et al., 2003; Zacharatos et al., 2005; |

## 3. RESEARCH DESIGN

A quantitative research method was selected to examine the proposed conceptual model. A questionnaire survey was used in order to assist the collection of data from individuals at construction sites. All model constructs were measured using a five-point Likert-type response format. Items, relating to each of the constructs, were used in the form of statements to measure individual constructs under investigation. The different statements used in developing the questionnaire were drawn upon scales that had been previously used by research used by researchers (Choudhry, Fang, & Lingard, 2009; Mohamed, 2002; Vinodkumar & Bhasi, 2010). Participants were asked to endorse the statements using a five point Likert-type scale (from 1=

“strongly disagree’’ to 5=‘‘strongly agree’’) for three constructs; safety motivation, safety climate, and safety behaviour. For the safety outcomes construct we used five-point likert type scale (from 1= “very often” to 5= “Never”) to measure the frequencies of the safety outcome components. Including complimentary additions of new items further developed the scales and some items were reworded and rephrased to suit local working practices and culture. The contents of this draft questionnaire were discussed with senior safety professionals from Saudi construction industries and senior professors in engineering management studies to ensure face validity. After considering each item in detail, required changes were made by simplifying, rewording, removing and replacing some of them.

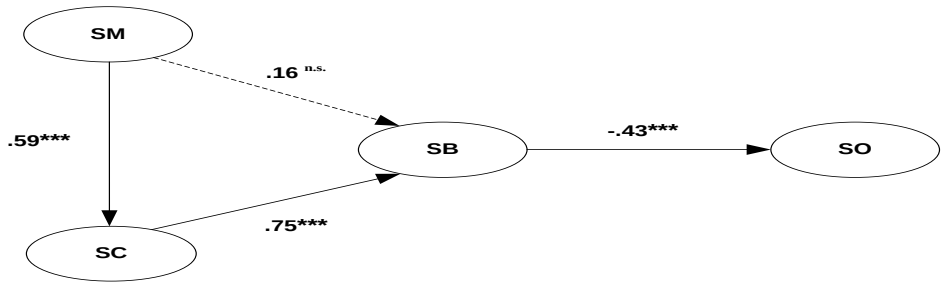
Descriptive statistics and reliability of the studied variables were firstly analysed. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were then employed to verify the unidimensionality and reliability of the five safety management practices (management commitment and communication, competence, personal appreciation of risk, work pressure, safety rules and procedures), two components of safety behaviour (safety compliance and safety participation), two components of safety motivation (intrinsic motivation and extrinsic motivation), and three components of safety outcomes (day-off rate, accidents type and injuries type). Structural equation modelling (SEM) techniques were used to conduct the path analyses to test the relationship between the constructs and the goodness of fit of the model. AMOS 21 software was used for CFA and path analysis. The remaining analyses were done using SPSS 20 software. The study employed the following model fit indices: normed chi-square ($x^2/df$); goodness-of-fit index (GFI); comparative fit index (CFI); incremental fit index (IFI); and root mean square error of approximation (RMSEA). To be considered as having an adequate fit with the data, all the indices of the model should meet the following criteria: $x^2/df < 3.0$; GFI, CFI, and IFI > 0.90; and RMSEA < 0.08 (Hair et al., 2006).

## 4. ANALYSIS RESULTS

The survey was conducted with Saudi Construction Industry (SCI) from February to May 2012. The study sample targeted only individuals in the construction workplaces (supervisors, engineers from main contractors as well as subcontractors). In total, 430 survey packages containing a questionnaire, an introductory letter, and an incentive were sent out via email. Of the 430 surveys sent, 295 usable questionnaires were returned thus achieving a response rate of 68.6%. The majority of the respondents were site engineers (44.4%) and project manager (29.8%) aged between 31- 40 (35.9%) and 31-40 (30.2%). Most of them were employed in engineering firms, 29% were in civil and infrastructure projects, 20.5% in residential building and 18.7% in urban development with a size ranging from small-to-medium (100-2000 employees, 49.8%) to large (>2000 employees, 50.2%). Overall, the respondents were considered a good representation of the survey population.

The CFA results of constructs are adequate, the factor loadings, ranging from 0.48 to 0.88, and were all significant at $p < 0.001$ level, suggesting convergent validity. All the correlation coefficients among constructs were less than 0.850, thus supporting the discriminate validity of the constructs.

Based on the collected data, SEM was performed to preliminary evaluate the fit of the conceptual model as well as the hypothesised relationships between the constructs. The fit indices of the conceptual model were considered to ensure the model explains the data. Figure 2 shows the results for the model with standardised path coefficients. Overall, the fit indices of the model proved to be satisfactory: $x^2 = 147.95$; df = 49; $x^2/df = 3.01$; GFI = 0.92; CFI = 0.93; IFI = 0.93; and RMSEA = 0.08.




$x^2 = 147.95$; $df = 49$; $x^2/df = 3.01$; GFI = 0.92; IFI = 0.93; TLI = 0.91; CFI = 0.93; and RMSEA = 0.08
*** $p < 0.001$.

**Figure 2: Final model with standardised path coefficients**

## 5. DISCUSSION AND CONCLUSION

This paper presents a study attempting to examine a proposed model that the Safety climate (SC) will mediate the relationship between Safety Motivation (SM) and the Safety Behaviour (SB) of individuals in Saudi construction workplace. Specifically, the study highlights the motivation has to be linked to required actions for the outcome to be achieved, which is safety climate in the current study. The motivation alone may not produce the change unless there is an appropriate safety climate to maintain safe manner and no reversion to unsafe behaviour especially in the developing countries. The model is important because it provides a link between these four constructs in a new workplace environment.

The study was carried out using a quantitative method design integrating questionnaire survey. The model derived from the SEM analysis of the survey data indicates that safety climate appears to be a key role to safety behaviour by mediating the relationships between both motivation and behaviour. The study demonstrates that general safety motivation can influence perceptions of safety climate, and these perceptions of safety climate influence safety behaviour. These findings provide valuable guidance for researchers and practitioners trying to identify the mechanisms by which they can improve safety in the workplace. A construction workplace in Saudi context should

place an emphasis on safety climate hence it is the main player beyond the connection of safety motivation and desired safety behaviour.

## 6. ACKNOWLEDGMENTS

The authors would like to thank everyone who provided information for this research. The authors would like to thank the Saudi Council of Engineers for their support and Special thanks go to the Ministry of commerce and industrial in Saudi Arabia for the generous financial support.

## REFERENCES

Al-Haadir, S. A., & Panuwatwanich, K. (2011). Critical Success Factors for Safety Program Implementation among Construction Companies in Saudi Arabia. *Procedia Engineering, 14*, 148-155.

Bright, L. (2007). Does person-organization fit mediate the relationship between public service motivation and the job performance of public employees? *Review of public personnel administration, 27*(4), 361-379.

Choudhry, R., Fang, D., & Lingard, H. (2009). Measuring Safety Climate of a Construction Company. *Journal of construction engineering and management, 135*, 890.

Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009). Workplace safety: A meta-analysis of the roles of person and situation factors. *Journal of Applied Psychology, 94*(5), 1103.

Clarke, S. (2010). An integrative model of safety climate: Linking psychological climate and work attitudes to individual safety outcomes using meta-analysis. *Journal of Occupational and Organizational psychology, 83*(3), 553-578.

Clarke, S., & Robertson, I. (2005). A meta analytic review of the Big Five personality factors and accident involvement in occupational and non occupational settings. *Journal of Occupational and Organizational psychology, 78*(3), 355-376.

Cooper, M., & Phillips, R. (2004). Exploratory analysis of the safety climate and safety behavior relationship. *Journal of Safety Research, 35*(5), 497-512.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual review of psychology*, 109-133.

Fang, D., Chen, Y., & Wong, L. (2006). Safety climate in construction industry: a case study in Hong Kong. *Journal of construction engineering and management, 132*, 573.

Fey, C. F. (2005). Opening the black box of motivation: A cross-cultural comparison of Sweden and Russia. *International Business Review, 14*(3), 345-367.

G.O.S.I. (2010). *EMPLOYMENT INJURIES Annual statistical report 1431 H* General Organization for Insurance Retrieved from http://www.gosi.gov.sa/portal/web/guest/85.

Geller, E. S. (2010). Cultivating a Self-Motivated Work Force: The Choice, Community and Competence of an Injury-Free Culture-" The best kind of pride is that which compels people to do their very best work, even if no one is watching.". *Occupational Hazards, 3*(5), 31.

Gershwin, M. C. (1994). What Workplace Education Programs Need to Know About Behaviour Change: Tapping the Work of Kurt Lewin. Retrieved 11 November 2012 http://cmapspublic.ihmc.us/rid=1GSCTFY1V-Q3H645-243Q/Workplace%20Education%20&%20Behavioral%20Change_Tapping%20the%20Work%20of%20Kurt%20Lewin.pdf

Glendon, A., & Litherland, D. (2001). Safety climate factors, group differences and safety behaviour in road construction. *Safety Science, 39*(3), 157-188.

Griffin, M., & Neal, A. (2000). Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology, 5*(3), 347-358.

Hamid, A., Rahim, A., Majid, A., Zaimi, M., & Singh, B. (2008). Causes of accidents at construction sites. *Malaysian Journal of Civil Engineering, 20*(2), 242-259.

Hinze, J. (1997). Construction safety, Prentice-Hall, Upper Saddle River, N. J.

Lee, T., & Harrison, K. (2000). Assessing safety culture in nuclear power stations* 1. *Safety Science, 34*(1-3), 61-97.

Locke, E., & Latham, G. (2004). What should we do about motivation theory? Six recommendations for the twenty-first century. *The Academy of Management Review, 29*(3), 388-403.

Lusk, S. L., Ronis, D. L., & Baer, L. M. (1995). A comparison of multiple indicators. *Evaluation & the Health Professions, 18*(1), 51.

Mohamed, S. (2002). Safety climate in construction site environments. *Journal of construction engineering and management, 128*, 375.

Moynihan, D. P., & Pandey, S. K. (2007). Finding Workable Levers Over Work Motivation. *Administration & Society, 39*(7), 803.

Rechenthin, D. (2004). Project safety as a sustainable competitive advantage. *Journal of Safety Research, 35*(3), 297-308.

Sawacha, E., Naoum, S., & Fong, D. (1999). Factors affecting safety performance on construction sites. *International Journal of Project Management, 17*(5), 309-315.

Schutte, R. (2010). Safety Performance in the Construction Sector.

Vinodkumar, M., & Bhasi, M. (2010). Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. *Accident Analysis and Prevention, 42*(6), 2082-2093.

Vroom, V. H. (1964). *Work and motivation*: Oxford, England: Wiley.

Yule, S. (2003). Safety culture and safety climate: A review of the literature. *Industrial Psychology Research Centre*, 1-26.